SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. C-55-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CORPORATIONS" 1-10; and "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action

BRIEF IN OPPOSITION TO PLAINTIFF'S MOTION FOR LEAVE TO FILE A COUNTERCLAIM AND FOR PRELIMINARY INJUNCTION

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PRELIMINARY STATEMENT

Defendant City of North Wildwood's ("NWW's"), motion is procedurally deficient because it fails to state claims that can be addressed by the Court, makes claims that are not ripe for consideration, and requests relief that cannot be disposed of in a summary manner.

The New Jersey Department of Environmental Protection ("DEP" or "Department") has been charged by the legislature with reviewing all development in coastal areas. Preconstruction review and approval of coastal protection facilities like bulkheads is necessary to ensure protection of both the public and the environment, and the review is highly technical. Nevertheless, NWW has filed a motion for leave to file a Counterclaim seeking injunctive relief in the form of an order from the Court authorizing it to install a bulkhead without first obtaining DEP approval and despite DEP's stated concerns about the safety and effectiveness of the proposed bulkhead. NWW also seeks unrelated monetary relief.

NWW's best and most prudent course of action is to file an application with DEP relevant to the alleged current emergent conditions, cure any administrative deficiencies in its 2020 application, and proceed with a technical review of its applications with DEP. DEP has repeatedly discussed these options with NWW and has offered it's technical expertise and expedited help.

In its proposed Counterclaim, NWW requests that the Court use its equitable powers to stand in the shoes of the DEP and authorize specific oceanfront construction, including the installation of a bulkhead between 15th and 16th Avenues, without a permit or emergency authorization ("EA") granted by the DEP. NWW has resorted to this extraordinary request after it failed to timely challenge DEP's partial denial of NWW's October 5, 2022 Emergency Authorization application, in which the City requested the same relief. But the ability to approve their request, which lies with DEP pursuant to the Coastal Area Facilities Act ("CAFRA"), exceeds the broad equitable powers of the Court.

NWW further contends it is entitled to monetary relief based on the alleged breach of a State Aid Agreement, entered into between DEP and NWW on March 1, 2022. NWW seeks damages from the Department in the amount of $21,000,000, for expenses NWW allegedly incurred that largely pre-date the State Aid Agreement itself. Even so, this demand was made by NWW without first filing of a required, valid notice of claim pursuant to the New Jersey Contractual Liability Act, N.J.S.A. 59:13-5 et seq. A notice of claim must be filed at least ninety (90) days prior to the filing of an action against a state agency in accordance with N.J.S.A. 59:13-5. As such, NWW's claim for damages is premature and not ripe for consideration by this Court.

Even if the Court were to approve NWW's motion, its Counterclaim would fail on the merits and DEP reserves its right to file a more specific Motion to Dismiss. This Court simply has no authority in law or equity to authorize the installation of a bulkhead without DEP approval and the DEP has diligently fulfilled all of its obligations under the State Aid Agreement. As such NWW's request for leave to file a Counterclaim should be denied in its entirety.

STATEMENT OF FACTS AND PROCEDURAL HISTORY[1]

NWW's History of Noncompliance

Since 2012, NWW has engaged in extensive oceanfront work without the necessary DEP approvals and permits including, destroying/disturbing existing vegetated dunes, wetlands and wildlife habitat, by grading, excavating and filling these areas and constructing a lengthy bulkhead, as well as constructing numerous other oceanfront structures and pathways. Certification of Michele Kropilak ¶ 6. NWW and its leasehold developer also constructed numerous unpermitted structures including a private swim club on the nearby Seaport Pier. Id. at ¶ 9. Most relevant, in 2020, NWW destroyed/disturbed more than 6 acres of mature,

[1] The Statement of Facts includes a reiteration of certain facts and references to certifications previously submitted in support of DEP's Order to Show Cause, as same are also relevant to NWW's motion for leave to file a Counterclaim. Courtesy copies of the referenced certifications are being resubmitted with this opposition brief for the Court's ready reference and convenience.

densely vegetated dunes, and installed a vinyl and/or steel bulkhead from 3rd Avenue to 13th Avenue without applying for or receiving the required DEP permits prior to construction. Id. at ¶¶ 7, 9. DEP was alerted to this unauthorized activity and issued NOVs to NWW and its oceanfront development contractors NOVs for these violations on June 6, 2020. Id. This area is regulated by DEP under CAFRA, the Freshwater Wetlands Protection Act ("FWPA"), and its implementing regulations, and the Flood Hazard Area Control Act ("FHACA") and its implementing regulations. Id.

NWW subsequently filed a permit application in 2020, to attempt to legalize the existing unauthorized bulkhead and other unauthorized oceanfront structures, and to further expand the bulkhead south from 13th Avenue to 25th Avenue within dunes along the oceanfront. Certification of Colleen Keller ¶¶ 7-10. DEP notified NWW that this permit application is administratively deficient, but NWW has to date declined to provide information necessary for DEP to deem the application complete for review.[2]

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[2] Technical review of the 2020 permit has not commenced as of the date of this application because DEP has determined that the permit remains administratively deficient. Certification of Colleen Keller at ¶¶ 9, 10. Technical review cannot commence until the deficiencies have been addressed by NWW. Id. ¶ 10. An administrative deficiency notice was issued by DEP on December 3, 2020 for the permit application to legalize the unauthorized bulkhead that was installed from 7th Ave to 13th Ave and the proposed expansion of the bulkhead. Id. at 9. This administrative deficiency was issued for missing, but required, property owner signatures and the initial newspaper ad as required by CAFRA. Id. NWW's counsel has represented that these deficiencies are being addressed and a new application should be submitted to DEP. See First Supplemental

Id. NWW recently requested, and was denied authorization, to install a section of the 2020 proposed steel bulkhead from 15th to 16th Avenues in its most recently filed EA as noted above. Certification of Jennifer Moriarty ¶ 9.

Post-Ian Emergency Authorization Request

On the evening of October 3, 2022, DEP received an email from NWW's consultant indicating that NWW would be submitting an EA request to protect the Beach Patrol Building at 15th Avenue. Certification of Colleen Keller at ¶ 13. The next day, DEP responded indicating that it would expedite review of the EA and reminded NWW of the standards applicable to post-storm restoration within the Coastal Zone Management ("CZM") Rules, N.J.A.C. 7:7-10.3(b). Id. ¶ 14. NWW submitted a request for an EA pursuant to N.J.A.C. 7:7-21.1 on October 5, 2022, that identified the impairment of the protective dune system in the area of 15th and 16th Avenues due to erosion and claimed that a "breach condition was imminent." Certification of Jennifer Moriarty at ¶ 5.

NWW sought an EA for: 1) immediate installation of jersey barriers at the City's beach patrol building/oceanfront safety facility; 2) future installation of a bulkhead in the same location; 3) reshaping of the ocean side of the dune within this area; and 4) repair of the 16th Avenue right-of-way to the beach

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Certification of Kevin Terhune, ¶ 9. To date, an updated application has not been submitted to DEP so that technical review may commence.

and the 25th Avenue vehicular access. Certification of Jennifer Moriarty Exhibit A.

Following receipt of NWW's EA request, DEP promptly reviewed the information submitted in the request including the photographs submitted by NWW, an aerial photograph of this area taken by DEP on October 6, 2022, and on the ground photographs taken by the Office of Coastal Engineering ("OCE") of the area on October 4, 2022. Id. at ¶ 10. Staff from the Division of Land Resource Protection ("DLRP"), the DEP Division tasked with approving or denying the EA request and all land use permits, consulted with staff from the OCE who are knowledgeable and experienced with the size and shape of beach and dune systems that provide protection in towns along the State's coast. Id. Based on information compiled, and internal consultation with OCE, on October 7, 2022, DEP partially granted item 1 of the EA for the installation of the temporary jersey barriers and removal/relocation of composite/timber decking walkway to allow for the barriers. Id. at ¶ 8.

DEP determined that the other three requests: installing a bulkhead; reshaping the dune remnants; and reconstructing the 16th and 25th Avenue access points, were not necessary to prevent an imminent threat. On October 12, 2022, DEP denied these additional three additional requests. Id. at ¶ 9. DEP's EA determination was published in the DEP Bulletin on October 19, 2022. Id. In its notification denying additional EA relief, DEP reasoned NWW was not eligible for the three requests, because NWW had not demonstrated that there is an imminent threat to the loss of life or severe loss of property based on existing conditions, and that an application for a technical Individual Permit needed to be submitted for review of a bulkhead. N.J.A.C. 7:7-21.1; Id. at ¶¶ 10, 12. The emergent effects of Ian had subsided and a substantial dune/beach berm remained in place that would offer shore protection during a future storm. Id. at ¶ 10; see also the Certification of Michael Lutz at ¶ 7 (finding in his October 6, 2022 site visit that Hurricane Ian caused some erosion of the beach berm, but the beach berm and dune remained both to the North and South of 15th Avenue). In addition, an EA is intended for immediate action, and the proposed bulkhead would not be installed immediately because NWW had not yet ordered the required materials. Certification of Jennifer Moriarty at ¶ 11. N.J.A.C. 7:7-21.3(d)(1) provides that the regulated activities authorized under an EA shall be commenced within 30 calendar days after the Department's verbal decision to grant the EA. Id. Typically, an EA is proposed for emergency work that will be done within ten days of the issuance date for immediate protection if necessary. Certification of Colleen Keller at ¶ 16. A bulkhead would require significantly more time to plan, order and install and therefore, would not be considered an immediate emergency response. Id. On October 20, 2022, DEP re-emphasized to NWW that the CZM Rules, N.J.A.C. 7:7-10.3(b), authorize certain emergency post-storm beach restoration activities that are designed to return the beach to its pre-storm conditions. Id. at ¶ 20.

Less invasive shore protection measures are clearly contemplated in N.J.A.C. 7:7-10.3(b). Id. at ¶ 14. These measures include the placement of clean fill material with grain size compatible (or larger than) the existing beach material; the bulldozing of sand from the lower beach profile to the upper beach profile; the alongshore transfer of sand on a beach; the placement of concrete, rubble, or rock; and the placement of sand geotextile bags or tubes. Id. at ¶¶ 14, 20. All of these measures were unpersuasively dismissed by NWW out of hand citing logistical difficulty and expense. Certification of Jennifer Moriarty ¶¶ 14-16.

DEP further explained in its October 12, 2022 correspondence that a bulkhead must be considered through a permit application under the CZM Rules because "the proposed bulkhead could increase erosion to the beach/dune system waterward of the [lifeguard station] structure, and to the north and south of the structure due to end-effect erosion, which could exacerbate, rather than alleviate, the problems faced by the City in future storms." Id. at ¶ 12. NWW acknowledges this possibility in its October 20, 2022 letter to the Commissioner. See Ex. E to the Certification of Jennifer Moriarty.

DEP also reminded NWW of its pending permit application for the proposed bulkhead (which includes the section in its EA requested location) that has been administratively deficient since 2020. Id. DEP recommended that NWW cure the known administrative deficiencies communicated to NWW on December 3, 2020, in its pending bulkhead permit application so that DEP can start its technical review and assess the environmental impact of the proposed bulkhead as required by the CZM Rules, FHCA and FWPA regulations. Id. at ¶¶ 9 and 12. DEP committed to expediting review once the administrative deficiencies were addressed by NWW, however, NWW has not taken the necessary steps to date. Id. at ¶12; see also Certification of Colleen Keller at ¶ 21. On October 27, 2022, DEP sent an email to NWW's counsel requesting a meeting to discuss NWW's 2020 permit application. Id. at ¶ 21. To date, no meeting has been scheduled. Id.

NWW did not agree with DEP's partial denial of its EA, and sent a letter on October 20, 2022, indicating that it was moving forward with the unauthorized dune reshaping, which commenced that morning, and installation of the unauthorized bulkhead in the area of 15^{th} and 16^{th} Avenues. Certification of Jennifer L. Moriarty ¶ 17. That same day, H4 Enterprises, LLC, working for NWW, completed a portion of the dune reconstruction by excavating sand located at the 11th Avenue beach berm and grading the sand into the dunes from 14th to 16th Avenues without a required CAFRA permit and in violation of the EA. N.J.A.C. 7:7-2.2; Certification of Michele S. Kropilak ¶¶ 10-13.

DEP issued NWW a Notice of Violation ("NOV") for NWW's unauthorized dune disturbance and sand excavation on October 20, 2022. On October 28, 2022, DEP issued the contractor, H4 Enterprises, LLC an NOV for completing the unauthorized sand excavation and dune grading work. Certification of Michele S. Kropilak ¶¶ 10, 11. Counsel for NWW also indicated that the fabrication of the steel sheets for the bulkhead was expected to begin on November 1st, with installation planned for December 5, 2022. Certification of DAG Kevin Terhune ("Terhune Certification") Exhibit A.

On November 9 and 16, 2022, DEP received letters from the Mayor of NWW indicating that NWW intends to move forward with the construction of at least 404 linear feet of bulkhead in the vicinity of 15th and 16th Avenues. Certification of Jennifer Moriarty at ¶ 18.

The Department has been actively visiting NWW's oceanfront since the EA request was filed on October 5, 2022 to document the conditions, and in particular the beach berm/dune in front of the Beach Patrol Building at 15th Avenue. Certification of Mike Lutz. The conditions, as documented in the photographs in the Exhibits to Mr. Lutz's certification, highlight that there has been some erosion, but the beach berm/dune remains. DEP conducted a flyover of NWW's oceanfront on November 3, 2022 to document oceanfront conditions. Certification of Michael Lutz at ¶¶ 31-34. Mr. Lutz also collected and analyzed GPS data regarding the length of the beach berm/dune from 14th to 16th Avenues and determined that there is approximately seventy feet of beach berm and dune directly in front of the Beach Patrol Building at 15th Avenue. Id. at 28.

Designated Freshwater Wetlands and Freshwater Wetland Transition Area North of Beach Patrol Building at 15th Avenue

On July 10, 2019, DEP issued a Freshwater Wetlands Letter of Interpretation ("LOI") verifying the boundary of the freshwater wetlands located directly north of the Beach Patrol Building at 15th Avenue. Certification of Jennifer Moriarty at ¶ 19. Regulated activities proposed within a wetland, wetland transition area or water area, as defined by N.J.A.C. 7:7A-2.2 and 2.3 of the FWPA Rules, require a permit. Id. at ¶ 20. NWW has applied for a FWPA permit in its 2020 permit application to expand the bulkhead in the same proposed location of the bulkhead in the October 2022 EA. Id. The proposed expanded bulkhead in the 2020 permit application will impact the freshwater wetlands transition area near the Beach Patrol Building. Id. NWW submitted a hand-drawn map of the proposed bulkhead in the EA and it is unclear to DEP if the bulkhead under the EA will impact this freshwater wetland transition area. Id. at ¶ 21.

The Department has determined that the freshwater wetlands and freshwater wetlands transition area north of the Beach Patrol Building is likely of exceptional resource value and provides important habitat for state endangered migratory raptors. Certification of Laurance S. Torok at ¶¶ 7-9.

Stevens Institute of Technology Report Regarding Erosion Analysis of the Dune System at 15th Avenue

DLRP consults with the Stevens Institute of Technology to review certain shore protection projects that have been proposed within the coastal environment to provide DEP with comments regarding design and whether the project could cause adverse impacts to the adjacent coastal system from a coastal engineering perspective. Certification of Colleen Keller at ¶ 6. While DLRP does not traditionally consult with the Stevens Institute on EA requests, DLRP reached out to the Director of the Stevens Institute, Mr. Jon Miller, for his opinion on the recent erosion in the area of 15th Avenue. Id. at ¶ 22. Mr. Miller had previously opined on July 25, 2022, that NWW's shoreline from 13th to 25th Avenues remains healthy and that the dunes are well vegetated. Id. at ¶ 23. He further opined that the dune system in this area is adequate to protect upland infrastructure and the need for a continuous bulkhead is not apparent. Id. On November 15, 2022

Mr. Miller advised DLRP that his conclusions from the summer regarding NWW's shoreline from 13th to 25th Avenues remained unchanged. See Exhibit F of Certification of Colleen Keller.

Subsequent Communications Between the Parties

NWW indicated to this Court in its December 7, 2022 letter that NWW would file a new EA application if a new emergent situation arises. NWW's counsel has also repeatedly indicated to DEP since the filing of this Order to Show Cause that NWW is preparing a new EA application and would submit it when NWW believed emergency conditions warranted an EA application. See First Supplemental Certification of Kevin Terhune, ¶¶ 5, 7, 10 and 11.

During the pendency of this action, DEP representatives and counsel have maintained consistent and timely communication with counsel for NWW offering assistance, including offers to pre-review any new draft EA that NWW was willing to submit for consideration. To date, NWW has not filed a new EA with DEP to address what NWW continues to allege are emergent conditions on its oceanfront. Id.

NWW's Motion for Leave to File a Counterclaim

On January 4, 2023, NWW filed opposition to DEP's application for preliminary injunctive relief and filed a motion for leave to file a Counterclaim in DEP's summary proceeding.

In addition to a claim for damages for the breach of a State

Aid Agreement ("SAA") entered into between DEP and NWW, NWW requested the extraordinary relief that this Court use its broad equitable powers to authorize the installation of a bulkhead along 15th and 16th Avenues. See Certification of Anthony S. Bocchi, Exhibit A. DEP submitted its Reply Brief and supporting certifications in response to NWW's opposition on January 11, 2023. The SAA entered between DEP and NWW was not fully executed until March 1, 2022 when it was signed by the Commissioner. Certification of Christopher Constantino. Appendix D to the SAA contains the required easements DEP must obtain in NWW and Appendix D contains no due date by which DEP must obtain the easements. Id. DEP has been actively working on obtaining these easements in NWW. Id.

The instant Brief and attached Certifications are being submitted in opposition to NWW's motion for leave to file a Counterclaim.

Issuance of an AONOCAPA by DEP

On January 12, 2023, DEP issued an Administrative Order and Notice of Civil Administrative Penalty Assessment ("AONOCAPA") to NWW. See Certification of Jennifer Moriarty in Opposition to NWW's Motion for Leave to File Counterclaim, Exhibit 1.

ARGUMENT

POINT I

NWW'S REQUEST FOR LEAVE TO FILE A COUNTERCLAIM MUST BE DENIED BECAUSE IT IS PROCEDURALLY INSUFFICIENT AND REQUESTS RELIEF THAT CANNOT BE RESOLVED IN A SUMMARY MANNER.

NWW's contends that it needs to file a counterclaim pursuant to the Entire Controversy Doctrine. However, must first obtain leave of Court to file a counterclaim in this summary proceeding, NWW's application fails to provide sufficient facts indicating that it is authorized by rule or statute to proceed in a summary manner, and fails to plead facts sufficient for the Court to determine that the requested relief can be completely disposed of summarily. Further, NWW allegedly requests preliminary injunctive relief that is not sufficiently supported by verified pleading or affidavit. NWW's Counterclaim also asserts a claim for breach of contract between DEP and NWW which is both unrelated to this matter and not ripe for determination by the Court. As such, the Entire Controversy Doctrine would not require the inclusion of such claims in this summary action.

Count One of NWW's proposed Counterclaim, entitled "Injunctive Relief" does not plead facts setting forth what actions or inactions it seeks to enjoin. Rather, Count One asks the Court to grant affirmative, summary relief, that was properly denied by DEP in its review of NWW's EA application of October 5, 2022.

NWW had the opportunity to appeal DEP's denial of its EA application to the OAL, or in limited circumstances, to the Appellate Division, which has exclusive jurisdiction to review a final agency action. See Matter of Valley Road Sewage Co., 295 N.J. Super. 278, 290-91 (App. Div. 1996), aff'd 154 N.J. 224 (1998) (holding that only the Appellate Division has jurisdiction to review the merits of a final State agency action and that such review by a trial court is precluded by R. 4:67-6(c)(3)).

Rather than pursue review of DEP's decision in the appropriate forums, NWW now seeks to file a Counterclaim which seeks to provide the exact same relief that was requested and denied in its partially granted EA application. The "Facts Common to All Counts" simply state, in conclusory, unverified manner, that the installation of the bulkhead between 15th and 16th Avenues is critical to the protection of NWW, is absolutely necessary to protect against the imminent threat to life and property, and that the EA should not have been denied. These are issues NWW should have argued before the appellate division and are beyond the scope of the Court's broad jurisdiction.

Without adequate facts supported by affidavit or a verified pleading, NWW further claims that immediate and irreparable harm is likely to result in the absence of such affirmative relief. NWW sets forth in a conclusory manner that a breach of the dune system is likely, and because it is the middle of the winter storm season, that this represents an imminent threat to life and property satisfying its burden for an EA under N.J.A.C. 7:7-21.1. These unverified claims are virtually identical to those claims that were addressed by DEP in its review and subsequent denial of NWW's EA application. See Certification of Jennifer Moriarty, ¶¶ 9 through 12.

The facts previously presented to DEP in NWW's October 5, 2022 EA application are not properly before the Court because NWW failed to challenge DEP's partial denial of its EA application on October 12, 2022. Additionally, any new facts alleged by NWW in its counterclaim that were not previously presented to DEP in its October 5, 2022 EA application are also not properly before the Court because such facts have not been presented to DEP to make an agency decision. If and when NWW decides to submit a new EA or CAFRA permit to DEP for consideration of these new alleged harms warranting either an EA pursuant to N.J.A.C. 7:7-21.1 or an Individual CAFRA permit, NWW can challenge those facts once a final agency decision has been rendered to either the OAL or the Appellate Division, as appropriate. Any new data and opinion submitted by NWW to support its motion to file a Counterclaim is irrelevant to and lies outside the scope of DEP's request for preliminary injunctive relief. This Court does not have jurisdiction to further consider same.

POINT II

NWW'S REQUEST FOR LEAVE TO FILE A COUNTERCLAIM MUST BE DENIED BECAUSE THE REQUESTED RELIEF EXCEEDS THE EQUITABLE AUTHORITY OF THIS COURT.

While a chancery court possesses broad equitable powers and has great flexibility to devise a remedy where equity so requires, this authority is not unlimited and cannot circumvent the discretionary authority that our state legislature has granted to the DEP. Since the regulatory authorization sought by NWW in its "Injunction" claim is not within the powers of the Court, NWW's motion for leave to file a counterclaim should be denied.

A. Relief Sought is beyond the Constitutional scope of this Court.

Article 3, paragraph 1 of the New Jersey Constitution sets forth that,

> The powers of the government shall be divided among three distinct branches, the legislative, executive and judicial. No person or persons belonging to or constituting one branch shall exercise any of the powers properly belonging to either of the others, except as expressly provided in this Constitution.
>
> New Jersey Constitution of 1947, Art. III, para 1.

DEP, is a principal department within the Executive Branch of the New Jersey State government vested with the authority to conserve and protect natural resources, protect the environment, prevent pollution, and protect the public health and safety. N.J.S.A. 13:1D-9. DEP has exclusive authority to review permit applications under CAFRA and EA applications brought pursuant to the CZM Rules. N.J.S.A. 13:19-5. NWW has acknowledged DEP's authority in this regard by submitting its EA application to the DEP in the first instance. It further acknowledges DEP's authority by advising on multiple occasions that it would be submitting a new EA for consideration by DEP if the conditions on the beachfront warranted it and that NWW was addressing the administrative deficiencies in its 2020 CAFRA permit. See First Supplemental Certification of Kevin Terhune. NWW cannot now ask the Court to provide the exact relief that was previously denied by DEP, or consider new information and analysis that has come to light after DEP's denial. Any new information or analysis must be submitted to DEP, which has been tasked by the State legislature to decide what relief is appropriate or warranted.

It is without question that the Court cannot exercise unconstitutional authorization through the use of its equitable powers. The Court has jurisdiction pursuant to Rule 4:67-6(c)(1) to enforce final agency actions, not compel a State agency to make them. See Ironbound Health Rights Advisory Commission v. Diamond Shamrock Chemical Company, 216 N.J. Super. 166, 176 (App. Div. 1986) (holding that a judicial order compelling an executive agency to take discretionary action violates the separation of powers afforded by the New Jersey Constitution). Indeed, even the merits of those final agency orders are not reviewable in enforcement actions in Superior Court. Rule 4:67-6(c)(3).

B. Review of a final agency action is not justiciable before this Court.

DEP's Order to Show Cause and Verified Complaint was filed pursuant to Rule 4:67-6, and the trial court's powers are limited to enforcement of DEP's denial of NWW's October 5, 2022 EA request for an emergency bulkhead. See New Jersey Dep't of Envtl. Prot. v. Mazza & Sons, Inc., 209 N.J. Super. 13, 22-23 (App. Div. 2009).

"Rule 4:67-6(c)(3) does not permit a trial court to inquire into the validity of an agency order. The Rule simply gives agency orders the force of law with all of the law's panoply of power to punish for contempt." State Farm Mut. Auto Ins. Co. v. State, 118 N.J. 336, 344 (1990). R. 4:67-6(c)(3) states in pertinent part that "the validity of an agency order shall not be justiciable in an enforcement proceeding." Rather, pursuant to R. 2:2-3(a), the Appellate Division has exclusive jurisdiction to review the merits of final state agency determinations. Matter of Valley Road Sewage Co., 295 N.J. Super. 278, 290-91 (App. Div. 1996), aff'd 154 N.J. 224 (1998) (holding that only the Appellate Division has jurisdiction to review the merits of a final State agency action and that such review by a trial court is precluded by R. 4:67-6(c)(3)); State Farm v. Dept. of Public Advocate, 227 N.J. Super. 99, 131 (App. Div. 1988), aff'd 118 N.J. 336, 344 (1990); Dept. of

Community Affairs v. Wertheimer, 177 N.J. Super. 595 (App. Div. 1980). The Court is also not permitted to replace its judgment for DEP's when it is the State Agency tasked with making permitting decisions pursuant to CAFRA and the CZM Rules, including EA applications. See Pinelands Pres. Alliance v. N.J. Dep't of Envtl. Prot., 436 N.J. Super. 510, 524 (App. Div. 2014) (finding that Courts "extend substantial deference to an agency's interpretation and application of its own regulations, particularly on technical matters within the agency's special expertise."); see also In re Freshwater Wetlands Prot. Act Rules, 180 N.J. 478, 488-89 (2004).

NWW, however, has failed to seek appellate review of the Department's decision. As such, NWW is not permitted to attempt to re-litigate DEP's decision on its October 5, 2022 EA application, let alone request that the Court make an independent assessment of the viability of its proposed oceanfront construction *ab initio*, in the current action to enforce a final agency decision. Therefore, the Court should not grant NWW's motion for leave to file a counterclaim for a court order to install a bulkhead, a regulated activity that requires permit approval under CAFRA and the CZM Rules, to which DEP is the State Agency statutorily tasked with providing such authorizations. This administrative authority has been reserved for DEP by the State legislation and is clearly outside even the broadest equitable jurisdiction of the Court.

C. New permit or EA applications are necessary for any coastal construction.

DEP is not responsible for deciding what shore protection measures NWW may choose to address its ongoing concerns for its oceanfront. It is responsible for evaluating the shore protection measures that NWW wishes to implement. It is the burden of NWW at this point of the proceedings to either request an EA pursuant to N.J.A.C. 7:7-21.1 or submit an Individual Permit pursuant to the CAFRA and the FWPA to install a bulkhead. In fact, NWW concedes in its December 7, 2022 letter to the Court that it would file a new EA application if a new emergent situation arises. NWW's counsel has also repeatedly indicated to DEP since the filing of its Order to Show Cause that NWW is preparing a new EA application and would submit it when NWW believed emergency conditions warranted a new EA application. See First Supplemental Certification of Kevin Terhune, ¶¶ 5, 7, 10 and 11, which was submitted in support of DEP's reply brief and in further support of DEP's OTSC.

DEP has repeatedly reminded NWW that it is prepared to discuss a new EA application and quickly review such a request. Id. Nevertheless, to date, NWW has not filed a new EA with DEP to address what NWW continues to allege are emergent conditions on its oceanfront. Id. DEP has also continued to remind NWW that it should cure its administrative deficiencies in its 2020 permit application for a similar bulkhead so that DEP can quickly start technical review of that application. Id. NWW's counsel has represented that these deficiencies are being addressed and a new application should be submitted to DEP. See First Supplemental Certification of Kevin Terhune, ¶ 9. To date, an updated application has not been submitted to DEP so that technical review may commence.

It is incredulous that NWW, after failing to appeal DEP's partial denial of its October 5, 2022 EA, failing to cure the administrative deficiencies in its 2020 permit application, and failing to submit a new EA to address what it now alleges are new, emergent conditions, seeks such an extraordinary remedy from the Court. Such relief is beyond the scope of the Court's equitable jurisdiction, and even if the Court could consider this application, NWW presents new facts and conditions that cannot be disposed of in a summary manner.

Substantial deference to DEP's expertise in regard to construction of coastal facilities is essential to the protection of the environment and the State's natural resources. Recognizing this, the legislature designated DEP as the exclusive discretionary authority to consider CAFRA permits and review EA applications related to the CZM Rules. N.J.S.A. 13:19-5. NWW has a path available to seek appropriate redress of its plans for future oceanfront and shore protection. This path, however, does not travel through this Court. As such, the Court should deny NWW's motion for leave to file a counterclaim because the counterclaims are either not within the jurisdiction of the Court and/or not ripe for review.

POINT III

NWW'S MOTION FOR LEAVE TO FILE A COUNTERCLAIM SHOULD BE DENIED BECAUSE NWW FAILED TO FILE A TIMELY NOTICE OF CONTRACT CLAIM AS REQUIRED BY N.J.S.A. 59:13-5.

NWW contends that it is entitled to monetary damages in the amount of 21 million dollars for breach of a State Aid Agreement ("SAA") entered into between DEP and NWW on March 1, 2022.[3] NWW's contractual claims are not ripe for consideration by the Court because they are outside of the scope of DEP's Order to Show Cause, and are not of the nature that can be disposed of in a summary manner as proposed in the Count II of the Counterclaim.

A party must comply with the procedures set forth in the Contractual Liability Act ("CLA") in order to state a claim upon which relief can be granted against a public entity. See N.J.S.A. 59:13-1 to 10. Since NWW failed to file a notice of contract claim

[3] A true, fully executed copy of the referenced State Aid Agreement is attached as Exhibit 1 to the Certification of Christopher Constantino. NWW failed to attach the fully executed SAA in its papers and incorrectly states that the SAA was entered on November 16, 2021. The SAA became a fully enforceable document on March 1, 2022 when the Assistant Commissioner signed the SAA. NWW also failed to attach the Appendix to the SAA, which includes Appendix D that lists the easements DEP must obtain in NWW.

it is procedurally barred from filing a breach of contract claim. N.J.S.A. 59:13-5. Therefore, the Court should deny NWW's motion for leave to file a counterclaim for breach of contract as statutorily barred.

For purposes of this Motion, the Act's requirements in N.J.S.A. 59:8-8 are most applicable. N.J.S.A. 59:13-5 provides that a claimant's claim is "forever barred" if notice is not filed with the public entity within ninety (90) days of the claim's accrual, except as otherwise provided in N.J.S.A. 59:13-6. In other words, a complaint fails to state a claim upon which relief can be granted if a claimant does not properly file the CLA notice in accord with N.J.S.A. 59:13-5 or N.J.S.A. 59:13-6.

DEP has confirmed that NWW has not filed a Notice of Claim pursuant to N.J.S.A. 59:8-9 with the State Treasury Department or directly with DEP. See the Certification of Peter Ramos and Certification of Alice Previte. As such, NWW's Counterclaim against DEP cannot proceed until the expiration of ninety (90) days following the filing of a Notice of Claim.

Even if the Court were to entertain consideration of NWW's assertions at this time, these issues are not related to the present action before the Court and will require substantial discovery and fact finding that exceeds the scope of a summary action. DEP vehemently denies that it is in breach of the SAA, has been diligently seeking the easements which NWW claims are required of the agreement, and has already obtained most of the easements listed in Appendix D of the SAA. Certification of Christopher Constantino.[4] Additionally, the SAA contains no deadlines by which the easements noted in Appendix D are to be obtained and, thus, there can be no breach of the SAA regarding DEP's requirement to obtain the easements in NWW. Id. Further, NWW seeks reimbursement for expenses that are beyond the scope of the SAA and additional support must be provided to support its claims. For these additional reasons, the Counterclaim is not ripe for consideration in a summary action and not required under the Entire Controversy Doctrine. Therefore, the Court should deny NWW's motion for leave to file a counterclaim.

POINT IV

IF THE COURT WERE TO PERMIT THE FILING OF NWW'S COUNTERCLAIM NWW'S CLAIMS COULD NOT BE DISPOSED OF IN A SUMMARY MANNER AND WOULD EQUALLY FAIL ON THE MERITS

Throughout its submissions to the Court, NWW indicates that it has no choice but to request extraordinary relief from the Court, and that it is acting in the face of an immediate threat of irreparable harm to life and property. Not only does DEP disagree with NWW's assessment of the current conditions, but DEP maintains

[4] It should be noted that the SAA submitted by NWW with is motion for leave to file a Counterclaim is not a true, fully executed copy of the SAA entered into between DEP and NWW. A true copy has been attached to the Certification of Chris Constantino.

that NWW's current situation is due in large part to its own actions and lack of diligence in working with DEP to address the dynamic conditions that it faces on its beachfront.

NWW has submitted volumes of engineering data and analysis in support of its extraordinary request that the Court approve the installation of a bulkhead on its oceanfront. See Certification of James Verna, Certification of Peter Lomax and Certification of Ralph Patrella, Jr. submitted in opposition to DEP's application for preliminary injunctive relief and in support of NWW's application for preliminary injunctive relief. While this type of data and factual support is essential for DEP's consideration of a CAFRA permit or EA application, it is unfit for the Court's consideration under even its broadest equitable powers. Ironbound Health Rights Advisory Commission v. Diamond Shamrock Chemical Company, 216 N.J. Super. at 176.

NWW's best and most prudent course is to file an EA application relevant to the alleged current emergent conditions, cure any administrative deficiencies in its 2020 permit application, and proceed with any technical review of its application with DEP. DEP has repeatedly discussed these options with NWW and has offered to both pre-review any EA application and expedite technical review of any current or amended CAFRA permit application.

If the Court were to exercise jurisdiction to grant an EA, the technical data and opinion will require extensive discovery and expert analysis and testimony that cannot be heard in a summary manner. Further, DEP has substantial concerns regarding the engineering analysis NWW provided in support of the use of bulkheads on the NWW oceanfront that have not been reviewed by DEP in a permit application. NWW's current unpermitted bulkhead between 5th and 13th Avenues was placed along an eroding shoreline and was installed with no wave attenuating feature such as a seaward stone revetment often utilized in conjunction with bulkheads when moderate to large waves are expected due to the site conditions. See Certification of Erick Doyle at ¶ 6. Moreover, this constant wave energy hitting the bulkhead without a beach berm or revetment to dissipate the wave energy, may be causing further erosion seaward of the bulkhead and possibly adjacent to any unreinforced sites, including the area from 13th Avenue south. Id. Therefore, DEP finds it likely that the illegal bulkhead is contributing to the continued erosion south of the bulkhead's southern terminus. Id. This is why technical review of a CAFRA permit application are critical to analyze and minimize the proposed construction's erosive impacts up and down beach as well as minimizing impacts to dunes, wetlands, or other CZM designated special areas. See Certification of Colleen Keller at ¶ 19. Since NWW's proposed counterclaims are not appropriate for a summary action, NWW's motion for leave to file counterclaims should be denied.

CONCLUSION

For the foregoing reasons the Court should deny NWW’s motion to file a Counterclaim and application for preliminary injunctive relief.

Respectfully submitted,

MATTHEW J. PLATKIN
ATTORNEY GENERAL OF NEW JERSEY

By: /s/ Kevin A. Terhune
Kevin A Terhune
Deputy Attorney General

Dated: January 13, 2023

MATTHEW J. PLATKIN
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SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. C-55-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **CERTIFICATION OF ERICK M. DOYLE IN OPPOSITION TO NWW'S MOTION TO FILE A COUNTERCLAIM**

I, ERICK M. DOYLE, of full age, certify and say:

1. I am the Bureau Chief within the Division of Resilience Engineering and Construction, Office of Coastal Engineering ("OCE") at the Department of Environmental Protection ("DEP"). I previously provided a certification in support of DEP's request for a preliminary injunction and temporary restraints on December 6, 2022 to stop North Wildwood ("NWW") from installing a bulkhead as recently denied by the Department on October 12, 2022 in NWW's Emergency Authorization ("EA") application following the

remnants of Hurricane Ian, and in violation of numerous DEP statutes, as NWW does not have an approved permit to conduct such regulated activity.

2. I make this certification in support of DEP's opposition to North Wildwood's ("NWW") motion to file a counterclaim that requests court approval to install a bulkhead without DEP permit authorization or approval. This supplemental certification focuses on NWW's claim that its previously installed bulkhead along its oceanfront from 5th to 13th Avenues, which is unpermitted and unauthorized, has been a successful shore protection measure. Attached to this certification are numerous studies and/or manuals from the National Oceanic and Atmospheric Administration's Office for Coastal Management, the U.S. Army Corps of Engineers, and the Federal Emergency Management Agency ("FEMA") highlighting the fact that a bulkhead may not be an appropriate shore protection measure when there is no supporting beach berm, and that this may result in further erosion to adjacent areas of the bulkhead.

3. OCE was created to provide for the protection of life and property along the coast and preserve the vital coastal resources of New Jersey and is responsible for administering beach nourishment and shore protection projects throughout the State. When OCE partners directly

with a municipality to deliver a shore protection project in what is known as a State and Local Project, OCE works with the municipality as a co-applicant, to determine, based on the current site conditions of the coastal area, what the appropriate and legal shore protection measure(s) are that should be implemented. OCE routinely references federal studies and manuals to assist with its decision-making, some of which are attached to this certification, to assist with its review of permit applications for shore protection measures pursuant to the Coastal Area Facility Review Act ("CAFRA") and the Coastal Zone Management ("CZM") Rules. Then, either OCE or the municipality apply to the Division of Land Resource Protection for all necessary State permits and the United States Army Corps of Engineers ("USACE") for all necessary Federal permits to implement the shore protection project. OCE also consults with the Stevens Institute of Technology and the Stockton University Coastal Research Center as appropriate.

NWW's Previously Installed Bulkhead and Destruction of Dunes

4. After hearing of eyewitness accounts by OCE staff previously, on July 28, 2020, the USACE sent OCE a letter confirming that NWW performed unauthorized demolition of

existing vegetated dunes from 7th to 12th Avenues. See attached as **Exhibit A**. In this letter, USACE stated that NWW has undertaken non-permitted changes to shoreline structures that "significantly affect" the layout of the federal project. The federal project refers to the ongoing Hereford Inlet to Cape May beachfill project that was designed and authorized by USACE, with DEP serving as the non-Federal sponsor, to assist with coastal erosion. USACE's letter further states that, due to these non-permitted shoreline structures, including unpermitted construction of the steel bulkhead between 5th and 7th in 2018, the extension of the bulkhead to 13th Avenue in 2020, and the removal of existing vegetated dunes from 5th to 12th Avenues has resulted in impacts to the federal project, including redesign and analysis and an increase in cost.

Bulkheads as Shore Protection Measures

5. A bulkhead is a human-made protective structure generally designed to stabilize the shore. Bulkheads are "primarily soil-retaining structures which are designed to also resist wave attack." Generally, "for ocean-exposed locations vertical bulkheads alone do not provide a long-term solution because of foreshore erosion, toe scour, and flanking. Unless combined with other types of protection, the bulkhead must be enlarged into a massive seawall

capable of withstanding the direct onslaught of the waves." U.S. Army Corps of Engineers, Engineer Manual, 1110-2-1204, "Environmental Engineering for Coastal Shore Protection," p. 5-1 (July 10, 1989) attached as **Exhibit B**. Bulkheads are generally built along bay and harbor shorelines and not the ocean because they are not designed to withstand direct wave action. Thomas O. Herrington, "Manual for Coastal Hazard Mitigation", New Jersey Sea Grant College Program, p. 76 attached as **Exhibit C**. Moreover, "in cases where a bulkhead is needed to withstand moderate wave attack, rock facing is often placed along the seaward side of the structure to dissipate wave energy and provide scour protection." Id. Generally, bulkheads are not a suitable shore protection measure where there is no beach berm. Bulkheads are also not easily adaptable to account for sea level rise and may require full reconstruction. See NOAA "Natural and Structural Measures for Shoreline Stabilization" (Feb. 2015) attached as **Exhibit D**. FEMA's March 2022 Fact Sheet 5.4 on Shorelines states that "the primary purpose of a bulkhead is to keep soil in place and prevent the shoreline from sliding during flooding and wave attack. Protecting the land beyond the bulkhead is generally a secondary consideration." FEMA March 2022 Fact Sheet 5.4, "Shorelines" attached as **Exhibit E**. FEMA also finds that "bulkheads are not as strong as seawalls and are not suitable for ocean shorelines." Id.

6. NWW's current unpermitted bulkhead between 5th and 13th Avenues was placed along an eroding shoreline. Furthermore, this bulkhead was installed with no wave attenuating feature such as a seaward stone revetment often utilized in conjunction with bulkheads when moderate to large waves are expected due to the site conditions. As a result, the bulkhead is continuously encountering direct wave attack from the ocean. Without any wave attenuating feature to dissipate the wave energy other than the minor dissipation due to the Z-profile sheeting shape, wave energy is reflected along the length of the bulkhead to the terminus of the installation, which often leads to the phenomenon known as flanking, or end erosion. This constant wave energy hitting the bulkhead without a beach berm or revetment to dissipate the wave energy, may be causing further erosion seaward of the bulkhead and possibly adjacent to any unreinforced sites, including the area from 13th Avenue south. As such, it may be likely that the illegal bulkhead is contributing to the continued erosion south of the bulkhead's southern terminus.

7. The effectiveness of the current bulkhead, along with any possible installation of a bulkhead at 15th and 16th Avenues

should consider wave attenuation to break the energy associated with wave reflection and should be thoroughly technically reviewed via the permitting process as required by the CZM Rules.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Dated: 1-13-23

Erick Doyle
Erick M. Doyle

DOYLE EXHIBIT A TO CERTIFICATION IN SUPPORT OF OPPOSITION TO NWW MOTION TO FILE COUNTERCLAIM

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
100 PENN SQUARE EAST
PHILADELPHIA, PA 19107-3390

Mr. William Dixon
Bureau of Coastal Engineering
New Jersey Department of Environmental Protection
Suite 140
1510 Hopper Avenue
Toms River, New Jersey 08753

28 July 2020

Dear Mr. Dixon:

As you are aware on April 30, 2020 the Philadelphia District (NAP) was notified by the New Jersey Department of Environmental Protection (NJDEP) that the City of North Wildwood (NWW) had performed an unauthorized demolition of existing vegetated dunes which extend from 7th to 14th Avenues. This work occurred in the area of the authorized but unconstructed Hereford to Cape May beachfill project. This project will use sand mined from an offshore borrow area in Wildwood and Wildwood Crest to build a dune and berm from North Wildwood to Lower Township. Following an investigation, NJDEP issued 2 separate notices of violations to North Wildwood in relation to the unpermitted activity. NJDEP also requested that NAP perform a site visit to the proposed project area and determine the overall affect that the unpermitted work on the planned Federal project. To this end, members of the NAP Project Delivery Team (PDT) met with NJDEP personnel on June 12, 2020 and developed the following assessment.

Currently the project plans are at the 60% design level. The PDT is currently waiting on real estate easements to be obtained by NJDEP to procede with the development of the plans and specifications. The expectation is that the 90% plans and specifications will be completed once all necessary real estate easements are obtained for both the placement and mining of sand.

In the interim since the 60% submission, the City of North Wildwood has undertaken several non-permitted changes to the shoreline structures that significantly affect the layout of the project dune and berm as currently designed. These include:

a. The unpermitted construction of the steel sheet pile bulkhead between 5th and 7th Avenues in March/April 2018
b. In March 2020 the sheet pile bulkhead was extended to the north side of 13th Ave, also without a permit.
c. Removal of the existing vegetated dunes and crossovers from 5th to 15th avenues. See the images attached at the bottom of this document for before and after conditions of the existing dune removal.

Due to the observed structural and physical changes to the dune and berm in NWW, the USACE 60% design is in conflict with the current site conditions, and may require significant engineering re-analyses, and subsequent redesign of impacted locations of the project. This process will require the following activities due to the site changes:

a. Any modeling that would be required in support of updates or alterations to the project to optimize the placement and alignment of the dune and berm. The dune and berm locations were developed during the Feasibility Study based on storm erosion and inundation modeling analysis conducted to select an optimized design template that provided the highest level of net benefits selected from among several alternatives. It also should be noted that the placement of the project dune took into consideration the location of an existing stretch of vegetated dunes that have existed for decades from 7th to 15th Avenue. As a result of this the proposed project dune placement was seaward of the existing vegetated dune. It is recommended now that since the historic vegetated dune has been removed, the project dune be placed further landward than shown in the 60% design. This change in location would result in higher needed quantities but would lower the vulnerability of the project dune to storm erosion.

b. Additional H&H analysis to estimate if the erosion rate has changed due to the changed site conditions. The erosion rate was calculated previously to determine the re-nourishment volume and cycle. If the erosion rate is estimated to increase from the previous calculated value due to the physical changes made in North Wildwood then the construction berm width and therefore sand quantities will need to increase. In addition, the re-nourishment cycle length could become shorter if erosion rates are larger and re-nourishment needs to be place more frequently.

c. The completed bulkhead has the potential to alter benefits evaluated in the feasibility analysis for the study area. While the new bulkhead could potentially reduce coastal storm risk, the removal of decades-old natural dunes along six blocks of oceanfront may result in a net increase in coastal storm risk for the area and greater susceptibility to storm events in the future. The 2014 feasibility report evaluated storm damages for the then-existing and Future Without Project (FWOP) Conditions in North Wildwood, Wildwood, Wildwood Crest, and Lower Township. Analysis included investigation of the beach and dune profiles as well as the then-existing wooden bulkhead. Construction of the new steel bulkhead and the corresponding removal of dunes may impact the FWOP Condition and estimated Average Annual Damages (AAD). Prior to construction the FWOP and AAD may be recalculated based on the new coastal morphology to reflect any changes to the proposed dune template which could impact the Benefit Cost Ratio and Average Annual Net Benefits metrics.

d. A volume analysis of sand needed to construct the project will need to be recalculated and the proposed borrow area may need to be revised based on those findings.

e. The current drawings also reflect a sand back passing borrow location in Wildwood and Wildwood Crest and quantities associated with the 60% beach fill layout in North Wildwood. Since the entire beach template will need to be updated in North Wildwood, the quantities of mined sand will also change and all the relevant drawing sheets for these towns will also need to be revised.

f. Potential geotechnical investigations to verify subsurface conditions will support revised locations of project features.

g. All crossovers in North Wildwood will need to be re-evaluated.

h. As part of any redesign of the dune and berm, an assessment of site drainage should be completed to evaluate the need for any additional drainage features

i. Additional surveys in North Wildwood will need to be collected and used for subsequent analyses.

In addition, the layout of any revised project dune will be negatively impacted by the recent construction of the steel sheet pile bulkhead at 5th Avenue which was constructed about 100 feet seaward of the rest of the bulkhead to the north in what appears to be an attempt to create public space landward of the bulkhead (Note the constriction of the project dune at 5th Ave. resulting from the seaward construction of the steel sheet pile bulkhead in Figure 1). This seaward location could create an area of focused erosion along the shoreline that will negatively impact any dune or beachfill placed in this location. Also, if the project dune at 5th Avenue is to be relocated seaward so that the bulkhead is buried within its footprint then that could increase the vulnerability of the dune to storm damage and higher erosion rates than previously calculated. Placing the dune seaward from its location as shown in the 60% plans could reduce the storm damage protection afforded to the community.

To summarize, after completing the site visit the PDT has determined three potential project impacts. Based on the past design effort, and an estimate of tasks necessary for a redesign and analysis, the estimated cost increase to the project could be on the order of $150,000 to $200,000. If requested a more detailed cost estimated can be developed for future reference.

a. The proposed project dune alignment will most likely be realigned and shifted landward. As previously stated the removal of the historic vegetated dune will now allow the placement of the engineered dune further landward. The impact of this realignment is anticipated to have both a negative and positive impact to the project. There will be an additional project cost associated with the remodeling and redesign of the dune and berm as well as an increase in the volume of sand needed to construct the project. This volume increase will also increase the total cost to construct the project. However, the ability to move the dune further landward will most likely result in a more resilient dune which could lower its vulnerability to storm damage. As recommended, additional engineering analyses will be required to evaluate these impacts.

b. The volume of sand necessary for construction of the federal project is expected to increase due to the removal of the North Wildwood dunes. This additional volume will need to be removed from the borrow area in Wildwood and Wildwood Crest and a check of the amount of available material within the borrow area will need to be completed in order to make sure the additional needed quantity does not exceed the available quantity. The need for additional sand will result in a larger borrow area than was proposed during the 60% design. Expansion of the proposed borrow area could also result in additional real estate easements necessary to complete the project.

c. The current alignment of the steel sheet pile could expose any constructed dune to a significant increase in erosion over time and pose as a threat to the sustainability of the dune during the four year re-nourishment cycle.

Regardless of any of these potential impacts, NJDEP should continuing moving forward with real estate acquisition in order to proceed towards project construction. I would like to have our teams meet in the near future to discuss and develop a realistic schedule for obtaining the necessary easements. If you or your staff would like to discuss this issue further or if you have any additional questions, please feel free to contact Mr. Michael Hart (Project Manager) at 215-656-6513.

Sincerely,

BARCOMB.NATHAN.C.1228664827 Digitally signed by BARCOMB.NATHAN.C.1228664827 Date: 2020.07.28 15:08:24 -04'00'

for Curtis A. Heckelman, PE, PMP
Deputy District Engineer,
Programs & Project Management

DOYLE EXHIBIT B TO CERTIFICATION IN SUPPORT OF OPPOSITION TO NWW MOTION TO FILE COUNTERCLAIM

CECW-EH-W Engineer Manual 1110-2-1204	Department of the Army U.S. Army Corps of Engineers Washington, DC 20314-1000	EM 1110-2-1204 10 July 1989
	Engineering and Design ENVIRONMENTAL ENGINEERING FOR COASTAL SHORE PROTECTION	
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EM 1110-2-1204
10 July 89

US Army Corps
of Engineers

ENGINEERING AND DESIGN

Environmental Engineering for Coastal Protection

ENGINEER MANUAL

DEPARTMENT OF THE ARMY
US Army Corps of Engineers
Washington, DC 20314-1000

EM 1110-2-1204

CECW-EH

Engineer Manual
No. 1110-2-1204

10 July 1989

Engineering and Design

ENVIRONMENTAL ENGINEERING FOR COASTAL SHORE PROTECTION

1. Purpose. The purpose of this manual is to provide guidance in enviromental engineering for coastal shore protection projects.

2. Applicability. This manual applies to all field operating activities that have responsibility for environmental impact studies related to coastal shore protection projects.

3. Discussion. This manual summarizes research and field experience gained in the area of environmental engineering for coastal shore protection. It addresses both natural and human induced changes in the coastal zone; the structural and nonstructural measures that coastal engineers employ against these changes; and the desirable and adverse impacts of the measures. This manual is intended to be compatible and used in conjunction with other OCE engineering manuals and the coastal Engineering Research Center's "Shore Protection Manual." As new information becomes available the manual will be periodically revised.

FOR THE COMMANDER:

ALBERT J. GENETTI, Jr.
Colonel, Corps of Engineers
Chief of Staff

DEPARTMENT OF THE ARMY
US Army Corps of Engineers
Washington, DC 20314-1000

EM 1110-2-1204

CECW-EH

Engineer Manual
No. 1110-2-1204

10 July 1989

Engineering and Design
ENVIRONMENTAL ENGINEERING FOR COASTAL SHORE PROTECTION

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CHAPTER 1

INTRODUCTION

1-1. Purpose. This manual provides guidance for incorporating environmental considerations into the engineering, design, construction, operation, and maintenance of coastal shore protection projects.

1-2. Applicability. The manual is applicable to all Corps field operating activities having civil works responsibilities in the area of coastal shore protection.

1-3. Scope. Selection of the best environmental and engineering solution to a specific coastal problem reguires a systematic and thorough study because of the complexity of coastal projects and the diversity of coastal environments. The prerequisites to such a study are a clear definition of the problem and cause of the problem and then a comprehensive review of potential solutions (alternatives). This manual addresses both natural and human-induced changes in the coastal zone; the structural and nonstructural measures that coastal engineers employ against these changes; and the beneficial and adverse impacts of these measures. Immediate and long-term impacts in the project area, as well as adjacent environments, are summarized. In addition, this manual emphasizes potential steps for obtaining desirable results and reducing adverse impacts. The manual focuses primarily on shore protection, i.e., coastal projects designed to stabilize the shore against erosion related principally to current and wave action: however, the material is also applicable to harbor and navigation channel improvements. The manual applies to both the Great Lakes and the coastal marine systems. It identifies the principal environmental factors that should be considered in design and construction and provides techniques for attaining environmental quality objectives. Proper techniques for collection, analysis, and interpretation of environmental data to use in planning and engineering are outlined. This manual is intended to be compatible and used in conjunction with other OCE engineering manuals and the Coastal Engineering Research Center's "Shore Protection Manual" (US Army Engineer Waterways Experiment Station 1984). As new information becomes available, this manual will be periodically revised.

1-4. References. The Corps references listed below provide guidance to field personnel concerned with planning, design, construction, operation, and maintenance of coastal shore protection projects.

a. ER 200-2-2, Procedures for Implementing NEPA.

b. ER 1105-2-10, Planning Programs.

c. ER 1105-2-20, Projects Purpose Planning Guidance.

d. ER 1105-2-35, Public Involvement and Coordination.

e. ER 1105-2-50, Environmental Resources.

f. ER 1110-2-400, Design of Recreation Sites, Areas, and Facilities.

g. ER 1110-2-1403, Hydraulic and Hydrologic Studies by Corps Seperate Field Operating Activities and others.

h. ER 1110-2-8102, Model Testing at Waterways Experiment Station.

i. ER 1110-2-1404, Deep-Draft Navigation Project Design.

j. ER 1130-2-307, Dredging Policies and Practices.

k. ER 1165-2-130, Federal Participation in Shore, Hurricane, Tide, and Lake Flood Protection.

l. EM 1110-l-400, Recreation Planning and Design Criteria.

m. EM 1110-2-1202, Environmental Engineering for Deep-Draft Navigation.

n. EM 1110-2-1614, Design of Coastal Revetments, Seawall, and Bulkheads.

o. EM 1110-2-2502, Retaining Walls.

p. EM 1110-2-2904, Design of Breakwaters and Jetties.

q. EM 1110-2-2906, Design of Pile Structures and Foundations.

r. EM 1110-2-3300, Beach Erosion Control and Shore Protection Studies.

s. EM 1110-2-5025, Dredging and Dredge Material Disposal.

t. EM 1110-2-5026, Dredged Material Beneficial Uses.

u. EP 1165-2-1, Digest of Water Resources Policies and Authorities.

1-5. Appendices.

a. Bibliography. Bibliographical. references are indicated throughout the text by last names of authors listed alphabetically in Appendix A. The WES reports referenced are available on loan from the Technical Information Center, US Army Corps of Engineer, Waterways Experiment Station, PO Box 631, Vicksburg, Mississippi 39180-0631.

b. Models. Appendix B contains information on both numerical and physical models available for environmental studies. The capability of each model is briefly discussed and its source is identified.

c. Regulations. Federal regulations related to implementing coastal shore protection projects are listed in Appendix C. All projects will also need to achieve compliance (most likely through the local sponsor) with state or territorial, county, and other local government statutes.

d. Species Profiles. A list of published and unpublished estuarine/marine species profiles is provided (Appendix D). The profiles give brief but conprehensive sketches of the biological characteristics and environmental and habitat requirement of coastal fish and invertebrates.

1-6. Glossary. Definitions of key terms frequently used are provided at the end of this manual.

CHAPTER 2

OVERVIEW OF COASTAL SHORE PROTECTION PROJECTS

2-1. Classification. Coastal shore protection projects are classified into four general categories in the "Shore Protection Manual:"

a. Shoreline stabilization.

b. Backshore protection (from waves and surge).

c. Inlet stabilization.

d. Harbor protection.

A coastal problem may fall into one or more categories.

2-2. Alternatives. Once the project is identified, various alternatives are available to the coastal engineer. These alternatives involve the placement or removal of sediment, rock, wood, or other material to create new structures, to modify existing structures, or to physically alter the shore in some manner. In this manual, potential alternatives have been grouped into three categories: protective beaches, dunes, and levees; man-made structures; and nonstructural alternatives (Table 2-1). While this manual primarily addresses these three action alternatives, information presented will also be useful in evaluating passive solutions such as coastal zoning and land-use management. Dredging, a potential solution to inlet stabilization problems, and environmental considerations for this activity are addressed in EM 1110-2-1202 (see para 1-4). Mitigation policy for Federal projects is summarized in ER 1105-2-50. Chapter 8 of this manual provides an additional discussion of mitigation.

2-3. Considerations.

a. Table 2-2 lists the factors that must be considered in analyzing each project category and its associated considerations. Hydraulic considerations include wind-generated waves, swells, currents, tides, storm surge or wind setup, and the basic bathymetry of the area. Sedimentation considerations include the littoral material and processes (i.e., direction of movement, net and gross rates of transport, and sediment classification and characteristics), and changes in shore alignment. Control structure considerations include the selection of the protective works by evaluating type, use, effectiveness, economics, and environmental impact. Navigation considerations include the design craft or vessel data, traffic lanes, channel depth, width, length, and alignment. In selecting the shape, size, and location of shore protection works, the objective should be not only to design an engineering work that will accomplish the desired results most economically, but also to consider effects on adjacent areas. An economic evaluation includes the maintenance and replacement costs, along with the interest on and the amortization of the first costs. If any plan considered would potentially increase the

TABLE 2-1

Classification of Coastal Engineering Solutions

Problems to Address	Solutions
Shore Stabilization	Beach & Dune
	Beach nourishment Sand bypassing
	Structures
	Bulkheads Revetments Seawalls Detached breakwaters Groins
	Nonstructural
	Marsh plants Seagrasses
Backshore Protection	Beach & Dune
	Protective beach Dune stabilization
	Structures
	Bulkheads Revetments Seawalls
Inlet Stabilization	Structures
	Jetties Dredging
Harbor Protection	Structures
	Breakwaters Jetties

TABLE 2-2

Classification of Coastal Engineering Considerations

PROJECT	HYDRAULICS	SEDIMENTATION	CONTROL STRUCTURE	MAINTENANCE	REPLACEMENT	MATERIAL SOURCES	LEGAL REQUIREMENTS	ECONOMICS	ENVIRONMENTAL IMPACT	NAVIGATION	BAY CIRCULATION
SHORE STABILIZATION	■	■	■	■	■	■	■	■	■		
BACKSHORE PROTECTION	■	■	■	■	■	■	■	■	■		
INLET STABILIZATION	■	■	■	■			■	■	■	■	■
HARBOR PROTECTION	■	■	■	■		■	■	■	■	■	

impact of a project to a larger coastal stretch or prevent an extension of the impacts, the economic effect of each such consequence should be evaluated. A convenient measurement for comparing various plans on an economic basis is the average annual cost over the evaluation period and the average annual benefit captured by each plan.

b. Effects on adjacent land areas are considered to the extent of providing the required protection with the least amount of disturbance to current and future land use, ecological factors, and aesthetics of the area. The form, texture, and source of material should be considered in the design, as well as how the material is used. Proper consideration must be given to the legal and social consequences where shore protection measures may result in significant effects on physical or ecological aspects of the environment.

c. Coordination between the design and environmental elements should begin early in the planning process to assure that environmental concerns, opportunities, and features are adequately considered.

CHAPTER 3

ENVIRONMENTAL RESOURCES

3-1. Environmental Requirements.

a. General. As noted in Table 2-2, the "Environment" is a consideration in each coastal shore protection project category. The environmental effects of all project alternatives must, by law as well as normal engineering considerations, be evaluated. Opportunities for incorporating environmental considerations and enhancements in coastal shore protection projects should be investigated.

b. Policies. The planning, design, construction, and operation and maintenance activities of coastal shore protection projects must be consistent with national environmental policies. Those policies require that such activities be done to the extent practicable in such a manner as to be in harmony with the human and natural environment, and to preserve historical and archaeological resources. Corps project development is documented by a series of studies, each being more specific than the previous study. The series of reports produced for a project varies by Corps District and Division and through time due to scientific judgment, the unique conditions specific to each project, and changing regulations. In general, an initial evaluation (or reconnaissance) report and a feasibility (or survey) report are prepared prior to congressional project authorization. Refer to ER 1105-2-10, for a description of this planning process. Environmental studies are included along with engineering, economic, and other types of analysis (ER 1105-2-50).

c. Statutes and Regulations. Complying with Federal statutes, executive orders and memoranda, and Corps regulations requires careful study of existing environmental conditions and those expected to occur in the future with and without shore protection. Principal environmental statutes/regulations that are applicable to Corps coastal shore protection projects arelisted in Appendix C.

d. Environmental Studies. During each stage of project planning, design and construction, major environmental concerns and corresponding information needs should be identified. Forecasting of information needs is necessary in order to schedule sufficient time for field data collection, physical or numerical modeling if needed, and other needs. Scheduling of field studies should allow for administrative time related to contract preparation, contractor selection, report and NEPA document preparation, review of findings, and coordination or consultation with concerned Federal agencies and the interested public.

(1) Checklist of studies. The following checklist consists of some of the environmental factors that should be considered for coastal shore protection projects. Environmental factors selected for study will depend upon the type project being considered. This checklist is not all inclusive and not all factors are appropriate for all projects.

(a) Determine the bounds of the project areas.

(b) Characterize existing environmental (physical, ecological, cultural, economic conditions at a project site.

(c) Be aware of other planned construction activities likely to be associated with the Federal project and evaluate their cumulative impacts.

(d) Evaluate project effects on long-shore sedimentation processes, circulation patterns, currents, and wave action.

(e) Evaluate project effects on water quality, including characterization and testing of sediments as required in Section 103 of the Ocean Dumping Act (PL 92-532) or Section 404 of the Clean Water Act (PL 92-500) evaluations.

(f) Evaluate the no action alternative and nonstructural solutions.

(g) Evaluate project effects on erosion and deposition.

(h) Evaluate all reasonable and practicable construction alternatives (construction equipment, timing, etc.).

(i) Evaluate effects of the final array of alternative plans on significant biological, aesthetic, cultural and recreational resources.

(j) Describe relationships of each plan to the requirements of environmental laws, executive orders, Federal permits and state and local land use plans and laws.

(k) Include feasibledesigns, operational procedures, and appropriate mitigation measures to reduce or avoid adverse environmental impacts in the preferred plan and alternatives evaluated.

(l) Coordinate with other agencies, the public, and private groups.

(m) Plan and design an environmental monitoring program as needed.

(2) Critical issues. Time and money constraints will generally dictate the level and scope of investigation and data collection for all environmental areas of interest. Therefore, the most significant environmental issues identified by the public and resource agencies during scoping should be investigated. It is essential that the issues investigated fully account for all significant effects of a project and that a realistic balance be achieved between the study requirements and funds available. The addition of factors determined at a later date will increase the time, cost, and expertise required for the study.

Chapters 4, 5, and 6 of this manual identify major environmental considerations associated with alternative shore protection solutions. Criteria for determining significant issues include statutory requirements, executive orders, agency regulations and guidelines, and other institutional standards of regional and local interest. (see Appendix C).

(3) Environmental monitoring. The Council on Environmental Quality regulations at 40 CFR 1505.3 state that agencies may provide for monitoring to assure that their decisions are carried out and should do so in important cases and upon request, make available to the public the results of relevant monitoring. The 40 CFR 1505.2 also states that a monitoring and enforcement program shall be adopted and summarized where applicable. The term "environmental monitoring" as defined in ER 200-2-2 is that oversight activity necessary to ensure that the decision, including required mitigation measures, is implemented. Environmental monitoring as discussed in Chapter 7 of this manual refers to the overall process of data collection, management, analysis and interpretation of short and long term changes over the life of the project and analysis are discussed in Chapter 7 of this manual.

(4) Each study must have well-defined, detailed objectives prior to field data collection. The study design should include a rationale for hypotheses to be tested, the variables to be monitored, techniques and equipment to be used, sample station locations and frequencies, and data storage and analysis. Monitoring may extend beyond water quality and ecological studies and include monitoring noise, emission from equipment engines, cultural resources, archeological resources, etc., if deemed appropriate.

(a) Environmental studies during early stages of project formulation should emphasize identification of resources, development of an evaluation framework, and collection of readily available information for all potential alternatives. Resources likely to be impacted should be investigated, and additional data needs should be identified.

(b) Detailed analysis of a project occurs after evaluations narrow the range of specific alternatives to the most feasible (usually three or four) which have been selected for study. Beneficial and adverse environmental effects of each alternative should be quantified where possible or qualified in adequate detail so they can be included with the economic and technical analysis to compare and select the plan that maximizes NED benefits. Although a preferred alternative can be identified at this stage, formal selection of an alternative for construction must await the completion and agency review of the Environmental Impact Statement or Environmental Assessments. In this way the Corps, the public, and outside agencies have the benefit of a full evaluation of all feasible alternatives and a comparison of them by the lead agency. Post-construction monitoring, if authorized, should also be done to verify the impact predictions made during without project analysis. Where monitoring reveals the presence of unexpected impacts, measures should be considered to minimize the impacts.

3-2. Environmental Resource Categories. The remainder of this chapter summarizes the environmental resource categories that should be considered in evaluating the coastal shore protection alternatives. The six categories are physical, water quality, biological, recreational, aesthetic, and cultural.

3-3. Physical.

a. General. The physical modifications of the environment from coastal shore protection projects can result in both desirable and undesirable impacts. Many adverse impacts can be avoided by evaluating alternatives for siting and design. Consideration of physical impacts must occur during both the design stage and impact assessment stage.

b. Physical Design Considerations. Structural and, to a lesser extent, nonstructural measures have the potential of altering the hydrodynamic regime (circulation) and the hydraulic and wave energy conditions of the project area. Furthermore, construction frequently alters the shoreline configuration and/or bathymetry at the project site and occasionally up or down coast, by modifying the littoral transport system. In many instances these modifications are the objective of the design process. The purpose of a shoreline breakwater project is to reduce wave energy entering a harbor, marina, or other facilities. Groin projects and jetty construction result in modification of the littoral transport regime. If the project is not properly designed, adverse physical impacts, such as changes in shoreline configuration (shore erosion) or changes in bathymetry (navigation channel infilling), my occur. These impacts should be identified during the impact assessment stage and, if necessary, the project redesigned or relocated to minimize unwanted effects, such as excessive maintenance dredging and beach nourishment.

c. Physical Impact Assessment. Physical impacts can occur on both a short-term and long-term basis. Short-term impacts are generally construction related (i.e., short sections of a beach may be temporarily restricted during the fill and grading operations). During a beach nourishment project or dune construction, sands can become compacted altering transport phenomena. Physical effects from construction of breakwaters, jetties, groins, piers, or other nearshore structures stem from rock placement, jetting or driving piles, dredging to a solid bed or required depth, and other on site construction activities. Following the completion of these activities, impacts usually diminish rapidly (Naqvi and Pullen 1982, Van Dolah et al. 1984). Long-term impacts may be more important and more difficult to predict. Several tools will help in assessing potential adverse impacts: interviews with long-time residents, review of old aerial photos, on site monitoring, case studies of similar projects numerical models, and physical models. Using any or all of these tools, an evaluation of potential changes in circulation patterns, flushing conditions, and sediment transport phenomena should be completed. Other studies of physical factors may be warranted on a case-by-case basis.

3-4. Water Qualitv.

a. General. Unlike physical impacts, water quality impacts involve changes in the water column's characteristics rather than changes in shoreline configuration or local bathymetry. Again the impacts are manifested on both a short-term and long-term basis.

b. Water Quality Design Considerations. The construction process is often responsible for increases in local turbidity levels, changes in salinity, releases of toxicants or biostimulants from fill materials, introduction of petroleum products, and/or the reduction of dissolved oxygen levels. These impacts can be minimized by modifying or selecting specific construction practices, carefully selecting fill materials, and in some instances by construction scheduling. These impacts are short-lived, and ambient water quality conditions will rapidly return unless long-term changes in the hydrodynamics and hydraulics have occurred. It is these long-tern impacts that must be identified during the design process. In addition to the general impacts of the selected alternatives (whether structural or nonstructural), the proposed design specifications of any selected alternative also have the potential for affecting water quality. For example, the design of an off-shore breakwater (length, height, water depth, spacing) will greatly influence its impact on circulation and flushing and thus its impact on water quality.

c. Water Quality Impact Assessment. The long-term impact on water quality of nonstructural alternatives, i.e., planting beach grasses for dune stabilization, marsh grasses for bank stabilization, and seagrasses for bottom sediment stabilization, is generally negligible, whereas structural alternatives have a range of potential impacts. The range is a function of the location, size, and type of structure. In general, groins have the least potential for water quality impacts. Because groins change local patterns of water circulation, some changes in specific water quality parameters may occur, but these impacts are minimal for most groin projects. The water quality effects of bulkheads and seawalls are similar in that both will reduce erosion of the backshore and decrease local levels of suspended solids. Revetments, similarly to bulkheads and seawalls, may promote erosion of the foreshore and increase levels of suspended solids but to lesser extent. On the other hand, these structures may reduce overall levels of suspended solids by preventing erosion of uplands and backshore materials. Jetties and breakwaters have the greatest potential impact on circulation and flushing. The placement of jetties my not only alter circulation patterns and flushing conditions, as well as erosion and deposition patterns, but may also alter both river outflow and tidal conditions. These impacts may be of consequence well into the estuary and may have widespread effects, such as changing salinity and circulation patterns. Breakwaters, by definition, are wave energy barriers designed to protect landforms or harbor-behind them. These off-shore structures also often influence circulation and flushing action in their lee. If the breakwater is constructed to form a semienclosed basin for use as a harbor or marina, the flushing conditions of the project area may be dramatically altered. Assessment and evaluation of water quality impacts must begin in the planning stage and continue at least through the design stage. Postconstruction monitoring may also be recommended to provide feedback for future projects.

d. Other Contaminants. Activities involving sediments or other construction materials known to contain chemical toxins should be conducted with special precautions to avoid unnecessary chemical release into the water body. Of particular concern would be potential introduction of chemical agents either during preparation, application, or cleanup of construction equipment. Chemical cleaning agents may also contain toxic compounds. Little is known about the potential affects of these compounds on aquatic organisms even in trace amounts. However, chemicals may acutely or chronically affect sensitive life history stages of fishes and shellfishes through: sorption onto eggs, causing reduced survival rates and hatching; impaired osmoregulatory ability, causing delayed development or mortality: or impaired sensory ability, affecting feeding, movement, or predator avoidance (Cairns 1968, Sindermann et al. 1982). Olsen (1984) provides a good general review of the literature on the availability and bioaccumulation of heavy metals, petroleum hydrocarbons, synthetic organic compounds, and radionuclides in sediments. Specific information on toxicity, sublethal effects and bioaccumulation of selected chemical compounds is given by Eisler (1985a-d, 1986a-b). Any release of potentially toxic chemical substances into the water should be particularly avoided during periods when the area is being utilized by migratory species and/or juvenile forms and during periods of harvest of nearby commercially important shellfishes.

3-5. Biological.

a. General. Nearshore marine and estuarine biological systems are diverse and complex. Shore protection projects may benefit one or more components of the biological system while adversely impacting others. Biological assessments of shore protection projects are used to predict the kind of ecosystem and importance, spatial extent, and severity of expected biological changes. In practice, analysis usually focuses upon species of commercial or recreational importance; rare, threatened, or endangered species; and sensitive or highly productive habitats.

b. Biological Design Considerations.

(1) The construction of shore protection measures usually produces short-term physical and water quality disturbances. These perturbations

directly impact biological communities and may result in long-term impacts. For example, some ecosystems damaged by construction or water quality degradation may recover slowly and take years to achieve preconstruction levels of development. Many of these impacts are unavoidable. However, construction activities can often be timed to avoid critical events such as fish or shellfish migrations or shorebird nesting. Construction activities also can often be located to avoid sensitive areas.

(2) Coastal structures alter bottom habitats by physical eradication and in some cases by deposition or scour. However, certain hard structures often create a highly productive, artificial reef type habitat. The type of material used to build a structure and the surface area of the structure will influence the quality of the newly created habitat.

(3) Some structures, which are connected to the shore and extend some distance seaward, may potentially interfere with the migration of certain fish and shellfish. To alleviate these concerns the structure. may be modified to include gaps or shortened in length, or located outside the path of the migrations.

(4) Following construction, some remedial measures can be used to minimize biological impacts. For example, plant communities such as seagrass, beachgrass, and marsh grasses can be replanted following construction.

(5) Noise pollution from dredging or other activities may also be a major concern when in the proximity of bird nesting sites (Buckely and Buckely 1977). However, breeding activities are seasonal, and disturbance can be avoided by scheduling the operations during nonusage periods.

c. Biological Impact Assessment. The assessment of biological impacts must begin very early in the planning process. Some types of biological studies tend to be time consuming and often require data collection over an extended period of time. Early identification of specific biological issues is critical. Chapter 7 provides valuable information on the conduct of biological studies when important issues have been established. Often a key issue is possible siting of a project in a valuable biological area. If the ecosystem can be located and mapped early, it might be possible to move the project elsewhere to avoid the impacts, or redesign the project to reduce impacts.

(1) Habitat modification. All shore protection projects result in some modification of coastal habitats. Beach nourishment results in smothered benthic communities, although the recovery of these communities following nourishment is reported to be generally rapid (Naqvi and Pullen 1982). Structures provide a permanent alteration of the bottom. In some cases, the tradeoff made in replacing "soft" (mud or sand) bottom habitat

with "hard" (rock, at least in rubble mound structures) bottom habitat has generally been viewed as a beneficial impact associated with coastal structures where diversity is desired (Van Dolah et al. 1984). Such habitat modification is typically not a major biological impact issue except when highly productive habitats such as coral reefs, seagrass beds, and spawning and nesting areas are involved.

(2) Fish migration. The impact of coastal structures on fish and shellfish larval migration has been raised as a biological issue. Early life history stages of many important commercial and sport fishes and shellfishes are almost entirely dependent on water currents for transportation between off-shore estuarine spawing grounds and nursery areas. Some coastal structures (inlet jetties in particular) may interfere with this migration process by modifying currents. However, the extent of a problem of this nature will depend upon a case-by-case evaluation of each site. Similar impacts have been associated with jetties and breakwaters on migrations of juvenile and adult fishes and shellfishes. This issue has been raised primarily in association with anadromous fishes in the Pacific Northwest. Conclusive evidence supporting these concerns has not been provided.

(3) Predation pressure. Coastal rubble mound structures provide substrate for the establishment of artificial reef communities. As such, jetties and breakwaters serve as a focal point for congregations of some types of fishes and shellfishes which feed or find shelter there. This condition has also generated a concern by resource agencies, again largely associated with projects in the Pacific Northwest, that high densities of predators in the vicinity of jetties and breakwaters pose a threat to egg, larval, and juvenile stages of important species. Conclusive evidence demonstrating the presence or absence of a significant impact is currently unavailable and will be extremely difficult to establish. It is unwarranted in any case to apply generalizations, and evaluations must be conducted on a site specific basis. For example, examination of existing similar structures nearby the proposed project site could provide clues on the type and extent of marine organism development on jetties, breakwaters, and other rubblemound structures.

3-6. Recreational.

a. General.

(1) Requirements. Recreation development requires cost sharing by a local sponsor. Refer to EP 1165-2-1 for cost-sharing policies. Additional basic requirements for recreation developmemts include:

(a) Sufficient demand to ensure utilization of the facility.

(b) Publicly controlled sites, including access routes.

(c) Provisions for prevention of vandalism.

Refer to ER 1105-2-20 and Appendix D of ER 1110-2-400 for a description of the types of recreation facilities eligible for Federal cost sharing. In general, eligible facilities are those not ordinarily provided by private enterprise or on a commercial or self-liquidating basis. In addition to these regulations, feature selection is also controlled by project site characteristics.

(2) Structures. The recreational potential of engineering structures such as jetties, groins, and breakwaters is generally limited, although in some cases slight modification of structures may increase their suitability for certain recreational activities. For example, jetties and groins often provide additional fish habitat and may become popular fishing spots and surfing areas. Provision for access, parking, and public safety can enhance their recreational potential. Modifications can be incorporated during the early design stage or retrofitted to existing structures.

(3) Lands. Project lands, whether purchased or created through disposal or accretion, have high and diverse recreation potential. They are especially attractive for shoreline recreation development such as swimming beaches, boat launching ramps, marinas, and fishing piers. Campgrounds, multiple-day use areas, and trail systems are appropriate where areas are of sufficient size. While high-intensity recreational use is generally dependent on facilities development, undeveloped project lands can support activities such as nature study, hunting, and beachcombing if sufficient access is provided. Where possible, recreational facilities should accommodate the handicapped. Table 3-l outlines specific activities and required facilities for recreational use of Corps projects.

b. Recreation Design Considerations.

(1) Refer to EM 1110-l-400 and ER 1110-2-400 for guidance on design of recreation features. Additional information regarding land-based recreation and water-based activities is given by Nunnally and Shields (1985).

(2) Recreation facilities should be sized and located to avoid over utilization or underutilization, as well as conflicts with other authorized project purposes such as navigation. Refer to Urban Research and Development Corporation (1980) for methods to estimate carrying capacity. Over use often results in degradation of the natural resources. In addition, uncontrolled usage may impact the integrity of the shore protection project, particularly when dune or marsh vegetation is an integral part of that project. It is therefore necessary to assure adequate management to provide for optimum public use and maintain the natural characteristics and resource capabilities of the area.

3-7. Aesthetic.

a. General. Coastal shore protection projects affect aesthetic characteristics of the environment through changes caused by construction and maintenance activities, the presence of the coastal structures, and changes in public use patterns. Changes in public use patterns include the increased use of the coastal area for recreation or increased use of an area resulting from the protection afforded by the coastal structure. The aesthetic value of an environment is determined by the combination of landscape components, e.g., water resources, vegetation, and the perceptions and expectations for the resource user or visitor. Perceptions of aesthetic value encompass all of the perceptual stimuli in the environment, i.e., sight, scents, tastes, and sounds and the interaction of these. Visual perceptions are the most predominant of the senses, and visual changes are the major focus of aesthetic assessments. The visual environment for coastal shore protection includes terrestrial landscapes, shorelines, open-water channels, and waterways. Many coastal areas associated with coastal shore protection projects offer a high-value aesthetic experience.

b. Aesthetic Design Considerations. The assistance of a landscape architect should be sought for consideration of landscape design and aesthetic impact assessment. The landscape components of all environments can be manipulated, to some extent, to increase positive visual effects. The landscape components usually considered in water resource projects include landforms, water resources, vegetation, and use characteristics, e.g., recreation or navigation. Each of the landscape components has associated design elements that affect visual quality. The design elements are color, form, line, texture, scale, and spatial character. In considering the design elements, scale may be constrained more than the other properties because of its dependence on object size and the limitation on choice of size for most project features. Examples include the use of natural materials which possess colors, forms and textures that are more desirable than man-made materials, topographic modification of linear features to achieve a more irregular, natural appearing profile, and selection and placement of trees, grasses, and shrubs to improve compatibility of color, form, line, texture, and scale. Nonstructural alternatives, of course, provide high potential for maintaining or enhancing natural aesthetically pleasing conditions.

c. Aesthetic Impact Assessment. Potential visual impacts of proposed coastal projects or impacts at sites of existing projects can be assessed with a procedure such as the Visual Resources Assessment Procedures (VRAP) recommended to the US Amy Engineer Waterways Experiment Station by the Department of Landscape, State University of New York, Syracuse. Aesthetic impact assessment involves determining the changes to the landscape components caused by a proposed project. The potential changes caused by changes in vegetation and water resources can be determined by project plans. Evaluating the future visual appearance of a project is

TABLE 3-1

Recreational Activities and Facilities[1]

Activities	Facilities
Beachcombing	Beach
Bicycling	Trail or road
Boat launching	Ramp and parking areas
Boat mooring areas	Mooring buoys, boat slips, breakwaters, wake absorbers, jetties, dredged channels, aids to navigation, etc.
Camping	Campground, trash receptacles restrooms
Fishing	Water access
Hiking	Trails
Hunting	Sufficient area and habitat and access
Jogging/running	Jogging and running trails and paths
Nature study	Nature area
Outdoor games	Multiple play area
Picnicking	Tables, trash receptacles, fireplaces
Sunbathing	Beach
Swimming	Suitable water and shoreline
Sightseeing	Scenic overlook or viewing tower projects
Surfing	Water access, suitable wave climate and shoreline orientation, and/or sand bars
Snorkeling and scuba diving	Water access and marine recreational or park areas including navigational aids

1/"Where possible, all facilities should accommodate handicapped and wheelchairs.

most appropriately done by visual simulations, such as drawings or rendering on a photograph. Districts have a number of graphic capabilities that can be used for visual simulations. Assistance of a landscape architect should be sought for the aesthetic impact assessments.

3-8. Cultural.

a. General. Guidance on the need for identification and protection of significant cultural resources in a project area is provided in ER 1105-2-50. Cultural resources are the physical evidence of past and present habitation that can be used to reconstruct or preserve human history. This evidence consists of structures, sites, artifacts, and objects that may best be studied to obtain relevant information. Cultural resources found in coastal shore protection project areas provide physical evidence of how the areas were used for commercial and game fishing, navigation, agriculture, and other activities during historic and prehistoric periods. Identification and interpretation of cultural resource sites clarify the relationship between present-day use and past use. Protection of these historic properties is in the broad public interest as declared by Congress and should be identified, evaluated, protected, preserved, and managed. Cultural resource preservation is an equal and integral part of resource management and should be given equal consideration along with other resource objectives.

b. Coordination Requirements. ER 1105-2-50 requires all actions involving unavoidable effects on Natural Register or eligible historic properties to be fully coordinated with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP). It may also be desirable to establish and maintain coordination with state archaeologists, state and local archaeological or historical societies, and other state and federal agencies or institutions with special interests or expertise.

C. Cultural Resources Analysis. An analysis of the cultural resources of the project area is usually done during the planning phase to identify sites that require protection or mitigation due to their cultural significance. An analysis of cultural resources usually begins with a reconnaissance survey to determine whether sites are present and is later followed by an inventory of the cultural resource sites including their function and significance and an assessment of the potential losses or damages due to the project. Identification of sites is accomplished by professional archaeologists, often through interviews with local officials and residents, and by examination of archival materials such as the National Register of Historic Places, national architectural and engineering records, maps, and official records. The interviews and archival search delineate the density of sites and the types of sites present, i.e., prehistoric sites, historic sites, architectural elements, and engineering elements. The significance of each site is determined by criteria established by the National Register of Historic Places and by professional judgment. Loss or damage to sites from preliminary or potential project designs can be determined from an inventory and significance analysis, usually accomplished during the planning stage of the project as a result of an intensive archaeological survey. A management plan should be prepared for each applicable project consistent with current guidance to identify, evaluate, protect, preserve, and manage significant historic properties. A mitigation plan may be required when damage to significant resources is expected.

d. Cultural Resources and Design. Project designers should use the cultural resources analysis to develop designs that incorporate protection of the resources. compliance with historical preservation statutes is a significant determinant in developing the scope of studies and mitigation of impacts to significant resources. Preservation through avoidance of effects is preferable. Where avoidance of effects is impossible, protective measures incorporated in to project design must consider the nature and characteristics of the resource, site topography, and operation and maintenance requirements. Whenever a significant historic or archeological site is to be impacted, project design must proceed in consultation with the SHPO and ACHP in accordance with ER 1105-2-50 and 36 CFR Part 800. Project designers should consult Technical Report EL-87-3, Archaeological Site Preservation Techniques: A Preliminary Review (Thorne, Fay, and Hester 1987).

CHAPTER 4

PROTECTIVE BEACHES AND DUNES

4-1. Protective Beaches.

a. General.

(1) The sloping beach and beach berm are the outer line of defense in absorbing most wave energy; dunes are the last zone of defense in absorbing the energy of storm waves that overtop the berm. Beaches and dunes form a natural system of shore protection for coastal lowlands and associated development. When the natural protection system provides inadequate protection from large storms, the first solutions frequently chosen are quasi-natural methods such as beach nourishment or artificial sand-dune construction. Such solutions retain the beach as a very effective wave energy dissipater and the dune as a flexible last line of defense. Poorly conceived construction involving removal of berms and dunes or changes in long shore transport often aggravate shoreline erosion within and adjacent to the project area.

(2) Beach sediments on most beaches range from fine sands to cobbles. The size and character of sediments and the slope of the beach are related to the forces to which the beach is exposed and the type of material available on the coast. Much of the beach material originates many miles inland where weathering of mountains produces small rock fragments that are reduced to sand and gravel. When this sand and gravel reaches the coastal area, it is moved along shore by waves and currents. This longshore transport is a constant process, and great volumes may be transported. Beach material is also derived from erosion of nearby coastal beaches and dunes caused by waves and currents and, in some cases, by onshore movement of sediment from deeper water. In some regions, a sizable fraction of the beach material is composed of marine shell fragments, coral reef fragments, cobbles, or volcanic materials. Clay and silt do not usually exist on ocean beaches because the waves create such turbulence in the water along the shore that these fine particles are suspended and transported to low energy areas, either offshore into deeper water or into bays and estuaries.

(3) Beach characteristics are usually described in terms of average size of the sand particles that make up the beach, range and distribution of sizes of the sand particles, sand composition, elevation and width of berm, slope or steepness of the foreshore, the existence (or lack) of an offshore bar, and the general slope of the inshore zone fronting the beach (Figure 4-1). Generally, the larger the sand particles the steeper the beach slope. Beaches with gently sloping foreshores and inshore zones usually have a preponderance of the finer sizes of sand.

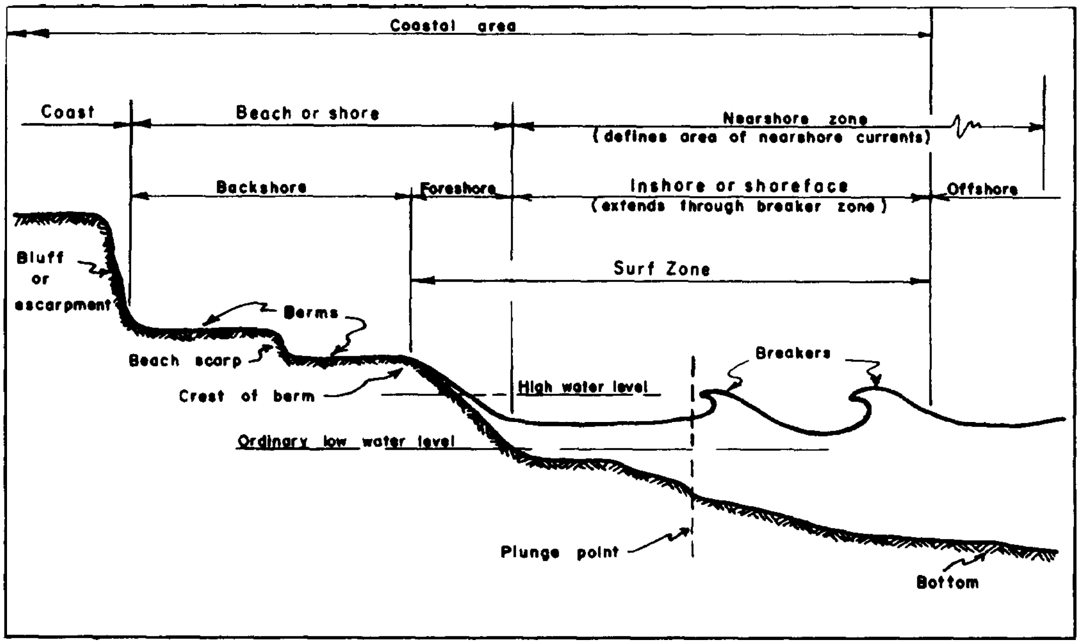


Figure 4-1. Visual definition of terms describing a typical beach profile (US Army Engineer Waterways Experiment Station 1984)

(4) Beaches can effectively dissipate wave energy and are classified as shore protection structures when maintained at proper dimensions. When beaches have narrowed because of long-term erosional trends or severe storms, beach restoration is often proposed. Beach restoration is the practice of mechanically or hydraulically placing sand directly on an eroding shore. However, it is important to remember that the replenishment of sand eroded from the beach does not in itself solve an ongoing erosion problem. Periodic replenishment will usually be required. Replenishment along an eroding beach segment can also be achieved by stockpiling suitable beach material at its updrift end feeder beach and allowing longshore processes to redistribute the material along the remaining beach. The establishment and periodic replenishment of such a stockpile is termed "artificial beach nourishment" (Figure 4-2). Artificial beach nourishment then maintains the shoreline at its restored position. When conditions are suitable for artificial nourishment, long reaches of shore may be protected by this method at a relatively low cost per linear meter of protected shore. An equally important advantage is that artificial nourishment directly but temporarily remedies a basic cause of most erosion problems--a deficiency in sand supply--and benefits rather than damages the adjacent shore. However, the use of feeder beaches may not be applicable in all cases. Thus, nourishment may be required along the entire length of an eroded beach. Feeder beaches are most often used after a beach has been restored to an acceptable alignment.

b. Role in Shore Protection. The shoreline, the interface between the land and the sea, is located where tides, winds, and waves attack the land, and where the land responds to this attack by a variety of "give and take" measures which effectively dissipate the sea's energy.

Figure 4-2. Beach nourishment operation, Mayport, Florida (courtesy of US Army Engineer District, Jacksonville)

(1) As a wave moves toward shore, it encounters the first beach defense in the form of the sloping nearshore bottom (Figure 4-3; Profile A). Along a gently sloping beach, when the wave reaches a water depth equal to about 1.3 times the wave height, the wave collapses or breaks. Thus, a wave 0.9 meter (3 feet) high will break in a depth of about 1.2 meters (4 feet). If there Is an increase in the incoming wave energy, the beach adjusts its profile to facilitate the dissipation of the additional energy. This adjustment is most frequently done by the seaward transport of beach material to an area where the bottom water velocities are sufficiently reduced to cause sediment deposition. Eventually enough material is deposited to form an offshore bar that causes the waves to break farther seaward, widening the surf zone over which the remaining energy must be dissipated. Tides compound the dynamic beach response by constantly changing the elevation at which the water intersects the shore and by providing tidal currents. Thus, the beach is always adjusting to changes in both wave energy and water level.

(2) During storms, strong winds generate high, steep waves. In addition, these winds often create a storm surge which raises the water level and exposes higher parts of the beach to wave action. The storm surge allows the large waves to pass over an offshore bar or reef formation without breaking. When the waves finally break, the remaining width of the surf zone is not sufficient to dissipate the increased energy contained in the storm waves. The remaining energy is spent in erosion of the beach, berm, and sometimes dunes which are now exposed to wave attack by virtue of the storm surge. The eroded

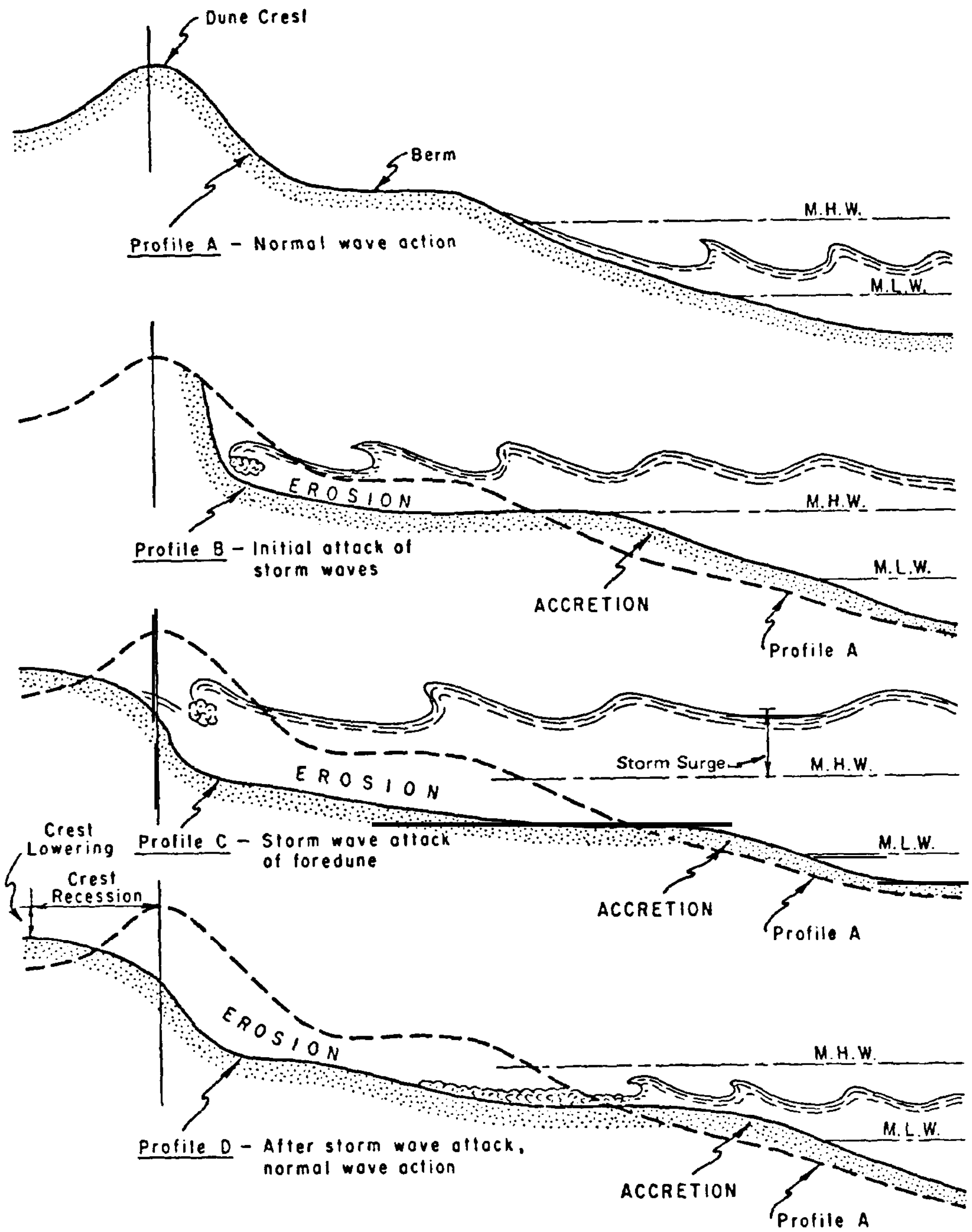


Figure 4-3. Schematic diagram of storm wave attack on beach and dune

material is carriedoffshore in large quantities where it is deposited on the nearshore bottom to form an offshore bar. This bar eventually grows large enough to break the incoming waves farther offshore, forcing the waves to spend their energy in the surf zone. This process is illustrated in Figure 4-3 (Profiles B, C, and D).

(3) Beach berms are built naturally by waves to about the highest elevation reached by average storm waves. When storm waves erode the berm and carry the sand off shore, the protective value of the berm is reduced and large waves can overtop the berm. The width of the berm at the time of a storm thus influences the amount of damage a storm can inflict. During extreme events, berm material can be carried landward and deposited, thus removing the material from the zone of littoral drift.

(4) Another dynamic feature of the beach and nearshore physical system is littoral transport, defined as the movement of sediments in the nearshore zone by waves and currents. Littoral transport is divided into two general classes : transport parallel to the shore (longshore transport), and transport perpendicular to the shore (onshore-offshore transport). The material that is transported is called littoral drift. Longshore transport results from the stirring up of sediment by the breaking waves and movement of this sediment by a longshore current generated by the breaking waves. The direction of longshore transport is directly related to the angle at which the wave breaks relative to the shoreline. Onshore-offshore transport is determined primarily by wave steepness, sediment size, and beach slope. In general, high steep waves move material offshore, and low waves of long period (low steepness) move material onshore.

c. Physical Considerations.

(1) Construction impacts.

(a) Three primary methods of placing sand on an eroding beach are land-hauling from a nearby borrow area, direct pumping of sand through a pipeline from an inlet or an offshore borrow area using a floating dredge, and transporting sand in a split-hull barge from a nearby area. Two basic types of floating dredges are used to remove material from the bottom and pump onto the beach. These two are the hopper dredge (with punp-out capability) and the hydraulic pipeline dredge (suction dredge). Hydraulic pipeline dredges are better suited to sheltered waters where wave height is less than one meter. A cutterhead is often used on the suction dredge. The action of the cutterhead agitates the substrate to a greater degree than a suction dredge without a cutterhead, creating a greater potential for elevated suspended sediment concentrations and turbidity. However, suspended sediments and turbidity are generally not a problem in sands. Studies have shown that very little material is resuspended from a properly operated cutterhead dredge. Desilting or sedimentationbasins are often needed to provide a controlled environment where pipeline slurry waters can be pumped and dewatered prior to placement of sand on the beach. These basins prevent the ecological and esthetic consequences of turbidity and sedimentation from pipeline discharges.

(b) Placement of equipment such as dredge anchors and pipelines can damage environmentally sensitive habitats such as coral reefs, seagrass beds, and dunes. Damage to coral reefs has been caused by dragging of anchors or other equipment across a reef (Maragos et al. 1977, Spadoni 1979, Courtenay et al. 1980). In addition, the operation of equipment on the beach can damage dune vegetation and may cause compaction. Narrow-tracked vehicles do not distribute the weight of the equipment as well as wider tracked vehicles and cause greater damage to the vegetation and increased sand compaction. Highly compacted beaches may have reduced numbers of burrowing organisms. Beach borrowing animals such as ghost crabs and sea turtles have difficulty digging in compacted beaches.

(2) Sediment modification.

(a) Sediments on most beaches range from fine sands to cobbles. The size and character of sediments and the slope of the beach are related to the natural forces to which the beach is exposed and the type of sediment available on the coast. The beach sediments may be in equilibrium due to the prevailing physical forces, or they may be eroding or accreting. When material is newly deposited on a high-energy beach, it modifies the beach sand/water interface and generally sand grain-size distribution, and may increase the suspended sediments of the adjacent nearshore waters depending on the type and particle size of sediments deposited. Waves and currents tend to winnow the finer sediments and to suspend them in the water column. Finer sediments are transported offshore and are deposited in the deeper, calmer offshore waters. These processes continue at a rather rapid pace until a more stable (flatter) beach profile is again achieved. Parr et al. (1978) observed at Imperial Beach, California, that fine sediments were rapidly sorted out of nourishment sediments and that sediment grain-size distribution after about four months was comparable to the beach sediments prior to nourishment. Generally, silts and clays in the fill material are suspended during placement, but after initial placement turbidity and suspended sediments are dissipated.

(b) Coincident with changes in grain size and shape in beach material, an increase in compaction of the beach can result from beach nourishment. A compact beach is less suitable for burrowing organisms. An increase in fine material, mineralization or the binding together of particles, and the layering of flat-shaped grains may contribute to an increase in compaction. However, a greater occurrence of increased compaction is likely when sand is pumped onto a beach in a water slurry. This sand-water slurry allows maximum crowding together of sand grains which results in a very dense, compact beach (Smith 1985). Increases in compaction may be a short-term effect since the beach will be softened by wave action, particularly during storms.

d. Water Quality Considerations. Problems related to water quality and turbidity in the nearshore zone of a high-energy beach do not appear to be a major concern because the fine sediments that contain high levels of organic material and other constituents are rapidly transported offshore and sulfides are oxidized (Naqvi and Pullen 1982). However, high turbidities resulting from prolonged beach nourishment and/or erosion degradation of nourishment material may indirectly affect light-sensitive plants and animals. The reduced sunlight penetration into the water may impact nearshore corals, associated algae, and submerged aquatic vegetation. It may also affect the migration and feeding of visually oriented adult and juvenile fishes and the recruitment of larval and juvenile animals to the beaches. Turbidity resulting from beach nourishment generally creates only minor impacts in the surf and the offshore zones except when light sensitive resources are involved (Naqvi and Pullen, 1982). Precautions should be taken to use only clean, uncontaminated material. While most dredged material is clean sand, concerns about the presence of toxins in the borrow material will have to be addressed.

e. Biological Considerations.

(1) Fish and other motile animals.

(a) Suspended solids in the water can affect fish populations by delaying the hatching time of fish eggs (Schubel and Wang 1973), killing the fish by abrading their gills, and anoxia (O'Connor et al. 1976). Fish tolerance to suspended solids varies from species to species and by age (Boehmer and Sleight 1975, O'Connor et al. 1976). This problem does not appear to be a major one along coastal beaches.

(b) Destruction of habitat rather than suspension of sediments seems to be the major hazard to beach and nearshore fishes. Most of these animals have the ability to migrate from an undesirable environment and return when disposal ceases (O'Connor et al. 1976, Courtenay et al. 1980). Species that are closely associated with the beach for part of their life cycle are most likely affected by beach nourishment. Parr et al. (1978) observed that beach nourishment did not prevent subsequent spawning of grunion (Leuresthes tenuis) at Imperial Beach, California. However, the dusky jawfish (Opistognathus whitehursti), a burrowing species with limited mobility and narrow sand grain-size requirements, was displaced by fine sediments on the east coast of Florida (Courtenay et al. 1980).

(c) The loss of a food source due to burial by nourishment sediments may also have some effect on motile populations. However, there is evidence that nourishment benefits some fish by suspending food material (Courtenay et al. 1972). Also, associated turbidities may provide temporary protection from predators (Harper 1973). Studies indicate that fishes may be attracted to dredging (Ingle 1952, Viosca 1958) or to sand mining operations (Maragos et al. 1977). Sherk et al. (1974) found that demersal fishes are more tolerant to suspended solids than filter-feeding fishes.

(d) Several long-term studies have shown that moderate to complete recovery of motile animal populations occurred within less than a year. Courtenay et al. (1972, 1980), Parr et al. (1978), Reilly and Bellis (1978), and Holland et al. (1980) described motile fauna recovery following beach nourishment. These studies have shown that motile animals generally temporarily depart an area disturbed by beach nourishment, but return when the physical disturbance ceased. Oliver et al. (1977) observed that demersal fishes moved into an area within the first day after a disturbance. Courtenay et al. (1980) noted that lobsters, crabs, shrimp, and fishes left disturbed areas, but reappeared within four months after the disturbance. The motile animals which have stringent environmental requirements, such as substrate preferences for spawning, foraging, or shelter, are most likely to be affected.

(2) Benthos.

(a) Species comprising marine bottom communities on most high-energy coastal beaches are adapted to periodic changes related to the natural erosion and accretion cycles and storms. Organisms adapted to unstable nearshore bottom conditions tend to tolerate perturbations better than those in more stable offshore environments (Thompson 1973, Oliver and Slattery 1976). Burial of offshore benthic animals by nourishment material has a greater potential for adverse impacts because the subtidal organisms are more sensitive to perturbation than those in the intertidal and upper beach zone (Naqvi and Pullen 1982). For that matter, any project which results in net deposition of sediment onto an offshore benthic community will tend to cause greater impacts. Direct burial of nonmotile forms with beach nourishment material can be lethal, whereas motile animals might escape injury. However, burial of animals is not generally significant at the population or community level, unless it is a sensitive resource such as corals. Some infaunal bivalves and crustaceans can migrate vertically through more than 0.3 meter (1 foot) of sediment (Maurer et al. 1978). Survival depends not only on the depth of deposited sediment, but also on rate of deposition, length of burial time, season, particle-size distribution, and other habitat requirements of the animals.

(b) Following dredging and burial of benthic animals, a short-term increase in diversity, accounted for by recruitment of opportunistic species, may occur (Clark 1969, Gustafson 1972, Parr et al. 1978, Applied Biology, Inc. 1979). These opportunistic species, which initially invade the disturbed area, are generally later replaced by species common to the original community. A similar response can also result from natural events such as storms, hurricanes, and episodes of "red tide" organisms (Saloman and Naughton 1977, Simon and Dauer 1977). The recovery rate of preproject resident species will vary from 5 weeks to 2 years (Hayden and Dolan 1974, Saloman 1974, Parr et al. 1978, Reilly and Bellis 1978, Taylor Biological Company 1978, Tropical Biological Industries 1979, Marsh et al. 1980). Reef corals tend to be among the slowest of recolonizers (15-50 years) and usually require hard substrates for larval settlement and attachment.

(c) Recovery will depend on the species affected, the season in which nourishment occurs, and the recruitment of larvae into the area. The ability of most macrofauna to recover rapidly is due to their short life cycles, their high reproductive potential, and the rapid recruitment of planktonic larvae and motile macrofauna from nearby unaffected areas. Shore zone animals are generally adapted to living in a high-energy environment; thus they can tolerate a high level of disturbance.

(3) Oysters. The turbidity and increased sedimentation that can result from beach nourishment in coastal bays and estuaries can be detrimental to oysters. Elevated turbidity can reduce oyster respiration and ingestion of food (Loosanoff 1962). Mature oyster reefs are more susceptible to elevated turbidity, sedimentation, and direct physical alteration than immature reefs because mature reefs are already stressed from crowding (Bahr and Lanier 1981). Even a moderate disturbance of a mature reef can destroy it. Immature reefs can undergo rapid growth and thus are more resilient to disturbance (Bahr and Lanier 1981).

(4) Seagrasses and mangroves. Burial, uprooting, elevated turbidity effects, and sedimentation as results of beach nourishment may damage coastal vegetation (Zieman 1982). Seagrasses may be slow to recover when rhizomes are severed and plants are uprooted (Godcharles 1971, Zieman 1975). Elevated siltation rates and turbidity can cause suffocation and reduce photosynthetic activity in seagrasses (Thayer et al. 1984). Covering of mangrove prop roots with dredged material can kill the plants (Odum et al. 1982).

(5) Corals.

(a) Corals are sensitive to covering by fine sediments (Figure 4-4). Hard corals (Scleractinians) are more sensitive than soft corals (Octocoralians) because they are not as capable of cleansing themselves of heavy sediment loads and are easily smothered. Sand or silt accumulation on reefs will foul and kill corals, algae, other invertebrates, and also displace other resident invertebrates and fish. The soft corals are better adapted for survival in the nearshore areas subject to beach nourishment.

(b) Coral damage as a result of beach nourishment is usually caused by elevated sedimentation rates and by direct physical damage (e.g. burial) to the reef. Sedimentation may inhibit the food-acquiring capability of the coral polyps and inhibit photosynthesis of symbiotic unicellular algae (Zooanthellae), eventually killing the coral (Goldberg 1970, Courtenay et al. 1972).

(c) Several studies have shown that coral reefs can withstand some sedimentation. Courtenay et al. (1974) examined the effects of beach nourishment on nearshore reefs at Hallandale Beach, Florida. They noted that the reefs sustained short-term damage caused by fine materials eroding from the nourished beach. A follow-up survey seven year later found no evidence of major reef damage (Courtenay et al. 1980, Marsh et al. 1980). Excessive sedimentation which buries a reef results in permanent destruction or replacement by soft bottom habitat and communities. Even for reefs where accumulated sediment is removed by later storms, recolonization by corals and other organisms on the dead surfaces may take decades to be complete.

(6) Sea turtles.

(a) Nourishment can affect the sea turtles directly by nest burial or by disturbing nest locating and digging behavior during the spring and summer

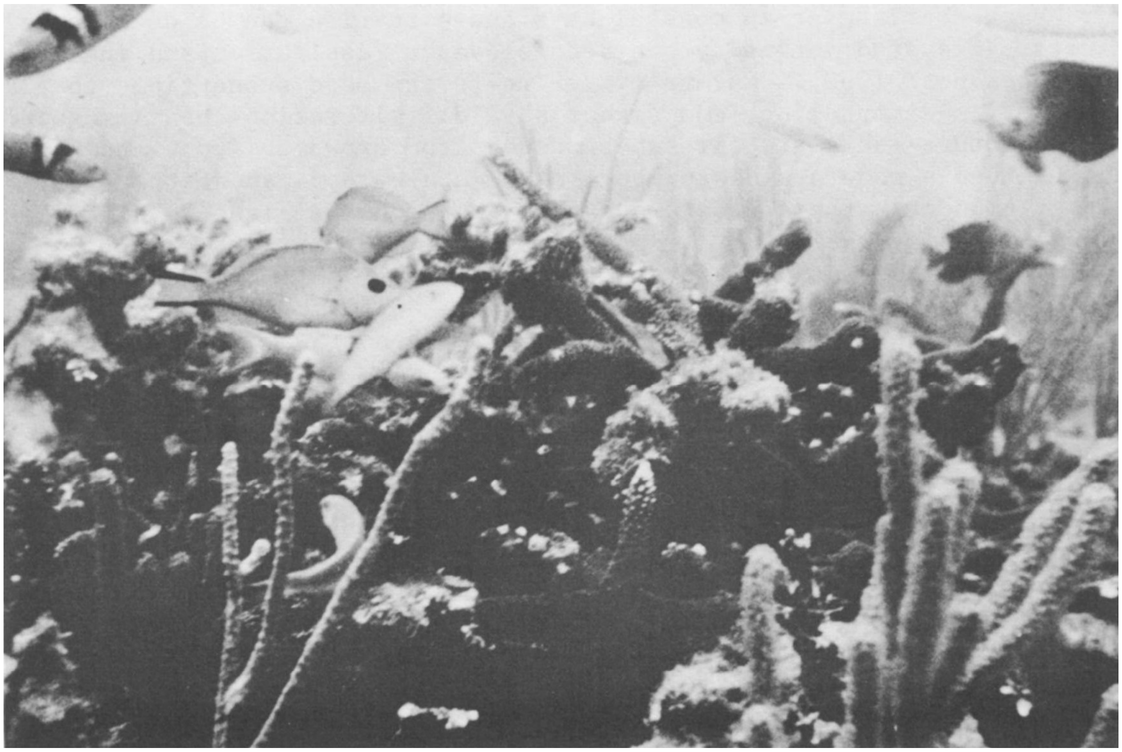


Figure 4-4. Reef fauna near outer edge of second reef off Golden Beach, Florida (Courtenay et al. 1980)

nesting season (Figure 4-5). Indirectly, beach nourishment or replenishment has the potential of affecting sea turtle nest site selection, egg clutch viability, and hatchling emergence by altering the physical makeup of the beach. Factors such as sand grain size distribution, grain shape, moisture content, color, temperature, and the density of the sand may be altered.

(b) Smaller grain size, flatter shaped grains, and greater density may cause compaction of the beach. A compacted beach will inhibit nest excavation by sea turtles (Fletemeyer 1980, Ehrhart and Raymond 1983) and impede emergence of hatchlings (Fletemeyer 1979). Mortimer (1981) and Schwartz (1982) reported that an optimum range of grain size for hatchling success was coarse to fine sand (2.5 to 0.125 millimeters). Even though sand particle size distribution varies greatly from one nesting beach to another (Hirth and Carr 1970, Hirth 1971, Hughes 1974, Stancyk and Ross 1978), when sands are too fine the gas diffusion rate required to support embryonic development may become inadequate (Ackerman 1977; Mortimer 1979, 1981; Schwartz 1982). If sands are too coarse, the nest collapses and the hatchling turtles are unable to emerge to the surface (Mann 1978, Sella 1981).

(c) Sand temperature may be affected by sand color, density, and grain size of borrow material. Nest site selection, incubation duration, sex ratio,

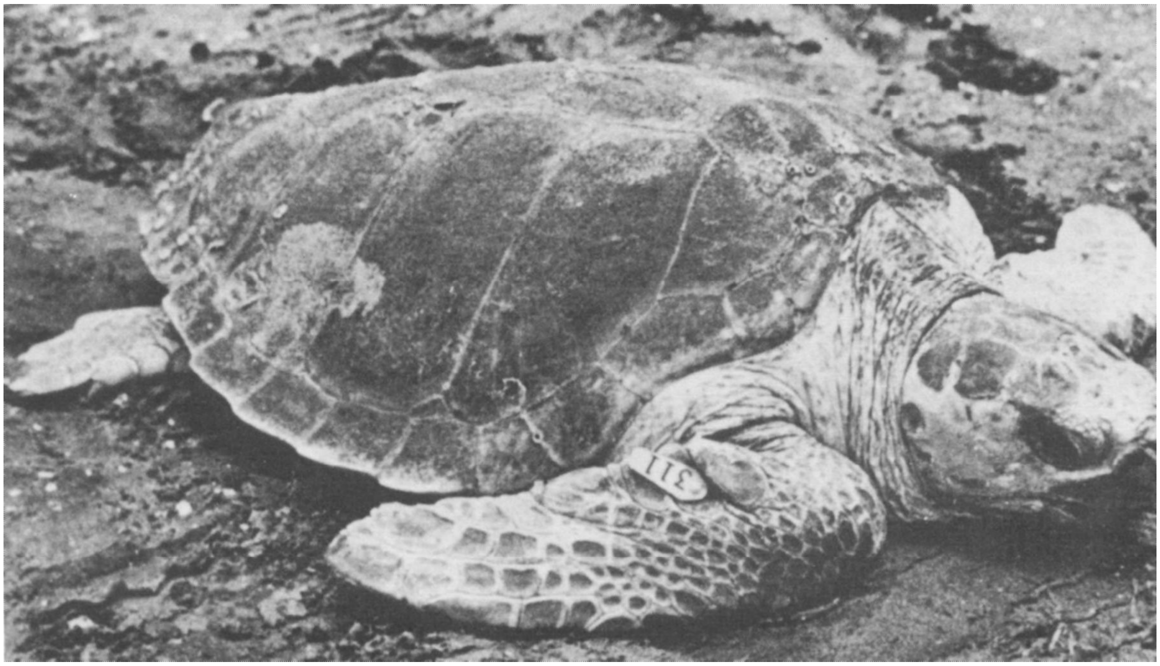


Figure 4-5. Nesting sea turtle

and hatchling emergence of turtles may be influenced by sand temperature (Mrosovsky 1980, 1982; Stoneburner and Richardson 1981). Stable nest temperature is a prerequisite for normal development of green and loggerhead turtles (Sella 1981, Geldiay et al. 1981). Lower ambient sand temperature increases incubation time (Harrison 1952, Hendrickson 1958, Mrosovsky 1982). Temperature is also an important determinant of hatchling sex ratios (Morreale et al. 1982). Incubation temperatures above 30" C result in more females hatchling, whereas below 30" C more males hatch (Yntema and Mrosovsky 1982). Morreale et al. (1982) also report that warmer temperatures inhibit emergence of hatchlings from the nest, presumably due to hatchlings cueing on cooler night-time temperature6 for synchronization of nocturnal emergence.

(d) Sand moisture content may be affected by grain size, grain shape, pore space, compaction, density, and other factors. Moisture content can in turn affect hatching success of sea turtles (Ackerman 1977, Mortimer 1981). Too much moisture may decrease gas diffusion to the nest because of water-logging of the sand (Ackerman 1977), while too little moisture may cause higher nest temperatures and egg desiccation (Mortimer 1981).

f. Recreational Considerations.

(1) Beach restoration and nourishment usually produce tangible recreation benefits by increasing the dry beach area. In general, the dry beach area determines the potential carrying capacity of the beach. Although there is no current formally established standard in the United States, EM 1110-1-400 recommends 50 square feet (4.6 square meters) of dry beach and 30 square

feet (2.8 square meters) of swimming area per bather as peak carrying capacity for optimal beach usage benefits (Figure 4-6). However, in resort area6 with many visitor6 and limited beaches, densities may be much higher.

Figure 4-6. Recreational use of Delray Beach, Florida

(2) To the coastal engineer the dry beach is the "backshore" which consists of the "natural berm" and "storm berm." Increasing the width of the berm region is an important design criterion in beach restoration projects. Criteria for specifying berm width depend on several factors. If the purpose of the fill is to restore an eroded beach to protect backshore improvements from major storm damage, the width of the berm may be determined as the protective width of historical record which has been lost during storms plus the minimum required to prevent wave action from reaching improvements. Where the beach is used for recreation, the optimum width of the beach may be influenced by the recreational use. Estimated beach use is generally based on the prospective change6 in population of the area6 considered tributary to the beach and the beach-carrying capacity and availability of alternative sites. Federal participation in beach erosion control projects is limited to a part of the construction costs for restoration and protection of beach fills, based on public ownership and use of the shore frontage. For these projects, other recreation developments are entirely non-Federal responsibilities except on Federally owned shore6 (ER 1165-2-130).

g. Aesthetic Considerations.

(1) The alignment of a nourished beach segment generally parallel6 the existing shoreline but is offset seaward by the width of the fill. The

nourished segment can be thought of as a subtle headland that protrudes from the existing coast. Transition from the fill to the existing shoreline can be accomplished either by constructing 'hard' structures, such as groins and jetties, or by filling transition zones between the terminal ends of the beach fill and the unrestored beach. The use of containment structures often produces an abrupt transition at the limits of the project, and the structures themselves detract from the natural appearance of the beach. When transition fill is used in lieu of structural containment, the nourished beach is gradually merged with the natural shore and visual impacts are lessened or may be absent altogether. The orientation of the transition shoreline will differ from the natural shoreline alignment; however, for engineering reasons this difference is usually quite small.

(2) Locating borrow material that is visually compatible with the natural beach is often impractical and ha6 generally not proven to be a necessary practice from the standpoint of aesthetics. Borrow sediments containing organic material or large amounts of the finer sand fraction have been used as beach fill since natural sorting and winnowing processes clean the fill material. This fact ha6 been confirmed with fills containing fine sediments at Anaheim Bay and Imperial Beach, California, and Palm Beach, Florida. Also fill material darkened by organic material (Surfside and Sunset Beach, California) have been bleached quickly by the sun to achieve a more natural beach color. However, coastal engineers attempt to locate borrow materials that are texturally compatible with the natural beach. Textural properties of native sand are selected for the comparison because their distribution reflects a state of dynamic equilibrium between sediments and processes within the system. This process frequently leads to the selection of visually compatible borrow material (US Army Engineer Waterway6 Experiment Station 1984).

h. Cultural Considerations. As a shore protection measure, beach restoration will potentially protect onsite cultural resources. However, impacts on cultural site6 associated with increased beach use and the impact of beach induced recreational or commercial development should be evaluated, In addition, when beach restoration is confined by "hard" structures, the impact of these structures on erosion rates in adjacent areas and possible erosion of cultural resources should be considered.

i. Environmental Summary.

(1) Environmental design.

(a) Equipment. A suction dredge with a cutterhead is less desirable than a dredge without a cutterhead for extracting beach nourishment material in the vicinity of live coral reefs or other light sensitive resources (Courtenay et al. 1975, Maragos et al. 1977). The suction dredge without a cutterhead is generally desirable because siltation is minimized and there is less potential for physical damage to the reef. To prevent sand compaction, wide-tracked vehicle6 should be used for moving equipment and beach nourishment material on the beach.

(b) Borrow material. The composition of sediment at the borrow sites should closely match that of the natural beach sediments (Thompson 1973, Parr et al. 1978, Pearson and Riggs 1981) and should be low in pollutants, silts, and clays. Minimum damage to the beach animals will occur when clean sand is placed on a sandy substratum. The damage may be great to the beach fauna if fine organic-rich sediments are used. In addition, fine sands exhibit greater density and thus greater potential for compaction. The vertical migration of infaunal animals may be inhibited when the particle size and composition of borrowed material differ from the original beach sediments (Maurer et al. 1978). To minimize siltation and consequently potential anoxic conditions following beach nourishment, the percentage of fine-grained sediments (smaller than 125 micrometers) should be kept to a minimum in the borrow material (Parr et al. 1978). Silt, which may be highly detrimental to corals and other beach and offshore benthic invertebrates, will be readily moved offshore if present in the material. Sedimentation can result in the reduction of species diversity. If a key specie (i.e., coral, seagrass, etc.) is affected adversely, the entire animal community of the area may be altered. Silt curtains may be used for containing silty sediments during construction. Silt curtains are not however, recommended for use in open water or in currents exceeding 1 knot. They are not effective for use in areas exposed to high winds or breaking waves or for preventing long-term elevated turbidity when silt is present in the material.

(c) Material placement. Nourishment material placed within the upper beach and the nearshore zone (intertidal) is best from an environmental standpoint. Organisms adapted to unstable nearshore bottom conditions tend to survive perturbations better than those in more stable offshore environments (Thompson 1973, Oliver and Slattery 1976). Burial of offshore benthic animals by nourishment material has a greater potential for adverse impacts because the subtidal organisms are more sensitive to perturbation than those in the intertidal and upper beach zone (Naqvi and Pullen 1982). In addition, by placing material into the intertidal portion of the beach, two benefits can be achieved. First, the maximum amount of existing beach is preserved. Second, the material is sorted and reworked by wave action, which reduces compaction.

(d) Time of placement. Most studies indicate that the optimal time for beach nourishment from a biological standpoint is during the winter (Saloman 1974, Oliver and Slattery 1976, Reilly and Bellis 1978, US Army Corps of Engineers 1979). Winter is typically the period of lowest biological activity. The spawning season for most nearshore and beach fauna occurs between the spring and fall. During winter adults have usually migrated out of the nearshore area and would be less concentrated in the shallow beach zone. Along most coasts, winter also has the most severe wave climate. This season makes it difficult to operate dredging equipment. It also may result in initial movement of large quantities of material offshore from the severe wave conditions.

(2) Environmental considerations. Though beach nourishment may be one of the most environmentally desirable and cost-effective shore protection alternatives, it is not without environmental consequences.

(a) Short-term impacts. During construction, the placement of equipment such as dredge anchors and pipelines can damage nearshore habitats and onshore earth-moving equipment can damage coastal vegetation. The dredging of material from the borrow area may cause locally elevated turbidity levels and increased sedimentation. However, few turbidity and sedimentation problems have ever been documented at the dredge cutterhead. Turbidity may impact motile animals while sedimentation can produce smothering of benthic fauna. The process of placing material on the beach will impact beach fauna. For a period following material placement, nearshore turbidity will be elevated because of the resuspension of fine sediments in the borrow material. The magnitude and duration of these impacts can be minimized through equipment selection, borrow material selection, the timing of construction, placement methods, and the use of dewatering, sedimentation or desilting basins.

(b) Long-term impacts. In general, beach restoration produces long-term recreational benefits and is seldom associated with long-term negative ecological impacts. Within a period of months, nourished beaches often visually and ecologically resemble undisturbed beaches. Potential long-term impacts are usually associated with sensitive habitats such as coral reefs and sea turtle nesting beaches. Under these circumstances special provision should be incorporated into the nourishment project to protect these resources. Many eroding shorelines do not provide sufficient surface area for nesting sea turtles. Restored beaches can provide additional nesting surface. Restored beaches require periodic replenishment. Therefore, impact assessments must consider that the short-term impacts will occur periodically over the life of the project. If a restored beach is confined by "hard" structures, the impact of these structures on the erosion rates in adjacent areas and possible erosion of cultural resources should be considered.

4-2. Dunes.

a. General.

(1) Foredunes are the dunes immediately behind the backshore. They are valuable, nonrigid shore protection structures created naturally by the combined action of sand, wind, and vegetation, often forming a continuous protective system.

(2) Dune building begins when an obstruction on the beach lowers wind velocity causing sand grains to deposit and accumulate. As the dune builds, it becomes a major obstacle to the landward movement of windblown sand. In this manner, the dune functions to conserve sand in the proximity to the beach system. Foredunes are often created and maintained by the action of the beachgrasses, which trap and stabilize sand blown from the beach.

(3) Foredunes may be destroyed by the waves and high-water levels associated with severe storms or by beach grass elimination (induced by drought, disease, excessive traffic by beach users, or overgrazing), which thereby permits local "blowouts." Foredune management has two divisions--stabilization and maintenance of naturally occurring dunes, and the creation and stabilization of protective dunes where they do not already exist.

(4) The creation of new barrier dunes or the rebuilding of damaged or incomplete foredunes may be done mechanically, by moving sand into place by truck, bulldozer, or pipeline dredge and grading it to suitable form, or by trapping blowing sand by means of sand fences or vegetation or a combination of these, where sand supply and wind pattern permit. The latter method utilizes natural forces to create dunes in the same way they develop in nature. It is usually the most economical method and tends to discourage the placement of dunes in unsuitable locations.

b. Beach Grasses For Beach and Dune Stabilization. The most common sand capture method is the use of dune vegetation, primarily beach grasses. Each coastal region has one or more beach grasses which are suitable for use in dune building. The most frequently used beach grasses are American beach grass (Ammophila breviligulata) along the mid-and upper-Atlantic coast and in the Great Lakes region: European beach grass (Ammophila arenaria) along the Pacific Northwest and California coasts; sea oats (Uniola paniculata) along the south Atlantic and Gulf coasts; and panic grasses (Panicum amarum) and (Panicum amarulum) along the Atlantic and Gulf coasts. Each of these grasses is easy to grow and plant, and all are efficient traps for sand. Stems of these plants are usually planted in early spring at one-half to one-meter (18- to 36-inch) centers in a band about 15 meters (50 feet) wide and parallel to the shore. If plantings are flooded with salt water during the growing season, the planting is usually destroyed. For this reason, a small elevated dune is often created prior to planting. Current dune construction methodology is described by Knutson (1977a-b) and Woodhouse (1978) and is summarized in the Shore Protection Manual (US Army Corps of Engineers 1984).

c. Other Herbaceous Vegetation for Beach and Dune Stabilization. There are a number of lesser known plant species that are very effective in stabilizing beaches and dunes. Some of these can be obtained commercially; however, most propagules of these species will be from such sources as donor beaches and sites. Grass species that can be effective in beach and dune stabilization include dune sandspur (Canchrus tribuloides), finger grasses (Chloris spp.), seaside paspalum (Paspalum vaginatum), coastal Bermuda grass (Cynodon dactylon), dropseeds (Sporobolus spp.), and others. Herbaceous plant species that can be effective for dune and beach stabilization include glass-worts (Salicornia spp.) which occur on all United States coasts, dune and beach morning glories (Ipomoea spp.), saltwort (Batis maritima), air potato (Dioscorea bulbifera), sea purslanes (Sesuvium spp.), pepper grass (Lepidum virginicum), lead plants (Amorpha spp.), water pennywort (Hydrocotyle bonariensis), seaside evening primroses (Oenothera spp.), false mallows (Sida spp.), common nightshade (Solanum americanum), sea oxeye (Borrichia frutescens), dog fennel (Eupatorium capillifolium), camphor weed (Heterotheca subaxillaris), and a number of others. Detailed information concerning these plants and their propagation can be obtained in Landin (1978), Coastal Zone Resources Division (1978), US Army Engineer Waterways Experiment Station (1978), and EM 1110-2-5026.

d. Woody Vegetation for Beach and Dune Stabilization.

(1) In addition to salt meadow cordgrass (Spartina patens) and other grasses and herbaceous plant species that can be used to stabilize beaches and dunes, there are a number of woody plant species that also can be used for this purpose. Stabilization can be achieved in tropical and semitropical areas where native woody species such as mangroves grow into the water. Mangroves help break up wave action on shorelines, while at the same time they trap sediment and speed up development of fast land along the shore. In the tropics, especially on low coral islands vulnerable to erosion, are found several genera of strand trees and shrubs that can be of value in stabilizing beaches. These include species in the genera Messerschmidia, Casuarina, Scaevula, and Terminalia.

(2) In intertidal freshwater areas such as those found far inland in the Chesapeake Bay and in rivers such as the James, the Cape Fear, and the Columbia, woody vegetation that would be useful in shoreline and levee stabilization include a number of willows (Salix spp), alders (Alnus spp.), cotton-woods (Populus spp.), and such large trees as American sycamore (Platenus occidentalis) and willow oak (Quercus phellos). Black willow (Salix nigra) and sandbar willow (Salix interior) are pioneer species on beaches and dredged material deposits in freshwater/intertidal areas, and both can easily be planted on such sites to aid in stabilization. Plantings can be in the form of individual cuttings, wattling, matting, or willow fencing and can also be coupled with erosion control structures such as riprap or sandbags. Additional information on these techniques and plant species are available in EM 1110-2-5026, and in Allen and Klimas (1986), US Army Engineer Waterways Experiment Station (1986), and Schiechtl (1980).

(3) In intertidal saltwater areas such as those found in the Intra-coastal Waterway and along barrier islands and shorelines, the primary tree species that can be used for stabilization in North America are mangroves. It should be noted that mangrove species are not winter-hardy north of central Florida and south Texas. In those temperature zones, mangroves will establish naturally if wave conditions are suitable. In many cases where plant establishment is important to shoreline stabilization, such as on the fringes of dredged material

islands, mangrove establishment takes place by a unique planting method. First, smooth cordgrass (Spartina alterniflora) is planted in the intertidal zones, and mangrove propagules (seed pods) are planted between the Spartina sprigs. The Spartina is used to provide initial stabilization and to provide a protective substrate for the mangrove seedlings while they establish root systems. Eventually, the young mangroves overtop the Spartina, and the shade from the mangrove trees kills the Spartina. The primary mangrove used in this process is black mangrove (Avicennia germinans), since it is the mangrove usually found mixed with natural stands of Spartina in Florida and other tropical areas. White mangrove (Laguncularia racemosa) is the other mangrove which often grows in early successional stages with black mangrove. Red mangrove (Rhizophora mangle) is the climax in many areas and grows further out into the water than the other two species. Thus, for many years it was thought that red mangrove was the pioneer species until studies showed that black and white mangroves were actually the pioneers, followed by red mangroves (Lewis and Lewis 1978).

(4) Three other woody species which have been introduced to North America that will tolerate semiflooded conditions and that will provide shore-line stabilization are the punk tree (Melaleuca quinquenervia), tuart tree (Eucalyptus gomphocephalus), and Chinese tallow tree (Sapium sebiferum). However, it must be emphasized that these three species can very easily proliferate on their own and will quickly become pest species. Punk tree is a major problem in south Florida where it was introduced for shoreline stabilization in freshwater areas. It has spread on its own and has invaded the Everglades where it is displacing native species. These species are not recommended for Corps sites.

(5) There are a number of woody species that are common to coastal shorelines of North America that tolerate salt spray but do not tolerate saltwater conditions. They grow well from the mean high tide line up to dune or beach crests and establish well on beach slopes. Any of these species can be planted to hasten maritime forest development along beaches, but none can be relied upon to stop erosion in the intertidal zone. These plants, listed below in no particular order of importance or ability to colonize shorelines, are:

(a) Pinus maritima (maritime pine).

(b) Scaevola plumieri (scaevola).

(c) Tamarix aphylla (athel tamrisk).

(d) Tamarix gallica (French tamrisk).

(e) Schinus terebinthifolius (Brazilian pepper tree).

(f) Baccharis halimifolia (groundsel tree).

(g) Juniperus silicicola (Florida red cedar).

(h) Casurina equisetifolia (Australian pine).

(i) Sabel palmetto (cabbage palm).

(j) Myrica cerifera (wax myrtle).

(k) Atriplex arenaria (orach).

(l) Kostelelzkya virginica (salt marsh mallow).

(m) Forestiera segregata (Florida privet).

(n) Conocarpus erectus (buttonwood).

(o) Myricanthes fragrans (nakewood).

(p) Psidium guajava (guava).

(6) All of these species can be propagated readily, and in many cases, plants are available from nursery sources such as commercial businesses and US Department of Agriculture Soil Conservation Plant Material Centers. All of them should be transplanted as small trees or seedlings onto the site requiring stabilization rather than trying to use seeds for propagation (Landin 1978, US Army Engineer Waterways Experiment Station 1978, EM 1110-2-5026).

(7) The use of marsh or woody vegetation to stabilize shorelines and levees in lieu of or in conjunction with engineering features such as riprap can reduce costs of stabilization and will generally enhance the aesthetics of the eroding area. In areas where clean beaches are the desired result of the shoreline project, however, vegetation will not be readily accepted by users. Also, very heavy use of beach areas by recreationalists will retard or destroy any planted vegetation used for beach or dune stabilization, and such areas may have to be fenced or posted off-limits until plants are well established (EM 1110-2-5026).

e. Role in Shore Protection. Dune systems have two primary functions in shore processes. First, they act as a levee to prevent the inland penetration of waves and storm surges during some storm events. Second, they provide a reservoir of sand to nourish eroding beaches during storms.

(1) Overtopping. Assuming that the foredunes are not washed away, they prevent storm waters from flooding low interior areas (Figure 4-7). Large reductions in water overtopping are affected by small increases in the elevation of the foredune crest. For example, it has been estimated

that a l-meter (3-foot)-high dune on Padre Island, Texas, would prevent overtopping from water levels accompanying storms with an expected recurrence interval of five years (US Army Engineer Waterways Experiment Station 1984).

(2) Sand reservoir.

(a) During storm, erosion of the beach generally occurs and the shoreline recedes. In a sense, the dynamic response of a beach under storm attack is a sacrifice of some beach width to provide material for an offshore bar (Figure 4-8). This bar reduces the shoreline erosion. Dunes can reduce the amount of beach loss occurring during a particular storm event by contributing sand to the upper beach and offshore bar system.

(b) Recent investigations have estimated the volumes of sand eroded from beaches during storms. Losses from erosion during single storms on the shore of Lake Michigan, on Jones Beach, New York (Everts 1973), and on Mustang Island, Texas (Davis 1972), have been estimated to be as high as 14,000, 17,000, and 31,000 cubic meters per kilometer (29,000, 35,000, and 65,000 cubic yards per mile), respectively. These volumes are probably rep.resentative of temporary storm losses because much of the eroded sand usually is returned to the beach by wave action soon after the storm. Birkemeir (1979) studied poststorm changes on Long Beach Island, New Jersey. He found that about one half of the sand that eroded from the beach during the storm was returned to the beach within two days. Volumes of sediment equivalent to those eroded during the storm were trapped and stored by natural processes in foredunes adjacent to the beach at several locations. Foredunes constructed on Cape Cod, Massachusetts (Knutson 1980), Ocracoke Island, North Carolina (Woodhouse, Seneca, and Broome 1976), and Padre Island, Texas (Dahl et al. 1975), contained 60,000, 80,000, and 120,000 cubic meters of sand per kilometer 135,000, 185,000, and 275,000 cubic yards per mile) of beach, respectively.

f. Physical Consideration.

(1) Shore erosion.

(a) On an eroding coast, a stabilized dune will slow but not prevent erosion. Dunes can serve effectively as barriers to high-energy surf, but eventually storm waves will undermine or overtop the dunes with a subsequent net loss of sediment from the original dune. The life span of a particular foredune line is a function of the rate of shoreline erosion, dune height, and width. Large, well-developed dunes commonly withstand moderate storms and often relatively severe ones. But where beach erosion is rapid, artificial stabilization will result in dunes of limited size and short life span. Stabilization of dunes on such a coast will provide only temporary protection to backdune structures or facilities.

Figure 4-7. Dunes under wave attack, Cape Cod, Massachusetts (courtesy of Stephen P. Leatherman)

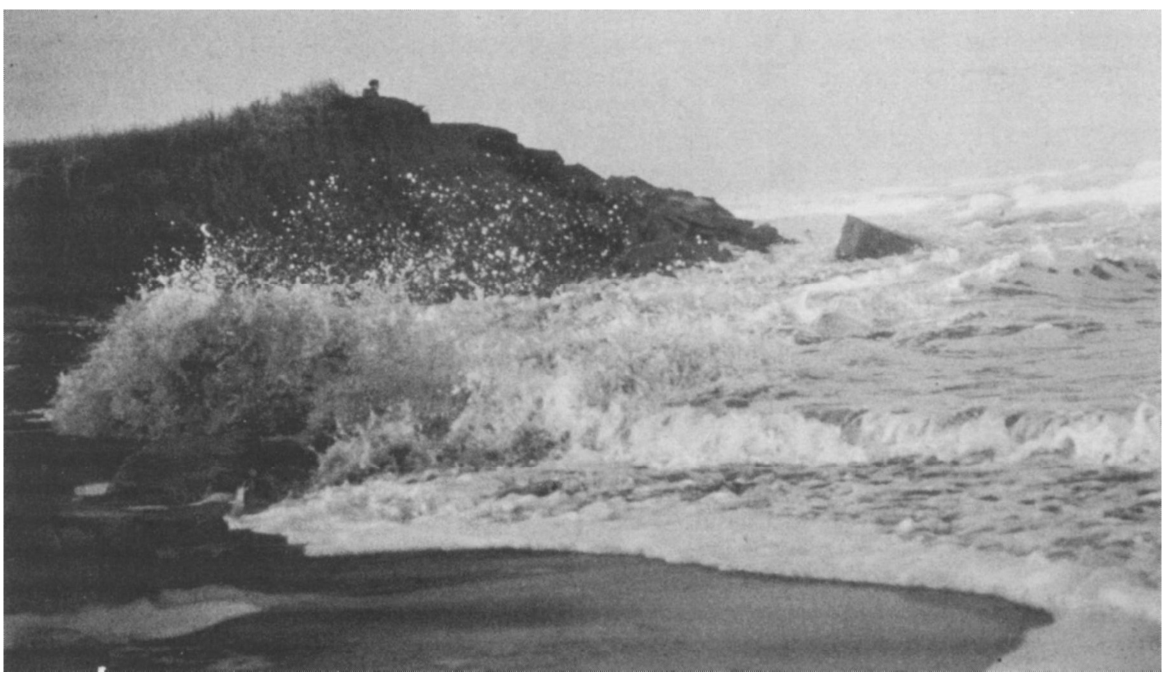


Figure 4-8. Dunes erosion during severe storm, Cape Cod, Massachusetts (courtesy of Stephen P. Leatherman)

(b) The impact of dunes on beach processes has been reviewed in detail by Leatherman (1979a-a). Leatherman concluded that much of the material removed from the dune and beach reforms as one or more nearshore bars. Wave reflection off the nearshore bars causes diminution of the incident waves and eventually reduces dune erosion. Seaward development of nearshore bars during high-wave storm events result in a dissipative surf zone (Figure 4-9) with shoreward decay of incident waves (Wright et al. 1979). The nearshore bar exhibits a cyclic behavior. During fair-weather conditions, the bar migrates landward and after several weeks may merge with the foreshore. Additional information on the process of onshore bar migration after a storm event due to decreasing wave power is provided by Short (1979). It should also be noted that major storms and high waves tend to flatten the foreshore profile rather than steepen it.

(c) Erosion of dunes by storms is a natural occurrence. This material provides a source of sand for the beach. As offshore sediments return to the foreshore to reestablish the original beach profile, onshore winds return sediment to the eroded dune. Whether or not the dunes revert to their former size depends on the local sand budget. If more sediment is leaving a local coastal zone than entering it, dunes will exhibit continual erosion. Where dunes are breached or undermined, dunes will reestablish naturally but usually landward of the original dune line. Sea-level rise may also cause dune erosion. If an adequate supply of sediment is available, the dune may migrate landward with the shoreline (Bruun 1983).

(d) High dunes, natural or artificial, reduce foreshore erosion during storms because much of the dunes and is transported seaward, ultimately to an outer bar and thereby further dissipating wave energy. This process does not appear to effect long-term erosional or depositional trends on the shoreline. Rather, stable dunes buffer rapid changes in the beach associated with the severe storm events.

(2) Barrier island migration.

(a) Barrier islands are elongated islands that mostly parallel the mainland shores of the Gulf of Mexico and Atlantic coasts. The coastal plain and continental shelf adjoining barrier islands are broad and gently sloping. In response to sea-level rise the coastal plain is being submerged. If barrier islands were to occupy a fixed position on the continental shelf, they eventually would be submerged by sea rise. It has been postulated that barrier islands migrate landward up the continental shelf maintaining a relatively constant elevation with respect to sea-level rise. Retreat of the seaward shore is accomplished by shore erosion, while the landward shore is extended by sediments transported between and around the island by tidal inlets and sediment transported over the islands by overwash and wind.

Figure 4-9. Dissipative surf conditions during Storm, Outer Banks, North Carolina

(b) Considering that the objective of most dune stabilization projects is to reduce the frequency of overwash and flooding, barrier island migration is an issue that should be addressed on a case-by-case basis. Though overwash processes have been shown to dominate some narrow barrier islands, most barrier islands appear to be too wide to migrate as a result of overwash. For example, the North Carolina barrier islands have narrowed, not migrated, over the past 130 years (Everts et al. 1983). Beach sands carried by overwash rarely reach the lagoonal side of most barrier islands, though after the barrier island narrows to a critical width, ovewash events may contribute to landward migration. Leatherman (1976) determined the critical maximum width for overwash based on an effective transport mechanism on Assateague Island, Maryland, to be between 100 and 200 meters (300 to 600 feet).

(c) The impact of small, localized dune-stabilization projects on barrier migration does not warrant extensive discussion. The beach grass planting techniques used to encourage dune growth mimic the natural dune building processes that are at work on all barrier systems. Typically, these techniques are used only when there is a need to protect existing man-made structures. Where such development exists, the absence of stable dune systems can often be attributed to human activities.

(d) The issue of barrier migration, however, may be raised when dune--stabilization efforts are employed to restabilize areas damaged by storm events. In this case, it should be recognized that the project, if successful, will accelerate dune establishment and will for a period of time reduce the frequency of overwash. The influence of this reduction in overwash, if any, on barrier island migration often will depend upon the type of barrier being stabilized. Upon relatively broad barriers, where the likelihood of an overwash traversing the entire barrier is remote, dune stabilization will have little impact on barrier migration. As noted earlier, most United States barriers are too broad for overwash to significantly effect their migration. On narrow, eroding barriers, overwash frequently will be critical to migration processes.

g. Water Quality Considerations. Dune sediments are composed of fine to coarse sands. Most coastal dune sediments are indirectly derived from reworked fluvial (river) and/or glacial material. Typically, dunes are nutrient poor and lack an organic component. Consequently, rainfall rapidly infiltrates the sediment, permitting little evaporation or surface runoff. Dune sands are a reservoir of fresh water and an aquifer for domestic water supply. Dune stabilization, by increasing the frequency and extent of dunes, can only enhance this resource.

h. Impacts of Human-Built Dunes.

(1) Dune vegetation. Human efforts to stabilize coastal dunes usually entail planting aggressive, perennial beach grasses in monospecific stands. These planted species remain dominant on the dune for many years after planting. Dahl and Goen (1977) found that when a dune forms naturally with the pioneering plants available to the area, some species remain from previous successional stages and a natural component of the mature dune plant community. However, planting of beach grasses bypasses some of the pioneering successional stages, resulting in rapid plant growth and dune development but in less plant diversity on the mature, planted dune. This lack of plant diversity is typically an unavoidable result of human-built dunes. Plant diversity is associated with slow and protracted dune development, which is contrary to the objectives of most dune stabilization projects. Cowan (1975) and others have conducted experiments on stabilizing dunes using a greater diversity of native species. However, because these native species are not commercially available and often require specialized treatment, such as hydromulching and irrigation, attempts to stabilize dunes in this manner are very costly.

(2) Secondary dune vegetation impacts.

(a) Some investigators have cautioned, based upon experiments conducted on the Outer banks of North Carolina, that dune stabilization projects may adversely impact coastal plant communities (Dolan, Godfrey, and Odum 1983, Godfrey and Godfrey 1973). They observed that high, continuous dunes form an effective barrier to stormwaves, reducing the amount of salt spray and preventing overwash. This protection of the secondary dune area can encourage the invasion and growth of shrub communities. At Cape Hatteras, North Carolina, continuous impenetrable thickets 3 to 5 meters (10 to 20 feet) high have formed in the lee of protective dunes. The National Park Service has resorted to controlled burnings to counter these changes. The excessive development of shrub communities in association with dunes is not an ecological issue in New England (Zaremba and Leatherman 1984) and has not been reported to be a problem in other regions. The shrubs do provide some benefit by providing storm erosion protection and wildlife habitat.

(b) The vegetative changes associated with artificial development of dunes are often considered ecologically beneficial. For example, plantings were made on Padre Island, Texas, following Hurricanes Carla and Beulah in 1967. Much of the island was unvegetated, hurricane-planed backshore and barren, migrating dunes. By 1976 the island's soil adjacent to the planted dunes was measurably less arid than other portions of this south Texas island (Figure 4-10). The mesic (moist) microclimate bayward of the planted dunes is believed to be due to the damming effect provided by the resultant dunes. These dunes retain rainwater in the mid-dune area, providing a more favorable habitat.

(c) The development of new dunes by planting or other means will change the microclimate of areas adjacent to the developing dunes. Whether or not these changes are viewed as ecologically positive or negative will depend upon the local importance and abundance of the habitats which are to be modified. Areas that are frequently stressed, by owewash for example, either lack vegetation or are colonized by a limited number of grasses and forbs. Developing dunes provide a measure of stability to adjacent areas, reducing flooding and salt spray. This stability makes the environment suitable for a greater diversity of plant species. If stable for a sufficient length of time (10 to 50 years), shrubs will invade and later dominate the plant community (Dolan, Godfrey, and Odum 1973, Zaremba and Leatherman 1984). If stability continues, mature forests can develop in 50 to 100 years.

(d) The shrub and forest communities represent an improved habitat for terrestrial animals and many bird species, principally song birds, though herons and egrets also use coastal shrubs for nesting. Conversely, bare sand and grass areas on the coast are the primary nesting sites for many colonial nesting birds, particularly gulls and terns.

(3) Back barrier salt marsh impacts.

(a) The coastal salt marshes of the United States are considered to be a major environmental resource. They are important contributors to the primary production of the coastal zone and are essential nursery grounds for sport and commercial fishery species. Some researchers contend that

Figure 4-10. Vegetation landward (left on photo) of artificially stabilized dune, Padre Island, Texas (courtesy of Bill E. Dahl)

dune stabilization can impede the development of salt marshes on the back side of barrier islands (Godfrey and Godfrey 1973). This contention is related to sediment overwash providing substrate for the development extension of the marsh into the bay or sound. If overwash does not occur, the marshes slowly erode.

(b) Salt marshes are intertidal plant communities found on the Atlantic and Gulf coasts and, to a lesser extent, on the Pacific coast. Two processes are of particular importance in creating shallow, marine environments in which marshes may establish: flooding due to sea-level rise and/or subsidence of land, and sediment deposition. Salt marshes are often associated with deltas. The Mississippi River delta is a spectacular example of the constructive impact of sediment deposition on marsh development. This delta system represents nearly half of our nation's coastal marshes. Deltas also are responsible for the development of the majority of Pacific coast marshes.

(c) On much of the Gulf and Atlantic coasts, however, deposition of barrier island sediment is important to marsh development. Active and remnant flood-tidal deltas behind these barriers are commonly the focus of marsh development (Godfrey and Godfrey 1973) as shown in Figure 4-11. On some barriers, marshes are altogether absent except where there is evidence of inlet activity (Leatherman and Joneja 1980). Overwash may have either a negative or positive impact on marshes. When stable marshes are present landward of the barrier, overwash events may destroy the marsh through burial or change its ecological character by raising its elevation (Zaremba and Leatherman 1984). Conversely, overwash may widen a narrow eroding marsh or may encourage the growth of new marshes on barren areas by creating a broad, gradually sloping, intertidal plain (Godfrey and Godfrey 1974).

(d) To fully evaluate the potential impact of a particular dune stabilization project on marsh development, two factors must be considered. First, back-barrier marshes will only be impacted when the entire width of the barrier is traversed by overwash or the entire barrier is breached by an ephemeral inlet. Therefore, marsh impacts will be a concern only where events of this magnitude can be reasonably expected to occur within the anticipated life of the project. Second, the current condition of the marshes landward of the barrier should be evaluated. The impact on marsh development will be a project issue if barren shore or eroding marshes are present in the back-barrier area.

Figure 4-11. Salt marshes landward of barrier island system, Murrells Inlet, South Carolina

i. Recreational Considerations.

(1) In general, coastal dunes have a positive impact on recreational

use of the shore. Dunes enhance beach recreational experience by providing shelter from the wind and screening structures and facilities from the beach view. However, sometimes high dunes can obstruct the desirable view of the beach for people using inland facilities.

(2) Recreational use of dunes, however, can seriously impact dune stability. Pedestrian traffic to and from the beach often damages or destroys vegetation along frequently used paths. Knutson (1980) observed a dune crossover path on a developing dune over a five-year period. Although the dunes adjacent to the path increased in elevation by more than one meter (3 feet), the elevation of the path remained constant. Dune areas in which vegetation has been disturbed may deflate rapidly. Field surveys on Assateague Island, Maryland, documented pathway deflation rates of more than one-half meter (2 feet) per year (Leatherman 1979b). These weakened areas of the dune system are the first areas to be overwashed during severe storms. Beach dune walk-over structures can be placed to lessen the Impact of pedestrian traffic (Coastal Engineering Research Center 1981).

(3) Off-road vehicle (ORV) traffic can also severely impact developing dunes. The effect of ORV activity on American beach grass on Cape Cod showed that low levels of activity (less than 175 passes) were sufficient to cause maximum damage to plants (Brodhead and Godfrey 1979). Fewer than 50 passes were shown to preclude seaward growth and development of the foredune system in some cases.

(4) Sand fences are often used to lessen the impact of foot traffic on the dune. Fences can be used to confine and direct traffic to designated crossover areas. These crossovers can be relocated periodically and impact areas can be replanted with beach grass. If ORV traffic is present, wooden ramps should be built over dune lines. Maintenance and repair must be a continuing effort in these situations.

j. Aesthetic Considerations.

(1) There are several features of human-built dunes which make them visually different from natural dunes, at least during the early stages of dune development. Natural dunes are formed by a series of chance events. They begin as small individual hummocks, usually of assorted shapes and sizes. The hummocks may coalesce over time, and the resultant dune will be irregular in elevation and in its location with respect to the shore. Regardless of stabilization procedure, human-built dunes tend to be linear (Figure 4-12). Dunes can be designed with a zigzag or other patterns, but for practical and economical reasons they usually are not. First, straight dunes require the least effort and materials to construct. Second, if an irregular pattern were used on an eroding shoreline, the portion of the dune closest to the shore would be the first area to erode. The flood protection provided by a dune system is limited to the protection provided by the weakest portion of the system. The same line

of thinking can be used to discourage the use of an irregular dune crest elevation. Because of these considerations, human-built dunes typically will be more regular in appearance and more continuous than natural dunes.

(2) The human-built dunes can be made to conform to natural dune contours in other respects. The selection of stabilization technique may influence the final shape of the dune. Knutson (1980) observed in Cape Cod experiments that planted dunes produced lower and wider dunes than fence-built dunes. In North Carolina, researchers found that decreasing plant spacing both landward and seaward from the dune crest increased dune width and reduced the seaward slope of the dune from about one on ten to one on twenty (Savage and Woodhouse 1968).

Figure 4-12. Linear shaped, planted dune system, Outer Banks, North Carolina (courtesy of R. P. Savage)

k. Cultural Considerations. As a shore protection measure, dune stabilization will often protect onsite cultural resources. However, if dunes are created by mechanical methods, potential exists for onsite equipment and traffic damage to cultural resources. Because of the dynamic nature of beach and dune systems (cyclical erosion and deposition), cultural resources are not a common feature in dune stabilization project areas.

l. Environmental Summary.

(1) Environmental design. When beach grasses are used to create and

stabilize coastal dunes, human-built dunes can be developed which are aesthetically and biologically similar to natural dunes. Dune slope, alignment, and plant diversity can be controlled through the selection of an appropriate planting design. In most cases, the planted dune will have a greater diversity of both plants and animals than the unstable sand environment which preceded it. The use of construction equipment to build dunes will generally increase potential for environmental impacts. Vehicular traffic can damage or destroy coastal vegetation. Controlling equipment traffic patterns, constructing sand fences and walkovers, and replanting damaged areas can mitigate these impacts.

(2) Additional environmental considerations.

(a) Short-term impacts. During construction, coastal plant communities can be disturbed by equipment and human traffic.

(b) Long-term impacts. Small, localized dune-stabilization efforts, particularly the planting of dune vegetation, can usually be considered as conservation measures. Dune-building techniques are only used when there is a need to protect existing facilities. Where such development exists, the absence of stable dunes can often be attributed to human activities, hence dune building can be a restorative action. Environmental impacts are not likely to be a major consideration even for relatively extensive dune-stabilization projects in mainland coastal areas. However, major efforts to build continuous dunes on barrier islands to provide protection to mainland areas from major storms and hurricanes will require more serious consideration. Projects of this magnitude may potentially alter the geological and ecological characteristics of the barrier system. Major dune-stabilization projects along a barrier system should be preceded by an investigation of the role that the dunes and the physical processes modified by dunes play in the overall dynamics of the system.

CHAPTER 5

HUMAN-MADE STRUCTURES

5-1. Bulkheads, Seawalls, and Revetments.

a. General.

(1) Where beaches and dunes protect shore developments, additional protective works may not be required. However, when natural forces do create erosion, storm waves may overtop the beach and damage backshore structures. Human-made protective structures may then be constructed or relocated to provide protection. In general, measures designed to stabilize the shore attempt to either harden the shore to enhance resistance to wave action, prevent waves from reaching the shore (or harbor), prevent waves from overtopping an area, or attempt to retard the longshore transport of littoral drift. In this chapter, three types of human-made shore protection structures will be discussed:

(a) Bulkheads, seawalls, and revetments.

(b) Jetties and breakwaters.

(c) Groins.

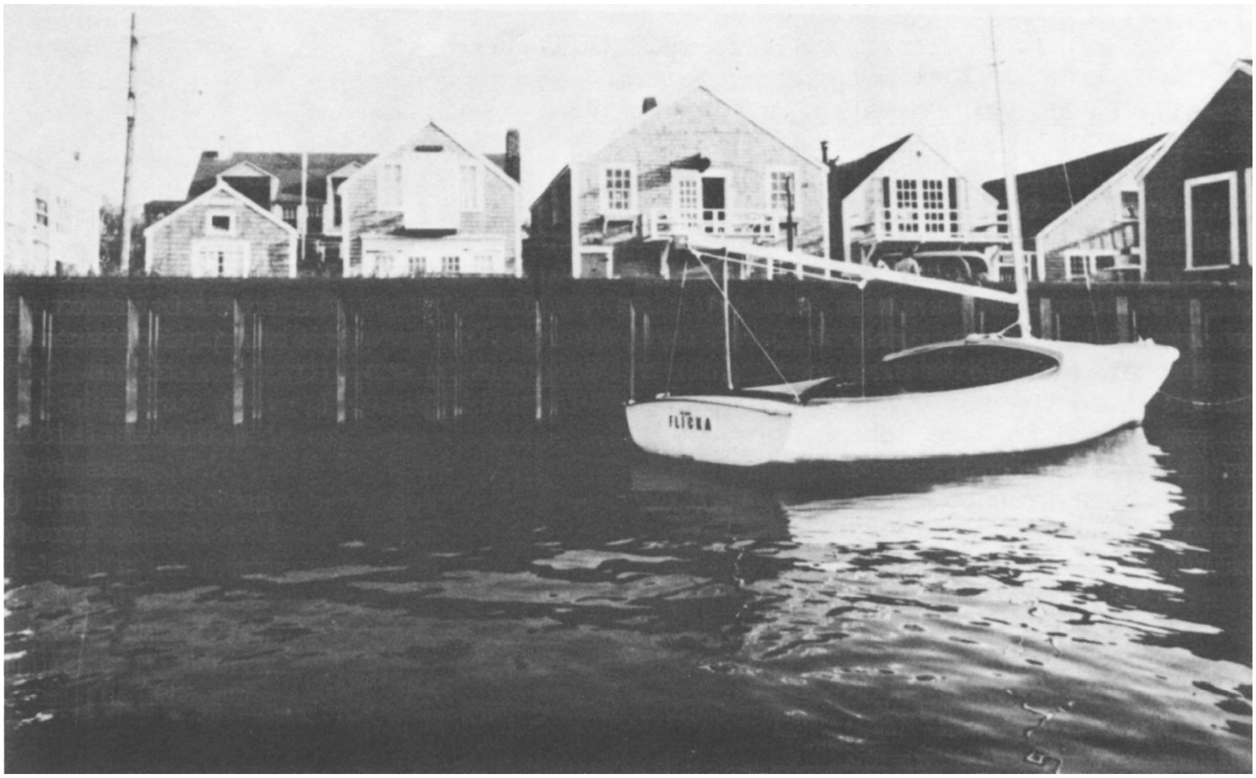
(2) Onshore structures, termed bulkheads, seawalls, and revetments, provide protection, based on their use and design, for the upper beach which fronts backshore development or erodible bluffs. Shorefront owners have resorted to shore armoring by wave-resistant walls of various types when justified by the economic or aesthetic value of the property to be protected.

b. Role in Shore Protection.

(1) Onshore structures are intended to protect the shore by reducing the rate of change in the shoreline. They slow the rate of change by protecting the shore from wave impact or by preventing overwash.

(2) Bulkheads and seawalls are similar in design with slightly differing purposes. Bulkheads are primarily soil-retaining structures which are designed to also resist wave attack (Figure 5-1). Conversely, seawalls are principally structures designed to resist wave attack, but also may retain some soil to assist in resisting wave forces. The land behind seawalls is usually a recent fill area. Bulkheads and seawalls may be built of many materials including steel, timber or concrete piling, gabions, or rubble-mound structures.

(3) For ocean-exposed locations vertical bulkheads alone do not provide a long-term solution because of foreshore erosion, toe scour, and flanking. Unless combined with other types of protection, the bulkhead must be enlarged into a massive seawall capable of withstanding the direct onslaught of the waves (Figure 5-2). Seawalls may have vertical, curved,



Nantucket Island, Massachusetts (1972)
(photo, courtesy of U.S. Steel)

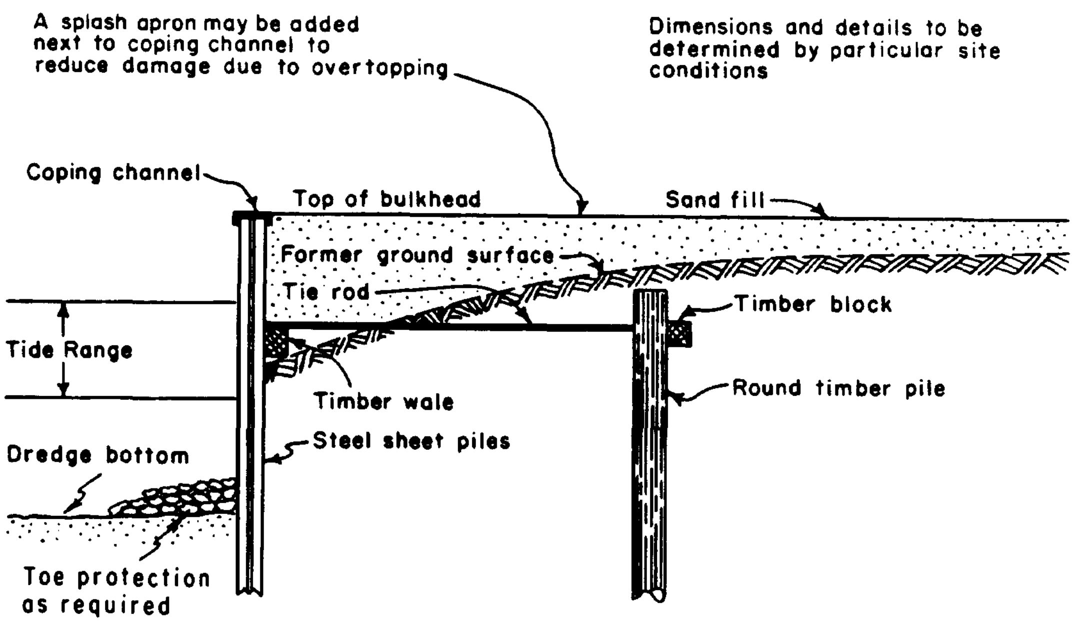


Figure 5—1. Steel sheet pile bulkhead

stepped, or sloping faces. Although seawalls protect the upland, they often create a local problem. Downward forces of water, produced by waves striking the wall, can rapidly remove sand from in front of the wall. A stone apron is often necessary to prevent excessive scouring and undermining.

(4) A revetment armors the existing slope face of a dune or embankment. It is usually composed of one or more layers of quarry stone or precast concrete armor units, with a filter layer overlaying a graded soil slope (Figure 5-3). Revetments are of little benefit if placed at the toe of a marginally stable slope since they are usually only a protective armor and not a retaining structure. Because the sloping face of the quarrystone revetment is a good energy dissipater, revetments have a less adverse effect on the beach in front of them than a smooth-faced vertical bulkhead.

c. Physical Considerations. The littoral system at the site of a structure is always moving toward a state of dynamic equilibrium where the ability of waves, currents, and winds to move sediment is matched by the available supply of littoral materials. When there is a deficiency of material moving within a system, the tendency will be for erosion at some location to supply the required material. Once a structure has been built along a shoreline, the land behind it will no longer be vulnerable to erosion (assuming proper design of the structure), and the contribution of littoral material to the system will be diminished along the affected shoreline. The contribution formerly made by the area must now be supplied by the adjoining areas. Therefore, though the structure provides a measure of stability to a portion of the shoreline, it may indirectly increase the rate of erosion along other reaches of the shoreline (Bellis et al 1975, Carstea et al. 197 5a-b, Georgia Department of Natural Resources 1975, Herbich and Schiller 1976, Pallet and Dobbie 1969, US Army Engineer District, Baltimore 1975, Mulvihill et al. 1980). In addition, some structures such as bulkheads may cause increased wave reflection and turbulence with a subsequent loss of fronting beach. Smooth, vertical structures will have the greatest impact on the beach and nearshore sediment loss.

d. Water Quality Considerations.

(1) The impacts of onshore structures on water quality result from increased suspended solids during construction and altered circulation patterns produced by the structure itself.

(2) Construction of onshore structures may require excavation, backfilling, pile driving, and material transport. These activities can result in increased suspended solid loads within the adjoining water body (Boberschmidt et al. 1976, Carstea et al. 197 5a-b and 1976, Environmental Quality Laboratory, Inc. 1977, US Army Engineer District, Baltimore 1975, Virginia Institute of Marine Science 1976, Mulvihill et al. 1980). The increased concentration of suspended solids is generally confined to the immediate vicinity of the construction activity and dissipated rapidly at the completion of the operation. Although these are generally short-term impacts, construction

Galveston, Texas (1971)

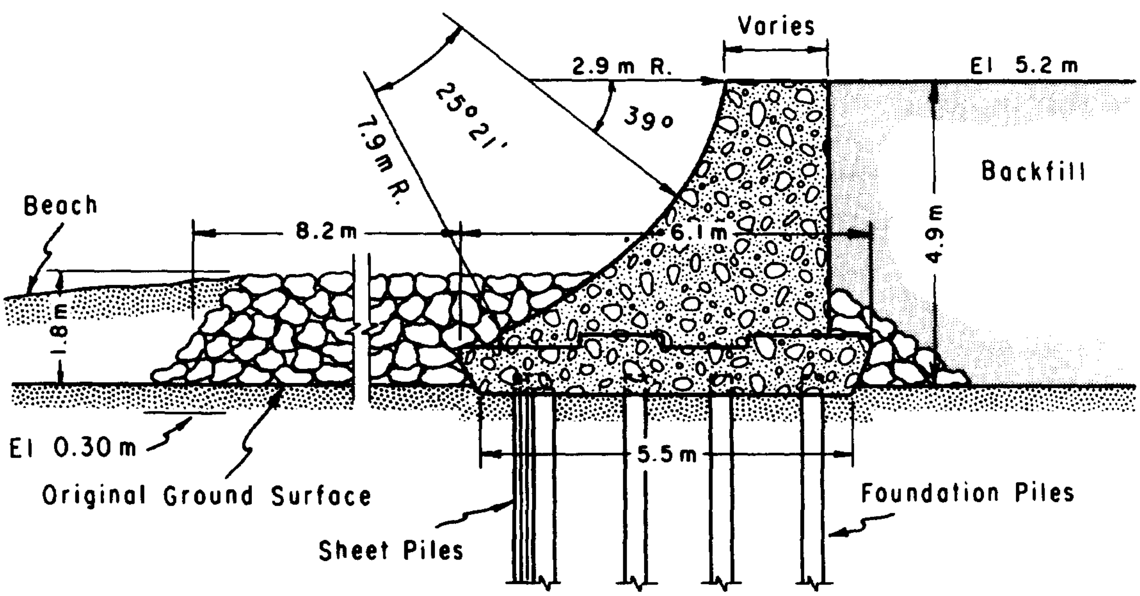


Figure 5-2. Concrete curved-face seawall

Chesapeake Bay, Maryland (1972)

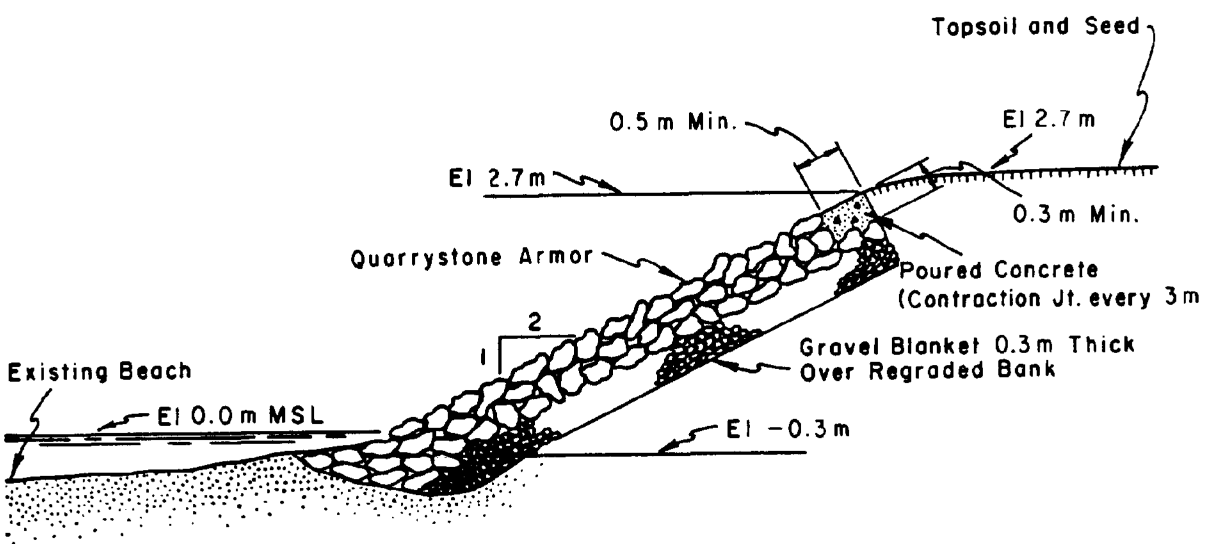


Figure 5-3. Quarrystone revetment

activities should be designed to minimize generation of suspended solids, for example, by the use of silt curtains in low-energy areas. See paragraph 4-11(1) (b) for a discussion of the limitation of silt curtains.

(3) Structures can influence water quality by altering circulation patterns. Modification in circulation can result in changes in the spatial distribution of water quality constituents, differences in the flushing rates of potential contaminants, and changes in the scour patterns and deposition of sediments (Bauer 1975, Carstea et al. 1975a-b, Georgia Department of Natural Resources 1975, Mulvihill et al. 1980). Environmental assessment of the effects on circulation should initially emphasize fundamental parameters such as salinity, temperature, and current velocity. If minimal changes occur in these parameters, then it can be assumed that the chemical characteristics of the system will not be significantly modified. Prediction of changes in circulation and its effect on the physical parameters can be achieved through comparison with existing projects, physical model studies, and numerical simulation (see Appendix B).

e. Biological Considerations. A wide variety of living resources is present in coastal shore protection project areas and includes species of commercial, recreational, and aesthetic importance. Because shore protection projects exist in arctic, temperate, and tropical climates, biological impacts will generally be highly site-specific and depend upon the nature and setting of the project.

(1) Short-term impacts. Short-term biological impacts are usually associated with the actual construction phase of the project. The actual time is typically short (measured in days and weeks) and therefore can be scheduled to minimize negative impacts. Transportation of material to the site, preparation and construction using heavy equipment, and backfilling and grading will cause temporary air and noise pollution close to the site. Nesting, resting, or feeding waterfowl, fish, and other wildlife may be disrupted. Projects should be timed, where possible, to avoid waterfowl and turtle nesting periods and fish spawning periods. Construction will also temporarily reduce water quality, generally by suspending sediments and generating turbidity. The environmental impacts on the benthic communities resulting from suspended solids in the water around shore protection construction are for the most part minor. Such impacts are particularly true in the surf zone on open coast beaches where rapid natural changes and disturbances are normal and where survival of the benthic community requires great adaptability. On rapidly eroding banks, construction impacts on suspended solids may be minimal when compared to the natural condition. However, sites with a high percentage of fine material and in proximity to seagrass beds or coral reefs (habitats sensitive to turbidity and siltation) will require special consideration and usually precautions such as silt curtains, where feasible. Temporary turbidity will also interfere with respiration and feeding, particularly of nonmotile bottom dwellers. Most motile organisms will avoid or flee the disturbed area.

(2) Long-term impacts.

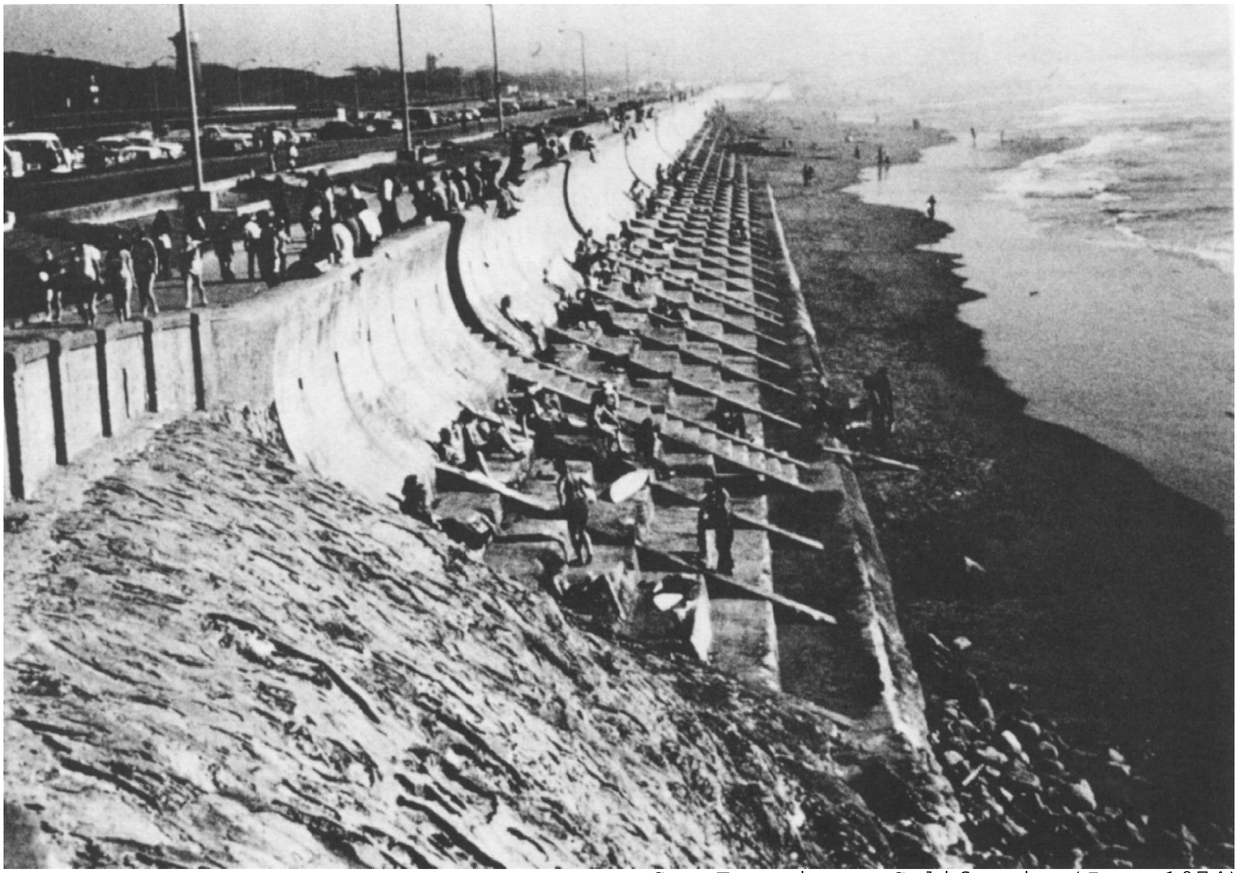
(a) Long-term effects vary considerably depending upon the location, design, and material used in the structures. Placement of coastal shore protection structures requires an initial disturbance of the benthic substrate, but it results in the formation of a new substrate composed of structural material. In many locations the placement of these structures provides new habitat not available otherwise. The biological productivity of the area to be displaced is also important. The impact of a vertical steel sheet bulkhead located at mean low water in a coastal marsh (highly productive habitat) will be considerably different from a rubble-reveted bank in an industrialized harbor.

(b) Vertical structures in particular may accelerate erosion of the foreshore and create unsuitable habitat for many bottom species in front of the structure as the result of increased turbulence and scour from reflected wave energy. Bulkheads and revetments can reduce the area of the intertidal zone and eliminate the important beach or marsh habitat between the aquatic and upland environment. The result can be a loss of spawning, nesting, breeding, feeding, and nursery habitat for some species. On the other hand, rubble toe protection or a riprap revetment extending down into the water at a sloping angle will help dissipate wave energy and will provide hard-bottom habitat for many desirable species.

f. Recreational Considerations. Bulkheads can severely limit recreational use of the shoreline (Brater 1954, Mulvihill et al. 1980). In particular, they restrict public access to the water (Coastal Plains Center for Marine Development Service 1973, Snow 1973, Mulvihill et al. 1980). Revetments also hamper public access to the water for water contact activities. Seawalls are frequently designed to permit public access and to enhance beach usage (Figure 5-4). However, where beach erosion persists in the vicinity of the above onshore structures, the usable portion of the recreational beach is usually diminished.

g. Aesthetic Considerations. The transition between land and water on a natural shoreline is either gradually sloping, consisting of a beach or marsh, or is sharply defined by a bank or scarp. Onshore structures are more similar to the latter in that they often represent an abrupt visual change. Bulkheads and revetments can sometimes be designed to blend in with the surrounding shoreline. For example, their natural appearance can be enhanced with the use of vegetation. The use of unusual construction materials such as junk cars, tires, or recycled construction debris would produce the greatest negative aesthetic impacts. Because seawalls are frequently large concrete structures and are usually located in densely populated areas, particular attention should be paid to their visual impact. The design of a structure should be visually attractive as well as functionally sound.

h. Cultural Resource Considerations. By reducing erosion rates, onshore structures will generally preserve onsite cultural resources. However, this local protection can potentially increase the rate of erosion on adjacent



San Francisco, California (June 1974)

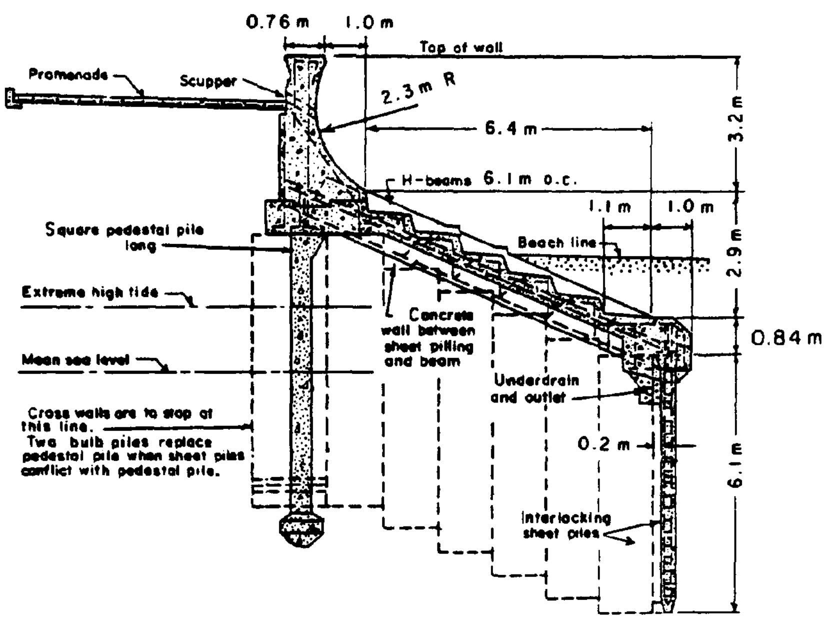


Figure 5-4. Concrete combination stepped- and curved-face seawall with public access points

shorelines. For this reason, cultural resources in the adjacent impact area must also be evaluated and projects designed so that erosion of adjacent areas is avoided.

i. Environmental Summary.

(1) Environmental design. Table 5-1 summarized potential design modifications that can be made to revetments, seawalls, and bulkhead projects in order to improve their environmental characteristics.

(2) Environmental assessment.

(a) Short-term impacts. Construction activities associated with onshore structures may include excavation, backfilling, and pile driving using both heavy equipment and hand labor. The impacts of this construction will be similar to the impacts associated with other land-based construction activities: vegetation damage, noise and air pollution, visual clutter, and other temporary impacts. Because this construction takes place on the shoreline, however, other impacts not usually associated with land-based construction activities are also possible. One of the short-term impacts of shoreline construction is the increased levels of suspended sediments in nearshore waters which accompany this disturbance. Suspended sediments and siltation can impact benthic communities and to a lesser extent life forms in the water column. Because of the local nature and short duration of this impact, it will be a primary consideration only in projects which are near sensitive habitats such as coral reefs and seagrass beds.

(b) Long-term impacts. The primary long-term impacts of onshore structures are associated with their effect on shore processes. Though these structures abate local erosion, they may indirectly accelerate erosion in adjacent shoreline areas. This accelerated erosion will be an important concern if potentially affected areas contain marsh vegetation, riparian vegetation, or other productive habitats. Wave reflection from exposed onshore structures may also produce deepening of the nearshore zone. Such losses may have recreational impacts and will alter biological habitats. Direct impacts of onshore structures include displacement of onsite habitats, modified public access, and aesthetic alterations.

5-2. Jetties and Breakwaters.

a. General.

(1) The distinction between jetties and breakwaters can be vague in that these structures are similar in many aspects of design and materials. They primarily differ with respect to function. Jetties are structures built at the mouths of rivers, estuaries, or coastal inlets to stabilize the position and prevent or reduce shoaling of entrance channels. A secondary function of a jetty is to protect an entrance channel from severe wave action or cross-currents, thereby improving navigational safety between harbors and deep water. Also, jetty construction can result in stabilization of the location

TABLE 5-1

Environmental Design Considerations for Revetments
Seawalls, and Bulkheads

Factor	Design Consideration	Environmental Benefit
Location	Site structure above mean high water	Allows intertidal zone to remain
		Allows shoreline vegetation to remain
		Does not interfere with littoral drift
	Avoid wetland sites, spawning beds, shore-bird and turtle nesting beaches, bird feeding and resting areas	
	Avoid nearby coral reefs and seagrass beds	Resource conservation
	Avoid archaeological sites	Preservation of historical information and features
Construction material	Rubble or riprap	Usually most desirable, natural, and durable
		Most reef-like surface area
	Treated wood and smooth concrete	Intermediate desirability and less surface area
	Steel sheet pile	Least desirable, least col-onizable surface
	Armor stone, largest cost-effective	More stabile physical habitat
		More size diversity of openings

(Continued)

TABLE 5-1 (Concluded)

Factor	Design Consideration	Environmental Benefit
Design	Riprap or stair-step revetments on a slope of 45 degrees or less when structure is partially submerged	Dissipates wave energy, more habitat for fish and reef fish
	Toe protection on structures below mean low water	More diverse habitat, reef-like properties, dissipates wave energy on bottom
	Sloping structures that are partially submerged	Reduce wave reflection Less disturbance of intertidal habitat due to scour Less disturbance of fish nursery habitat
	Natural contours and lack of sharp angles	Aesthetically pleasing Less debris capture Reduces chance for rip current formation

of an inlet on a barrier beach coastline. In contrast, the primary function of a breakwater is to protect a harbor, water basin, or shoreline from destructive wave forces. Thus, breakwaters provide calm waters for safe anchorages, moorings, access points, and a host of other water resource uses. Some breakwaters may also serve to create sediment traps in the nearshore zone.

(2) There are no truly "typical" designs for jetty or breakwater structures. The multiplicity of physical, logistical, and economic factors considered during the planning, design, and construction phases ensure that each project will be unique. For example, the linear dimensions of a jetty structure will vary greatly from project to project, because the seaward extent of a jetty is determined largely by the distance offshore required to reach the design depth of the adjacent channel entrance. Physical factors, important from an environmental standpoint, include geomorphology of the project site, bottom topography, wave climate, sediment transport rates, and tide and current regimes, among others.

(3) Selection of construction materials has numerous alternatives, although jetties and breakwaters on open coastlines are predominantly rubble-mound structures. Other types of materials include vertical wood pile, steel sheet pile, caissons, sandbags, and, particularly in the Great Lakes, timber, steel, or concrete cribs. Rubble-mound structures consist of underlying layers of randomly shaped and placed stones that are overlaid by an armor (cover) layer of selectively sized stones or prefabricated concrete forms (Figure 5-5). Lateral toe-to-toe dimensions of rubble-mound structures, as well as the slope angles of their lateral faces, vary among projects based on design criteria for site-specific wave climates.

(4) Jetty or breakwater configurations follow basic patterns, but also demonstrate considerable variation to adapt to individual project conditions. Jetties generally extend seaward from the shore in a perpendicular fashion, but the actual angles vary from project to project. Updrift jetties may incorporate a weir section (submerged during some portion of the local tidal cycle) to allow littoral sand movement across the jetty and into a deposition basin (Figure 5-6). Sand bypassing can then be accomplished by periodic dredging of the basin. Breakwater configurations are somewhat more diverse than those for jetties, reflecting wider functional uses. Breakwaters can be categorized as either shore-connected or offshore (detached), and as either fixed or floating. Commonly the landward portion of a shore-connected breakwater lies perpendicular to the shoreline, and the seaward extension lies more or less parallel to the shore. Fixed breakwaters are constructed of materials placed on the bottom substrate, whereas floating breakwaters are buoyant structures held in position by anchors and tethers. Fixed breakwaters may be emergent or partially or totally submerged especially in the case of offshore designs.

b. Role in Shore Protection. Jetties and breakwaters are built to serve "stabilization" and "protection" functions. This fact infers that the

Santa Cruz, California (Mar. 1967)

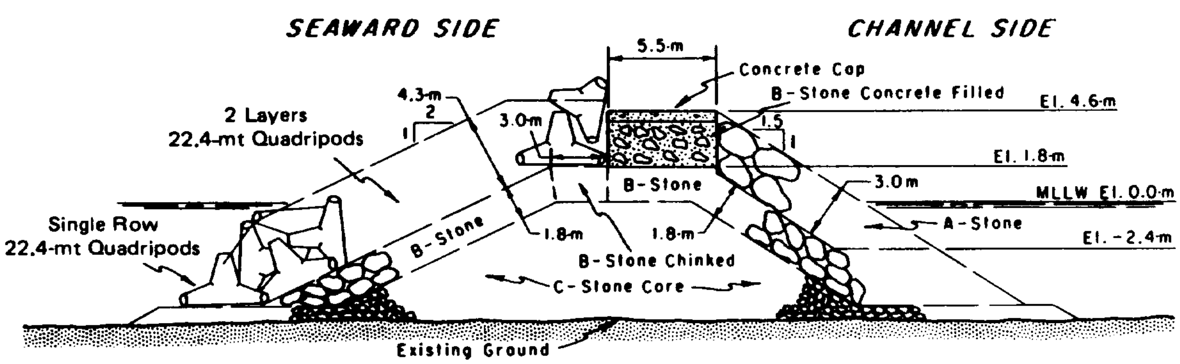
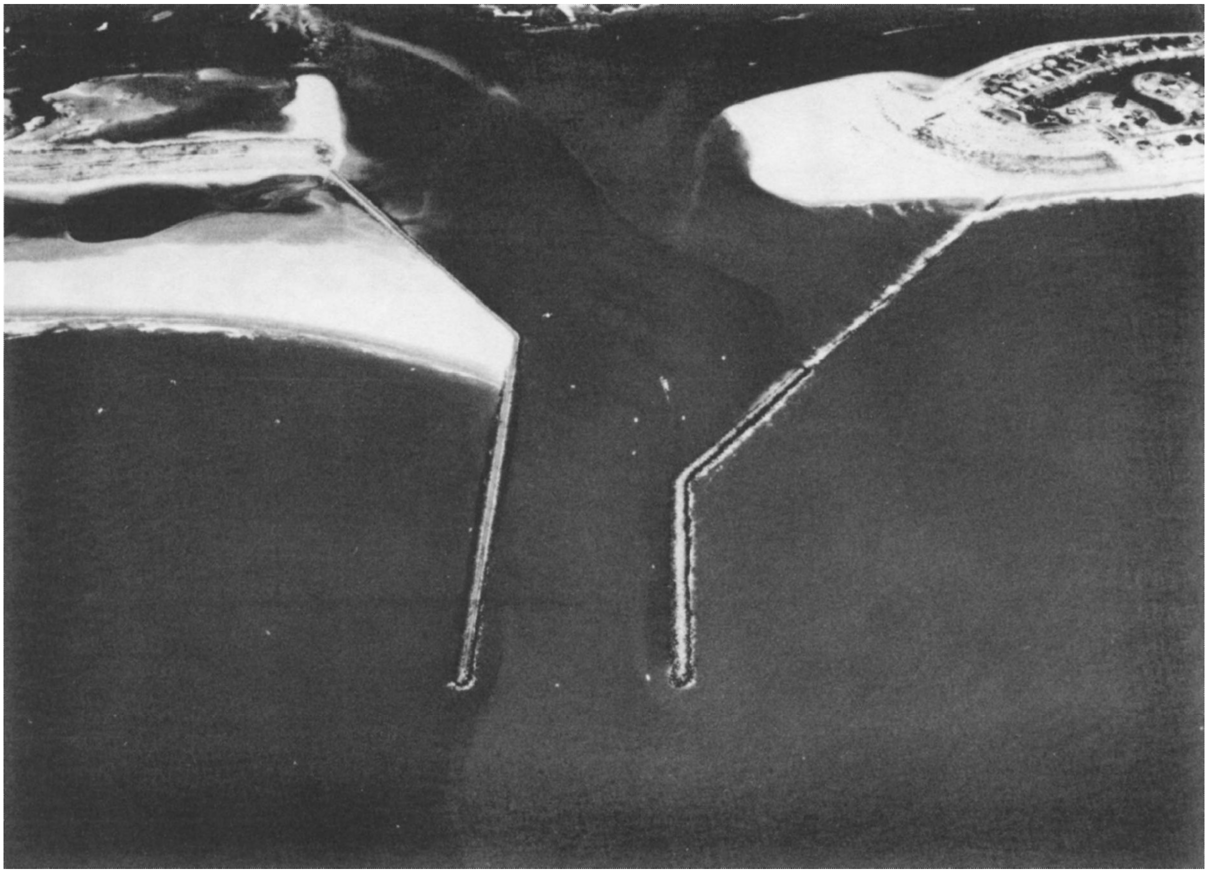


Figure 5-5. Quadripod and rubble-mound breakwater



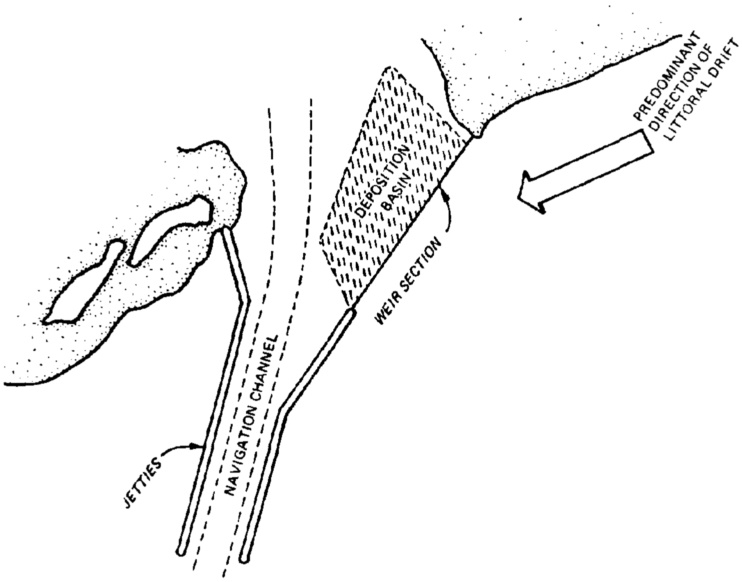


Figure 5-6. Sand bypassing, Murrells Inlet, South Carolina

environments in which they are built are characteristically dynamic and moderately to highly energetic.

(1) Jetties.

(a) Jetties are structures used at inlets to stabilize the position of the navigation channel, to shield vessels from wave forces, and to control the movement of sand along the adjacent beaches so as to minimize the movement of sand into the channel. The sand transported into an inlet will interfere with navigation depth. Because of the longshore transport reversals common at many sites, jetties are often required on both sides of the inlet to achieve complete channel protection. Jetties are built from a variety of materials, e.g., timber, steel, concrete, and quarrystone. Most of the larger structures are of rubble-mound construction with quarrystone armor and a core of less permeable material to prevent sand passing through. It is the impoundment of sand at the updrift jetty which creates the major physical impact. When fully developed, the impounded sand extends well updrift on the beach and outward toward the tip of the jetty.

(b) The jetty's major physical impact is the erosion of the downdrift beach. Before the installation of a jetty, nature supplies sand by intermittently transporting it across the inlet along the outer bar. The reduction or cessation of this sand transport due to the presence of a jetty leaves the downdrift beach with an inadequate natural supply of sand to replace that carried away by littoral currents.

(c) To minimize the downdrift erosion, some projects provide for periodically dredging the sand impounded by the updrift jetty and pumping it through a pipeline (bypassing the inlet) to the downdrift eroding beach. This pumping provides for nourishment of the downdrift beach and also reduces shoaling of the entrance channel. If the sand impounded at the updrift jetty extends to the head or seaward end of the jetty, sand will move around the jetty and into the channel causing a navigation hazard. Therefore, the purpose of sand bypassing is not only to reduce downdrift erosion, but also to help maintain a safe navigation channel.

(d) One design alternative for sand bypassing involves a low section or weir in the updrift jetty over which sand moves into a sheltered predredged, deposition basin. By dredging the basin periodically, channel shoaling is reduced or eliminated. The dredged material is periodically pumped across the navigation channel (inlet) to provide nourishment for the downdrift shore. A weir jetty of this type is shown in Figure 5-6. Environmental considerations of beach nourishment have been discussed in Chapter 4.

(2) Breakwaters.

(a) Breakwaters are wave energy barriers designed to protect any landform or water area behind them from the direct assault of waves. However, because of the higher cost of these offshore structures as compared to onshore structures (e.g. seawalls), breakwaters have been mainly used for harbor protection and navigational purposes. In recent years, shore-parallel, detached, segmented breakwaters have been used for shore protection structures.

(b) Breakwaters have both beneficial and detrimental effects on the shore. All breakwaters reduce or eliminate wave action in the lee (shadow). However, whether they are offshore, detached, or shore-connected structures, the reduction or elimination of wave action also reduces the longshore transport in the shadow. For offshore breakwaters, reducing the wave action leads to a sand accretion in the lee of the breakwater in the form of a cuspate sandbar (called a tombolo when a complete connection is made between the original beach and structure), which grows from the shore toward the structure.

(c) Shore-connected breakwaters provide protection to harbors from wave action and have the advantage of a shore arm to facilitate construction and maintenance of the structure.

(d) At a harbor breakwater, the longshore movement of sand generally can be restored by pumping sand from the side where sand accumulates through a pipeline to the eroded downdrift side.

(e) Offshore breakwaters have also been used in conjunction with navigation structures to control channel shoaling. If the offshore breakwater is placed immediately updrift from a navigation opening, the structure impounds sand in its lee, prevents it from entering the navigation channel, and affords shelter for a floating dredge plant to pump out the impounded material across the channel to the downdrift beach.

(f) While breakwaters have been built of everything from sunken ships to large fabric bags filled with concrete, the primary material in the United States is a rubble-mound section with armor stone encasing underlayers and core material. Some European and Japanese breakwaters use a submerged mound foundation in deeper water topped with concrete superstructure, thereby reducing the width and overall quantity of fill material necessary for harbor protection.

c. Physical Considerations.

(1) Jetty or breakwater construction is invariably accompanied by localized changes in the hydrodynamic regime, creating new hydraulic and wave energy conditions. The initial disruption of the established dynamic equilibrium will be followed by a trend toward a new set of equilibrium conditions. Rapid dynamic alterations in the physical environment may occur in the short-term time sale as the shore processes respond to the influence of the new structures. Slower, more gradual, and perhaps more subtle changes may occur over the long term.

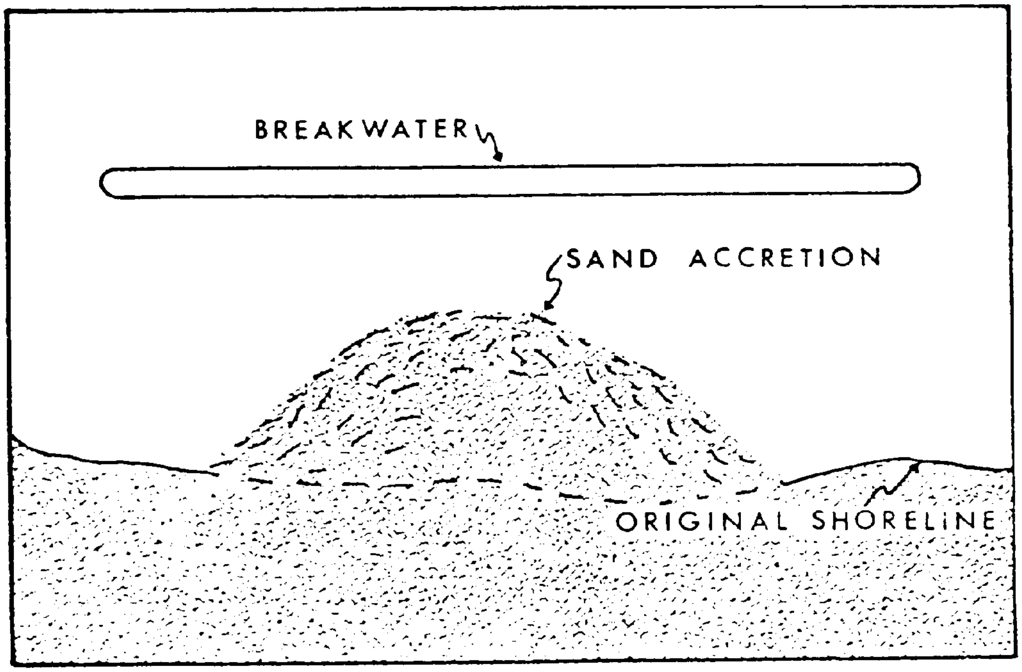
(2) In light of the dynamic character of shore processes, assessment of the effects of coastal engineering projects on shorelines is a difficult task.

Shoreline changes induced by the presence of a structure may be masked by wide annual or seasonal fluctuations in natural physical processes. Several events, however, can be predicted in response to jetty or breakwater construction with reasonable certainty. For example, by creating wave-sheltered areas, construction will result in changes in the erosional and depositional patterns along adjacent beaches, both inshore and offshore. A jetty or shore-connected breakwater will form a barrier to longshore transport if the structure extends seaward beyond the surf zone. In the particular case of a jettied inlet, sediment will tend to accrete on the seaward side (opposite the entrance channel) of the updrift jetty. Spatial extent of the ensuing shoreline alteration will depend on the structure’s effectiveness as a sediment trap, which is a function of its orientation to the inlet and to the prevailing wave climate. Updrift accretion of sediments will continue until the sink area is filled to capacity and the readjusted shoreline deflects longshore transport past the seaward terminus of the jetty. The volume of sediment trapped by the structure represents material removed from the natural sand bypassing process. Consequently, the downdrift shoreline will be deprived of this sediment and become subject to erosion. In circumstances where waves are refracted around the structures in a proper manner, accretion can occur along the seaward side of a downdrift jetty. Reflection of waves from a jetty may also cause erosion of adjacent shorelines. However, erosion further down the shoreline is not precluded. Planning for adequate sand bypassing is, in view of the above considerations, a critical requirement of coastal structure construction.

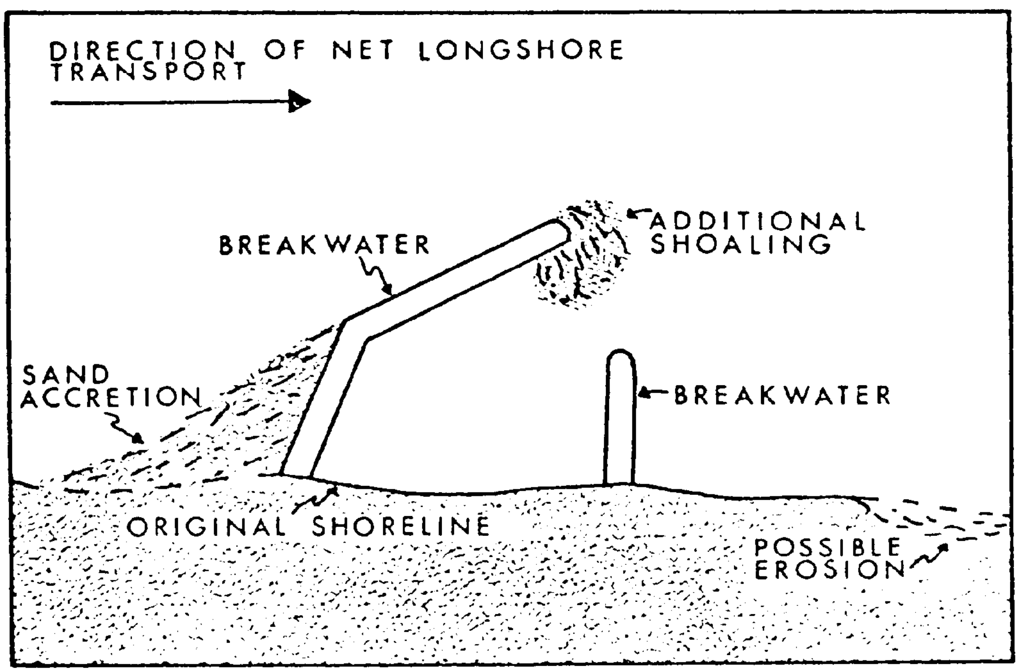
(3) Erosion at jetty project sites will not necessarily be limited to downdrift shorelines. Jetties redirect the course of the main ebb channel and confine ebb flows through an inlet such that current velocities are increased. An enhancement of ebb jet flows will result in displacement of sediments from between the jetties in a seaward direction to deeper waters. Also, sediments comprising the ebb-tidal delta will be shifted and redistributed, possibly leading to additional disruption of the natural sand bypassing process and exacerbation of downdrift erosion.

(4) Shore-connected breakwaters affect shorelines in much the same manner as jetties. Accretion occurs along the updrift junction of shore and structure and continues until longshore transport is deflected around the free end to the breakwater. Calm waters in the protected lee of the breakwater provide a depositional area which can rapidly shoal (Figure 5-7). Sediments trapped in the accretional area and terminal shoal are prevented from reaching downdrift beaches, and substantial erosion may result.

(5) Offshore breakwaters create depositional areas in their "shadows" by reflecting or dissipating wave energy. Reduction of wave energy impacting a shoreline in the lee of the structure retards the longshore transport of sediments out of the area and accretion ensues. The extent of accretion will depend on the existing balance of shore processes at a given project site. Generally, a cuspate spit will develop between the shoreline and the structure as the system approaches a new equilibrium (Figure 5-7). However, if the breakwater is situated in the littoral zone such that it forms a very



DETACHED EMERGENT BREAKWATER



ATTACHED BREAKWATER

Figure 5-7. Erosion and accretion patterns in association with detached and attached breakwaters effective sediment trap, a complete connection will eventually form, merging the shoreline with the structure. A tombolo associated with an offshore breakwater may present a severe obstruction to littoral transport and trap a significant volume of sediment. Extensive downdrift erosion may result.

(6) By modifying the cross-sectional area of an inlet, jetty construction potentially can alter the tidal prism, or volume of water entering or exiting through an inlet in one tidal cycle (usually excluding freshwater inflow). Enlarging an inlet can increase the tidal range within a harbor. In connection with channel deepening projects, seawater may intrude further into estuaries, embayments, or rivers than occurred under preproject conditions. Circulation patterns within a basin may be altered as a consequence of modified floodwater current conditions. Thus, the area physically affected by jetty construction might be extended appreciable distances from the actual project site. Conceivably, in systems with multiple connections to the sea, jetty construction at one inlet might elicit a response at a second inlet.

d. Water Quality Considerations.

(1) Suspended sediments. During the construction of a breakwater or jetty, suspended sediment concentration may be elevated in the water immediately adjacent to the operations. In many instances, however, construction will be occurring in naturally turbid estuarine or coastal waters. Plants and animals residing in these environments are generally adapted to, and are very tolerant of, high suspended sediment concentrations. The current state of knowledge concerning suspended sediment effects indicates that anticipated levels (generally less than 1,000 milligrams/l) generated by breakwater or jetty construction do not pose a significant risk to most biological resources. Limited spatial extent and temporal duration of turbidity fields associated with these construction activities reinforce this assessment. However, when construction is to occur in a clear water environment, such as in the vicinity of coral reefs or seagrass beds, precautions should be taken to minimize the amounts of resuspended sediments. Organisms in these environments are generally less tolerant to increased siltation rates, reduced levels of available light, and other effects of elevated suspended sediment concentrations. Potential negative impacts can be somewhat alleviated by erection of a floating silt curtain around the point of impact when current and wave conditions allow. However, the high-energy conditions usually associated with jetty and breakwater construction will generally preclude the use of silt curtains.

(2) Other water quality impacts. Indirect impacts on water quality may result from changes in the hydrodynamic regime. The most notable impact of this type is associated with breakwaters which form a semienclosed basin used for small boat harbors or marinas. If the flushing rate of the basin is too slow to provide adequate removal of the contaminants, toxic concentrations may result. Also, fluctuations in parameters such as salinity, temperature, dissolved oxygen, and dissolved organics may be induced by construction or due to altered circulation patterns. Anticipated changes in these parameters should

be evaluated with reference to the known ecological requirements of important biological resources in the project area.

e. Biological Considerations.

(1) Habitat losses. Measurable amounts of bottom habitat are physically eradicated in the path of fixed jetty or breakwater construction. If a rubble-mound structure with a toe-to-toe width of 50 meters (164 feet) is used as an example, one linear kilometer (0.6 mile) of structure removes approximately 5 hectares (12.5 acres) of preexisting bottom habitat. Once a structure is in place, water currents and turbulence along its base can produce a scouring action, which continually shifts the bed material. Scour holes may develop, particularly at the ends of structures. Scouring action may effectively prevent the colonization and utilization of that habitat area by sediment-dwelling organisms. Effects of scouring are largely confined to entrance channels and narrow strips of bottom habitat immediately adjacent to structures. Usually, only a portion of the perimeter of a structure will be subject to scouring, such as along the channel side of an inlet's downdrift jetty. Generally, the amount of soft bottom habitat lost at a given project site will be insignificant in comparison with the total amount of that habitat available. Exceptions to this statement may exist, such as where breakwater construction and dredging of the total enclosed harbor area will displace large acreages of intertidal mudflats. Often such habitats serve critical functions as nursery areas for estuarine-dependent juvenile stages of fishes and shellfishes, and the availability of those habitats will be a determining factor in the population dynamics of these species. Additional habitat losses may occur when significant erosion of downdrift shorelines impact spawning or nesting habitats of fishes, shorebirds, or other organisms and when the tidal range of a harbor or bay is modified by entrance channel modification which in turn affects coastal habitat. Short-term impacts of this type may also occur during construction activities as heavy equipment gains access to the project site.

(2) Habitat gains.

(a) Losses of benthic (bottom) habitat and associated benthos (bottom-dwelling organisms) due to physical eradication or scouring will gradually be offset by the gain of new habitat represented by the structures themselves and the biological community, which becomes established thereon. The trade-off made in replacing "soft" (mud or sand) bottom habitat with "hard" (rock, at least in rubble-mound structures) bottom habitat has generally been viewed as a beneficial impact associated with jetty and breakwater projects. Submerged portions of jetties and breakwaters, including intertidal segments of coastal structures, function as artificial reef habitats and are rapidly colonized by opportunistic aquatic organisms. Over the course of time, structures in marine, estuarine, and most freshwater environments develop diverse, productive, reeflike communities. Detailed descriptions of the biota colonizing rubble-mound structures have been made for project sites on the Pacific (Johnson and De Wit 1978), Atlantic (Van Dolah et al. 1984), Gulf of Mexico (Hastings 1979, Whitten et al. 1950), and Great Lakes (Manny et al. 1985) coastlines.

In some geographical areas jetties and breakwaters provide the only nearshore source of hard-bottom habitat. Also, exposed portions of detached structures may be colonized by seabirds.

(b) The ultimate character of the biological community found on a jetty or breakwater will depend on the quality of habitat afforded by the construction materials used. Physical complexity (i.e., rough surfaces with many interstitial spaces and a high surface area to volume ratio) is a desirable feature of rubble-mound structures in comparison with the relatively smooth, flat surface of steel sheet pile or caisson structures. The sloping sides of rubble-mound structures also maximize the surface area of habitat created. Structures with sloping sides also provide more habitat within a given depth interval than structures with vertical elements. Where depths are sufficient, the biota on jetties and breakwaters exhibit vertical zonation, with different assemblages of organisms having discrete depth distributions. In general then, structures built in deep waters will support a more diverse flora and fauna than those in shallow waters. This pattern will be influenced by such factors as latitude and tidal range.

(c) Just as changes in shoreline configuration and beach profile can entail habitat loss, so can they represent habitat gain. Accretional areas, such as cuspate spits, tombolos, and exposed bars, and the above water portion of structures may be used, for example, by wading and shorebirds for nesting, feeding, and resting sites.

(3) Migration of fishes and shellfishes.

(a) Eggs and larvae. Early life history stages, namely eggs and larvae, of many important commercial and sport fishes and shellfishes are almost entirely dependent on water currents for transportation between offshore spawning grounds and estuarine nursery areas, A concern which has sometimes been voiced by resource agencies in relation to jetty projects is that altered patterns of water flow through coastal inlets may adversely affect the transport of eggs and larvae. Jetties displace the entrance to an inlet to deeper waters, perhaps forming a barrier to successful entry by eggs and larvae. Those eggs and larvae carried by longshore currents might be especially susceptible to entrapment or delay in eddies and slack areas formed adjacent to updrift jetties at various times in the tidal cycle. Even short delays in the passage of eggs and larvae to estuaries may be significant because of critical relationships between the developmental stage when feeding begins and the availability of their food items. All aspects of this potential impact remain hypothetical. Mechanisms of egg and larval transport across shelf waters and through inlets, as well as their retention within estuaries, have not been explained to date. No conclusive evidence exists to support either the presence or absence of impacts on egg and larval transport. This fact is true even where jettied inlets have been present for relatively long spans of time, such as along the Texas coast. The complexity of the physical and biological processes involved would render field assessments of this impact a long-term and expensive undertaking. Even if some degree of impacts in terms of numbers of eggs and larvae successfully transiting an inlet could be demonstrated to occur, the relative significance of the impact would be difficult to estimate. The results of hydraulic modeling studies related to this question have been inconclusive (US Army Corps of Engineers 1980). Future modeling studies combined with field verification studies may provide insight into resolving the validity of this concern.

(b) Juveniles and adults. Similar concern has been voiced regarding potential impacts of jetties and breakwaters on migrations of juvenile and adult fishes and shellfishes. These stages generally have well-developed swimming capabilities, such that physical barriers imposed by these structures are less of a concern than are behavioral barriers. This issue has been raised primarily in association with projects in the Pacific Northwest, and with anadromous fishes in particular. Anadromous fishes, including many salmonids, spend much of their adult life in the ocean, then return to fresh water to spawn. Early life history stages spend various lengths of time in fresh water before moving downstream to estuaries where the transition to the juvenile stage is completed. Specific concerns are that juveniles or adults will not circumvent structures that extend for considerable distances offshore. Juveniles in particular are known to migrate in narrow corridors of shallow water along coastlines and may be reluctant, due to depth preferences, to move into deeper waters. The State of Washington has developed criteria, whereby continuous structures that extend beyond mean low water (MLW) are prohibited. Designs of coastal structures there are required to incorporate breaches or gaps to accommodate fish passage.

(4) Increase predation pressure. Coastal rubble-mound structures provide substrate for the establishment of artificial reef communities. As such, jetties and breakwaters serve as a focal point for congregations of fishes and shellfishes which feed on sources of food or find shelter there. Many large predator species are among those attracted to the structures in numbers, as evidenced by the popularity of jetties and breakwaters as sites of intense sport fishing. Thus, there is concern, again largely associated with projects in the Pacific Northwest, that high densities of predators in the vicinity of jetties and breakwaters pose a threat to egg, larval, and juvenile stages of important species. For example, fry and smolt stages of several species of salmon are known to congregate in small boat harbors prior to moving to the sea. The concern raised is that these young fishes are exposed to numerous predators during their residence near the structures. As is the case with the concern for impacts on migration patterns, this concern remains a hypothetical one. Conclusive evidence demonstrating the presence or absence of a significant impact is unavailable and will be exceedingly difficult to obtain.

f. Recreational Considerations. The primary impact of breakwaters on recreational use of the beach depends largely upon the type of use the beach receives. Breakwaters reduce nearshore wave climate, which is generally beneficial to swimming, scuba diving, and wading activities. They may also cause a widening of the beach, which can result in increased recreational area. Figure 5-8 illustrates a wide beach accreted adjacent to a breakwater. Ownership of accreted beaches is determined by state law unless agreements are otherwise entered into prior to construction of the project. Diminished waves

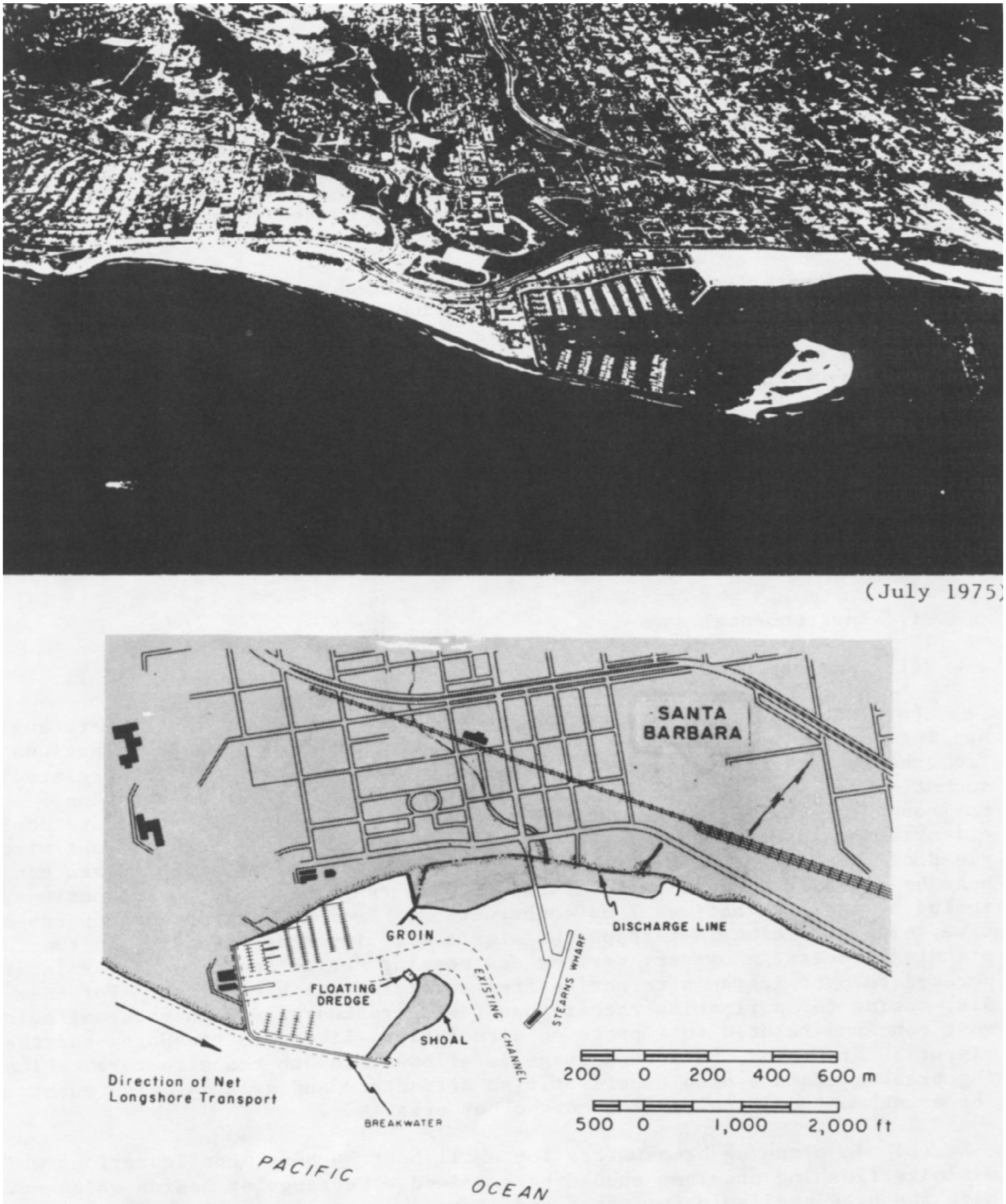


Figure 5-8. Breakwater protecting recreational harbor, Santa Barbara, California

will, however, reduce opportunities for body or board surfing activities. Special interest groups such as surfers may therefore vocally oppose detached breakwater projects. When breakwaters are used to shelter harbors or jetties are used to stabilize inlets, they benefit recreational boating (Figure 5-8). They may also act as fish attractors and may be used as fishing platforms. However, for safety reasons access to jetties for fishing is often prohibited. In other projects, walkways and handrails are provided to enhance fishing opportunities on these structures.

g. Aesthetic Considerations. Detached breakwaters are usually far enough from the beach that they do not produce visual impacts (Cole 1974). Jetties will visually alter shore views. The texture and shape of the jetty in relation to the overall shoreline scene should be considered in jetty design (Snow 1973).

h. Cultural Considerations. By reducing shore erosion or stabilizing inlet location, breakwaters and jetties will, generally, preserve onsite cultural resources. However, this local protection can potentially increase the rate of erosion on adjacent shorelines. For this reason, cultural resources in the adjacent impact area must also be evaluated. Lighthouses and other historically important structures are often found in close proximity to inlets.

i. Environmental Summary.

(1) Environmental design.

(a) Every jetty or breakwater project scenario should incorporate engineering design, economic cost-benefit, and environmental impact evaluations from the inception of planning stages. All three elements are interrelated to such a degree that efficient project planning demands their integration. Environmental considerations should not be an after thought. Structure design criteria should seek to minimize negative environmental impacts and optimize yield of suitable habitat for biological resources. Minimizing impacts can best be achieved by critical comparisons of a range of project alternatives, including the alternative of no construction. From an environmental perspective, site selection is perhaps the single most important decision in the planning process. However, various engineering design features can be incorporated to optimize an alternative from an ecological viewpoint. For example, opting for a floating rather than fixed breakwater design might alleviate most concerns related to impacts on circulation, littoral transport, and the migration of fishes, because passage is allowed beneath the structure. Floating breakwaters are also excellent fish attractors and still provide substrate for attachment and shelter for many other organisms.

(b) In planning breakwaters for small boat harbors, configurations which minimize flushing problems should be examined. Rectangular basins which maximize the area available for docks and piers characteristically have poor water circulation, particularly in the angular corner areas. Designs with rounded corners and entrance channels located so that flood tidal jets provide adequate mixing throughout the basin are desirable. Selection of a less steep rubble-mound sideslope angle will maximize the availability of intertidal and subtidal habitat surface areas. The size class of stone used in armor layers of rubble-mound structures is another engineering design feature that has habitat value consequences. Selection of large-size material results in a heterogeneous array of interstitial spaces on the finished structure. Heterogeneity rather than uniformity enhances the quality of the structure in terms of refuge and shelter sites for diverse assemblages of fishes and shellfishes.

(2) Environmental assessment.

(a) Short-term impacts. Actual construction activities for jetties and breakwaters entail a number of potential impacts of durations generally less than several days or weeks. These impacts will vary in type and frequency from project to project. For example, temporary or permanent access roads may have to be built to allow transportation of heavy equipment and construction materials to the site. Grading, excavating, backfilling, and dredging operations will generate short-term episodes of noise and air pollution and may locally disturb wildlife such as nesting or feeding shorebirds. Project activities should be scheduled to minimize disturbances to waterfowl, spawning fishes and shellfishes, nesting sea turtles, and other biological resources at the project site. Precautions should also be taken to reduce the possibility of accidental spills or leakages of chemicals, fuels, or toxic substances during construction activities. Effort should be expended to minimize the production and release of high concentrations of suspended sediments, especially where and when sensitive biological resources such as corals or seagrasses could be exposed to turbidity plumes and increased siltation rates. Dredging of channels in conjunction with jetty or breakwater projects presents a need for additional consideration of short-term impacts in relation to suspended sediments.

(b) Long-term impacts. Long-term impacts of jetty or breakwater construction are less definitive or predictable. Ultimate nearfield effects on littoral sediment transport can be expected to become evident within several seasonal cycles. These effects will vary according to a given project's environmental setting and specific engineering design. For example, periodic maintenance dredging will be required for catch basins adjacent to weir jetties. Consequences of constructing coastal structures on farfield shore processes are presently understood only qualitatively.

5-3. <u>Groins</u>.

a. General.

(1) Groins are barrier-type structures that extend from the backshore into the littoral zone. Although single groins are constructed on occasion, groins are generally constructed in series, referred to as a groin field or system, along the entire length of beach to be protected.

(2) Groins have been constructed in various configurations which are classified as high or low, long or short, permeable or impermeable, and fixed or adjustable. A high groin, extending through the surf zone for ordinary or moderate storm waves, initially entraps nearly all of the longshore moving sand within that intercepted area, until the accumulated sand fills the entrapment area and the sand passes around the seaward end of the groin to the downdrift beach. Low groins (top profile no higher than that of desired beach dimensions or natural beach elevation) trap sand like high groins. However, some of the sand also passes over the top of the structures. Permeable groins permit some of the wave energy and movement of sand through the structure.

(3) A number of factors are taken into consideration in the design of groins. As with other coastal structures, the prevailing wave climate at a project site is of paramount importance. Wave energies and the angle of wave approach onto a beach are critical factors in predicting the response of a shoreline to groin construction. The direction and rate of littoral drift will also determine design specifications. Additional factors include the existing pattern of water currents and the spatial distribution of accretional and depositional areas. These factors are essentially identical to those considered in the previous section on jetties and breakwaters. Indeed, the major differences between groins and these structures are in terms of function rather than form. In general, groins are smaller, less massive structures than jetties or breakwaters. An example of rubble-mound groin design is depicted in Figure 5-9. The length or seaward extent of a groin will largely determine the initial effectiveness of the structure as a barrier to littoral transport, so that the design length will vary from project to project. In most cases, a groin will be built out to the distance at which incoming waves exert their maximum force on bottom sediments. The length of a groin will determine the ultimate rate of sediment passage around the end of the structures (end passing), whereas the design height of the groin will largely determine the rate of sediment movement over the structure (overpassing). Overpassing can be augmented by incorporation of one or more weir sections into the groin or groin field design. The shoreward terminus of a groin is generally set sufficiently far inshore that abnormally high tides will not flank the structure, thereby preventing possible scouring, undercutting, and failure.

(4) As in the case of jetties and breakwaters, a wide variety of materials are used in the construction of groins. Impermeable groins can be constructed of stone (rubble-mound), sheet piles (concrete, timber, or steel), or asphalt. Often these materials are used in combination; for example, concrete may be set as a grout or cap in rubble-mound groins. In addition to the above materials, permeable groins can be made of sand bags, large stones, and earth, or by slots created in sheet-pile structures, although these are not commonly employed. Selection of construction materials depends on foundation characteristics of the seabed as well as cost and availability factors.

b. Role in Shore Protection. The basic purpose of groins is to modify the longshore movement of sand and to either accumulate sand on the shore or retard sand losses. Trapping of sand by a groin is done at the expense of the adjacent downdrift shore unless the groin or groin system is artificially

Westhampton Beach, New York (1972)

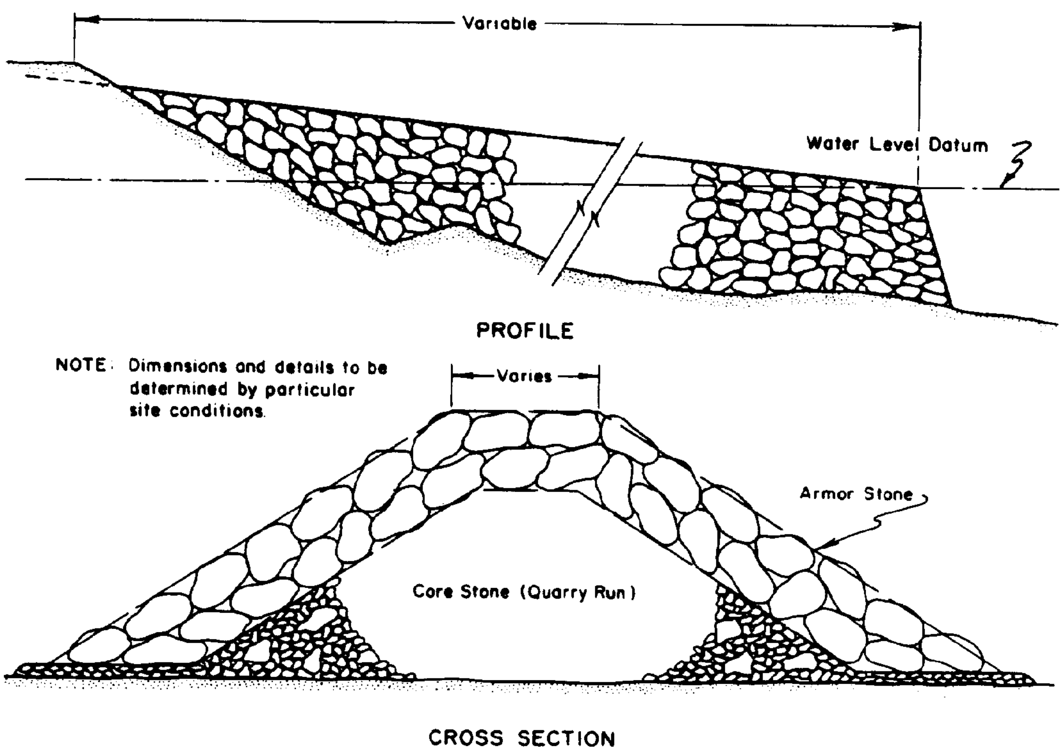


Figure 5-9. Rubble-mound groin

filled with sand to its entrapment capacity from other sources. To reduce the potential for damage to property downdrift of a groin, some limitation must be imposed on the amount of sand permitted to be impounded on the updrift side. It is desirable, and frequently necessary, to place sand artificially to fill the area between the groins, thereby ensuring an uninterrupted passage of the sand to the downdrift beaches. When fill is used, the groin functions to anchor the fill material. In either instance, groins provide shore protection by modifying longshore sand transport.

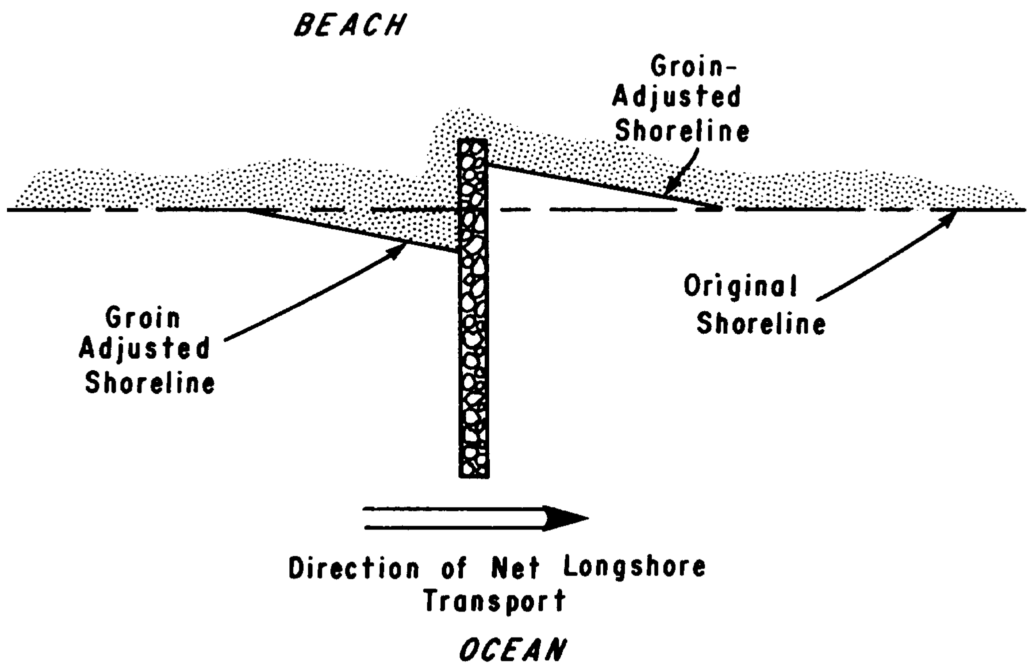
c. Physical Considerations.

(1) The effects of groins on shore processes are very similar to those discussed in reference to jetties and breakwaters. Groin construction will initially disturb the balance or equilibrium between physical processes at a given project site. With the passage of time, the system will tend to develop some new set of equilibrium conditions. The reader is referred to the discussion of physical impacts in the preceding section on jetties and breakwaters.

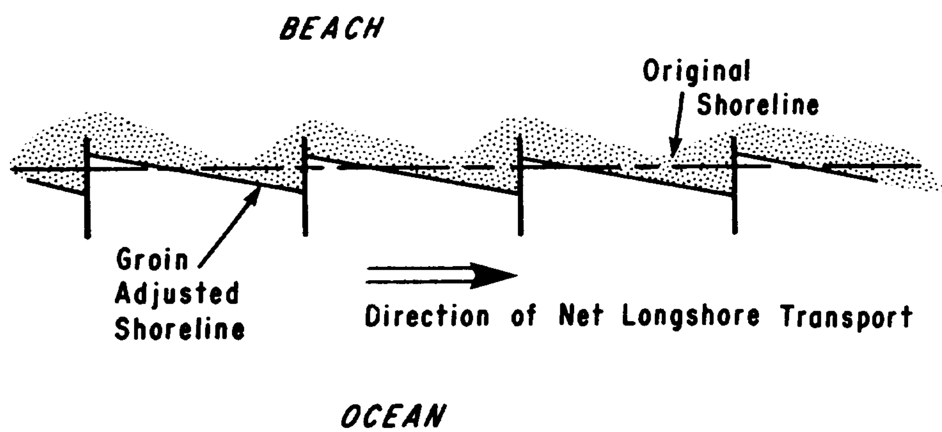
(2) By creating a barrier to littoral transport, groins cause changes in both shorelines and beach profiles. Entrapment of littoral drift results in the gradual buildup of a fillet on the updrift side of a groin. The fillet will grow until the volume of the available sediment sink reaches capacity and the rate of littoral drift is accommodated by endpassing or overpassing of the structure. Accretion of the updrift beach also shifts the location of the breaker zone offshore. Downdrift shorelines, however, will be deprived of that volume of sand accreted updrift of the groin and become susceptible to erosion. The overall displacement of both updrift and downdrift shorelines will reflect the groin's relative effectiveness as an obstruction to littoral transport (Figure 5-10). In turn, effectiveness as a transport barrier will largely be determined by the orientation of the groin to the direction of approaching waves. Adjustment of the shorelines within the influence of a groin or groin field will tend toward achieving normality, i.e., shorelines perpendicular to the direction of wave approach. Net littoral longshore transport is reduced to zero when waves move onto shore in a normal or perpendicular manner, thus expending their energy equally in both lateral directions.

(3) Changes in beach profiles in response to groin construction can be substantial. Growth of the updrift fillet alters the locations and slopes of the foreshore and nearshore zones. The alteration may also cause selective settlement of sediments of different size categories along the beach profile and result in graded rather than uniform substrate conditions.

(4) Groins may interfere with the onshore-offshore transport process by displacing the position of longshore currents and rip currents. Rip currents within groin compartments (the area between two consecutive groins in a groin field) may displace sediments from the shallow beach areas, carry them by jetting action, and deposit them in deeper offshore areas, thus preventing them from being carried to downdrift sections of the beach. Rip currents can be generated as the longshore movement



a. Single groin



b. Multiple groins

Figure 5-10. General shoreline changes associated with single or multiple groins of water is deflected seaward by the presence of a groin.

d. Water Quality Considerations.

(1) Groin construction operations may induce short-term episodes of elevated suspended sediment concentrations in the water column. This impact will usually be limited to the water immediately adjacent to the structure. Historically, concerns have been raised in connection with potential detrimental impacts of high suspended sediment loads on biological resources. However, the present state of knowledge on this topic allows an assessment that concentrations of suspended sediments found at groin construction projects pose minimal risk to lost flora and fauna likely to occur at these sites. Most estuarine and coastal marine organisms are highly tolerant to elevated suspended sediment concentrations for moderate to extended periods of time. As was stated in the discussion relevant to jetties and breakwaters, however, precautions such as the installation of silt curtains should be considered when feasible, where sensitive resources such as coral reefs and seagrass beds are located in the vicinity of a project.

(2) Because groins change local patterns of water circulation, sane changes in water quality parameters may also be anticipated. Slight fluctuations in temperature, dissolved oxygen, and dissolved organics may occur in the sheltered waters in the lee of groins. These impacts should be insignificant for most groin project scenarios.

e. Biological Considerations.

(1) Habitat alterations, both losses and gains, associated with groin construction projects are analogous to those discussed for jetty and breakwater projects. Because groins are generally smaller structures by comparison, these habitat changes are usually on a smaller scale. Construction operations will physically displace existing bottom habitat covered by the placement of structural materials, particularly in the case of rubble-mound groins. This habitat loss will be supplemented by scouring effects of water movement along the base of the structures. The amounts of bottom habitat involved will be dependent upon the number, location, and size of groins in relation to the total available habitat. Exceptional cases, such as tidal flats, do exist and should be examined on a project by project basis. Initial bottom habitat losses are later offset at least in part by the habitat represented by the structures themselves. Often the local diversity of bottom habitats, including the presence of scour holes, will be enhanced by groin construction. Where scouring effects would represent unacceptable habitat loss, they can be minimized by proper design of the groin, for example, by inclusion of a weir section.

(2) Habitat gains are evidenced by the biota which becomes established upon groin structures, although due to the shallow nature of groins, these biological communities are somewhat less diverse than those on larger jetties and breakwaters built of similar materials. Nevertheless, groins provide

substrate which serves as artificial reef habitat in the nearshore zone. Rubble--mound groins especially afford a physically complex habitat in support of productive invertebrate and fish assemblages.

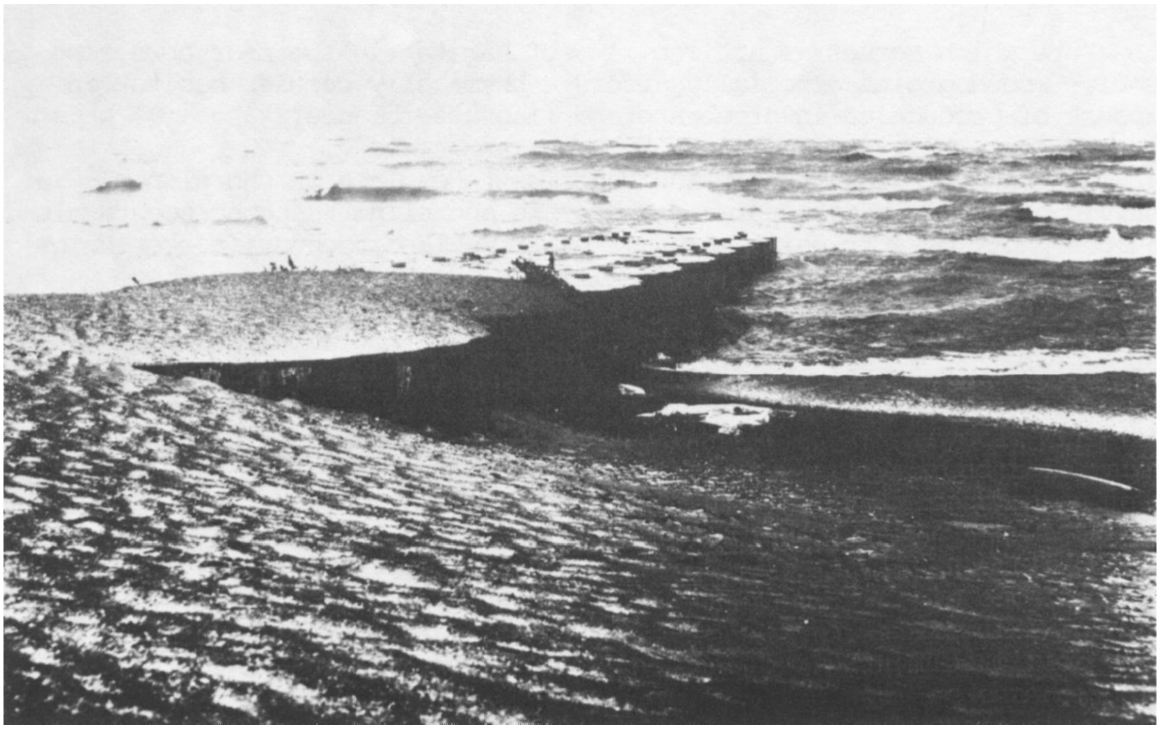
(3) Habitat losses and gains can also take place on shorelines influenced by groin structures. Where the shoreline response occurs along the periphery of a fringing marsh or other wetland, downdrift erosion or updrift accretion can result in significant adverse impacts. These impacts must be weighed against the eventual habitat losses incurred if stabilization by groins or other alternatives is not accomplished. Groin associated accretional areas may provide substrate for the establishment of beach vegetation. Shoreline responses to groins may also represent loss or gain of wildlife or fishery habitat in the form of nesting, spawning, nursery, resting, feeding, or shelter areas.

(4) Small groins have not been documented or implicated to have effects on the movements or migration patterns of fishes and shellfishes. Groins are very effective fish attractors and provide excellent sport fishing sites. Predation effects, as discussed under the biological impacts of jetties and breakwaters, have not been a significant topic of concern in relation to groin projects. These structures, particularly those of rubble-mound construction, may provide beneficial protective cover, as well as feeding and resting areas for both juvenile and adult fishes and shellfishes during coastal migrations.

f. Recreational Considerations. By increasing beach width, groins increase beach area available for use. However, they can be a safety hazard to nearshore recreation activities such as swimming, wind surfing, board surfing, and shallow-water diving. Potentially dangerous conditions can be created where the waves first encounter the structure or where rip currents are created between groins. Scour holes adjacent to groins also constitute safety hazards to nonswimmers. Also, some groin structures may impede lateral movement of beach users.

g. Aesthetic Considerations. One common feature of natural beaches is the presence of long, straight stretches of sand. Groin fields usually alter beach topography into a series of abrupt indentations (Figure 5-10). In addition, the materials used to construct groins and their linear configuration substantially alter the scenic character of the beach (Figure 5-11).

h. Cultural Considerations. Groins can protect onsite cultural resources by reducing shore erosion. However, the downdrift erosion usually associated with groins can potentially threaten cultural resources in adjacent areas. For this reason, cultural resource losses in the adjacent impact areas must also be considered. Cultural resource surveys should be conducted prior to construction. Placement of groins should accommodate cultural resource protection in so far as practical, while accomplishing the primary purpose of the project.



Presque Isle, Pennsylvania (Oct. 1965)

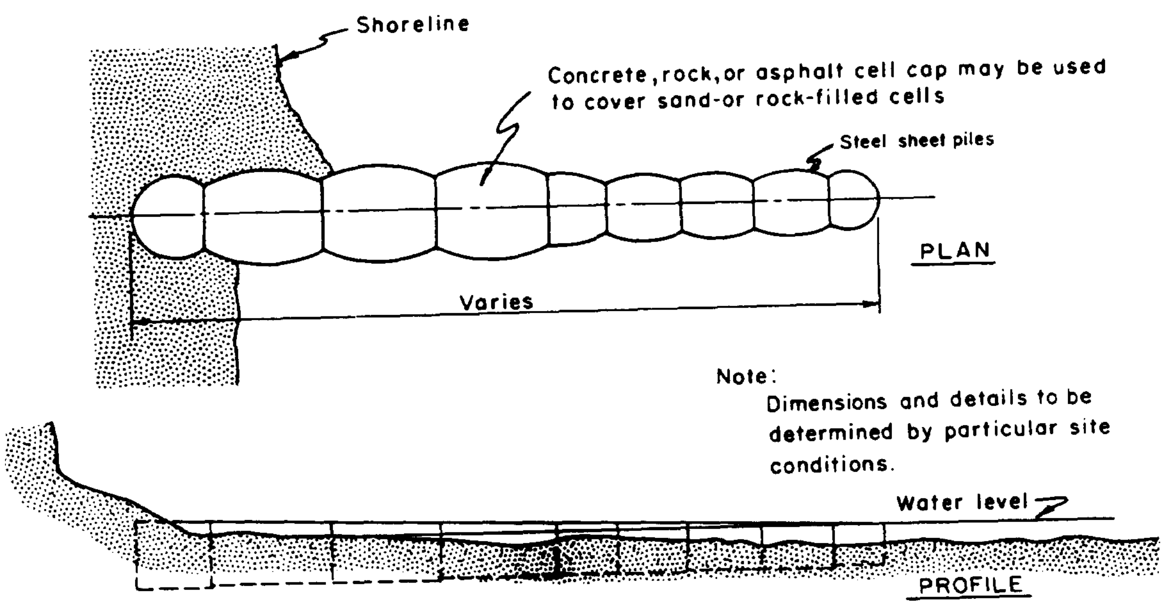


Figure 5-11. Irregular beach formed by cellular steel sheet-pile groin

i. Environmental Summary.

(1) Environmental design. Downdrift erosion will often be an important environmental consideration. Downdrift erosion can be ameliorated by providing beach fill, reducing groin height (overpassing) and length (endpassing), or incorporating permeability. The selection of construction materials can also be important to the overall impact of the project. Because rubble-mound structures provide a variety of living spaces and a firm surface for attachment, they are often considered beneficial habitats.

(2) Environment assessment.

(a) Short-term impacts. Construction operations are a source of several types of short-term impacts. Transportation of construction materials and operation of heavy equipment at the project site will generate localized incidences of air and noise pollution. Flexibility in the scheduling of these activities should be exercised to minimize disturbance of coastal biological resources, especially during critical spawning and nesting periods. Short-term events of elevated turbidity induced by groin construction or associated beach fill will occur. As discussed under water quality impacts, proper precautions should be taken to reduce suspended sediment effects if sensitive organisms or habitats are present.

(b) Long-term impacts. Long-term impacts of groin construction, as for jetty and breakwater construction, are difficult to assess. Downdrift erosional problems are by far the major topic of concern, and these will vary in magnitude among different projects. Deprivation of downdrift shorelines appears to be a cumulative impact in that large groin fields may take extended periods to attain their sediment entrapment capacities. Therefore, the downdrift erosional process, if not mitigated by nourishment or sand bypassing, could be both severe and prolonged. Such erosion may produce recreational impacts (loss of downdrift beach area), cultural resource impacts (erosion of cultural sites), and biological impacts (erosion of biologically productive habitats).

CHAPTER 6

NONSTRUCTURAL ALTERNATIVES

6-1. Salt Marshes.

a. General. Shore erosion is a common problem in the bays, sounds, and estuaries of the coastal United States. A wide variety of structures have been developed and used to control this erosion. However, due to environmental objections and economic limitations it is often impractical to use even the most innovative of these structures. This fact is particularly true for relatively low wave-energy areas where erosion may be costly but has not yet reached catastrophic proportions. Low-cost, nonstructural techniques are available for controlling erosion in salt and brackish water, low wave-energy areas of contiguous United States using native marsh plants. Vegetation, where feasible, is usually lower in cost than structures and may be more effective.

(1) Coastal marsh vegetation.

(a) A coastal marsh is an herbaceous (plants lacking woody stems) or grassy plant community found on the part of the shoreline which is periodically flooded by salt or brackish water. A number of species in the grass family (Poaceae), sedge family (Cyperacae), and rush family (Juncaceae) commonly form coastal marshes.

(b) Coastal marshes occur naturally in the intertidal zone of moderate- to low-energy shorelines along tidal rivers and in bays and estuaries. These marshes may be narrow fringes along steep shorelines but can extend over wide areas in shallow, gently sloping bays and estuaries. Historically, such lands were extensive and widely distributed along the Atlantic, Florida peninsula, Gulf, and Pacific coasts of the United States before development by man.

(c) There are two major groups of coastal salt marshes in the United States, based on physiographic differences--marshes of the Atlantic, Florida peninsula, and Gulf coasts (the eastern region) and those characteristic of the northern and southern Pacific coasts (the western region). The eastern marshes usually form on a gently sloping coast with a broad continental shelf, under conditions of a sea slowly rising relative to the land. Western marshes are mostly formed in relatively narrow river mouths which drain almost directly onto a steeply sloping continental shelf along a slowly emerging coastline (Cooper 1969). Consequently, the western estuaries and their marshes are more limited in development than those of the east and tend to mature more rapidly. There are two types of coastal salt marshes: the regularly flooded low marsh, which is considered to be the most valuable and usually the most essential to erosion control; and the irregularly flooded high marsh.

(2) Erosion control plantings.

(a) With the use of agricultural techniques, plants can often be established on shorelines where natural processes of invasion have failed to produce plant cover. Marshes established in this manner may greatly improve the shore's stability and resistance to erosion. This erosion control alternative has been used successfully for many years in the United States. For example, in the winter of 1928, a property owner on the eastern shore of Chesapeake Bay planted smooth cordgrass (Spartina alterniflora) along more than 1 kilometer (0.5 mile) of shoreline in an attempt to reduce erosion. This shoreline has remained stable for more than 50 years and is the oldest reported example of shore stabilization with salt marsh vegetation in the United States (Knutson et al. 1981) as shown in Figure 6-1. Similarly in 1946, a landowner on the Rappahannock River in Virginia graded an eroding shoreline and planted several varieties of salt-tolerant plants. This planting has prevented erosion for 40 years (Phillips and Eastman 1959, Sharp and Vaden 1970, Sharp et al. 1981).

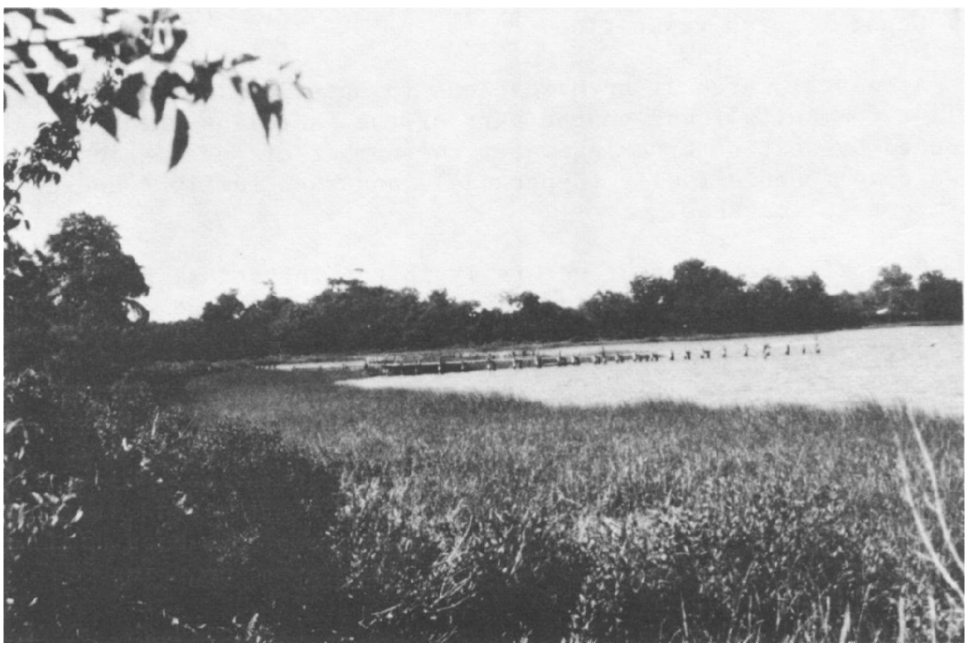


Figure 6-1. Oldest reported salt marsh planting in the United States

(b) Researchers in other coastal regions have found that shoreline stabilization with plants can be successful--Garbisch et al. (1975) in Chesapeake Bay; Webb and Dodd (1978) in Galveston Bay, Texas; Allen et al. (1986) in Mobile Bay, Alabama; Newcombe et al. (1979) in San Francisco Bay, California; and Newling and Landin (1985) at Corps sites in a number of coastal Districts. Based on these studies, design criteria for vegetation stabilization projects were developed (Knutson 1976 and 1977a-b, Knutson and Woodhouse 1983, Allen and Webb 1983, Allen et al. 1984, Webb et al. 1984). The US Army Engineer

Waterways Experiment Station (1978) conducted a nationwide study program on marsh establishment on dredged material in the mid-1970's as part of the Dredged Material Research Program, which resulted in design criteria for marsh development. This program has continued to the present under the Dredging Operations Technical Support Program to include all types of wetland development as well as erosion control in moderate wave energies using vegetation (Landin 1986).

(c) Hall and Ludwig (1975) evaluated the potential use of marsh plants for erosion control in the Great Lakes. They concluded that there were few natural areas suitable for this method of shore protection because there are few sheltered shorelines. Marsh plantings are also subject to winter icing conditions and fluctuating lake levels in this region. Marsh vegetation can be established behind protective structures in the Great Lakes (Landin 1982). However, vegetation can be used to stabilize upland areas (Hunt et al. 1978, Pennington 1986). The roots of terrestrial plants add stability to the soil, retard seepage, and reduce surface runoff (Great Lakes Basin Commission 1978, Gray 1974 and 1975, Dai et al. 1977). Information on surface erosion and various techniques for its control (dewatering, slope grading, and planting ground cover species) are available from EM 1110-2-5026, US Army Engineer Waterways Experiment Station (1986), the US Soil Conservation Service, or from county agriculture extension agents.

(d) In Alaska, a relatively short-growing season, broad tidal ranges, high-energy conditions, and icing prevent the use of salt marsh vegetation for erosion control, and only one site is known to exist. This alternative has not been used in the bays and estuaries of Hawaii.

(3) Planting guidelines.

(a) For erosion control projects, the intertidal zone is the most critical area to be planted and stabilized. If a healthy band of intertidal marsh can be established along a shore, revegetation of the slope behind it will occur through natural processes. Four species of pioneer plants have demonstrated potential in stabilizing the part of the intertidal zone which is in direct contact with waves: smooth cordgrass (*Spartina alterniflora*) along the Gulf and Atlantic coasts, Pacific cordgrass (*Spartina foliosa*) on the Pacific coast from Humboldt Bay south to Mexico, and Lyngbye's sedge (*Carex lyngbyei*) and tufted hairgrass (*Deschampsia caespitosa*) in the Pacific Northwest (Smith 1978). A number of wetland plants colonize the freshwater/intertidal zone (Landin 1978, Lunz et al. 1978).

(b) The width of the substrate at an elevation suitable for plant establishment will determine in part the relative effectiveness of the erosion control planting. A practical minimum planting width for successful erosion control is 6 meters (20 feet) (Knutson et al. 1981). On the Atlantic and Gulf coasts, marsh plants will typically grow in the entire intertidal zone in microtidal areas and to mean tide where tidal ranges are broader. Marsh plants seldom extend below the elevation of mean tide on the southern Pacific coast or below lower high water in the Pacific Northwest. Because of these elevational constraints, the more gradual the shore slope, the broader the potential planting width. On steeply sloping shores, there may be little area suitable for planting. If the potential planting area is not 6 meters (about 20 feet) in width, the shore must be sloped or backfilled to extend it. Backfilling must be done enough in advance of planting to allow for settling and firming of the soil.

(c) Salt marsh plants rely heavily on exposure to direct sunlight and will not grow in shaded areas. Therefore, any overstory of woody vegetation present at a site should be cleared above the planting area and landward to a distance of 3 to 5 meters (10 to 15 feet). However, should the woody overstory be desirable wetland plants such as mangroves, they should not be cleared, but worked around to prevent their loss.

(d) Vegetative transplants are used for erosion control planting instead of seeding which is not likely to be effective on sites subject to erosion. Vegetative transplant types include: sprigs, stems with attached root material; pot-grown seedlings; or plugs, root-soil masses containing several intact plants dug from the wild. Sprigs are the least expensive to obtain and easiest to handle, transport, and plant. They may be obtained from field nurseries, planted at least a year in advance, or collected from young marshes or the edges of expanding established marshes. Pot-grown seedlings are expensive to grow and plant, more awkward to handle and transport, but relatively easy to produce and transplant. They are superior to sprigs for late season planting. Plugs are the most expensive to obtain, difficult to transport, and probably used only when no other sources are available. The Soil Conservation Service may be helpful in locating and obtaining plant materials. A conservationist for the State Soil Conservation Service is located in all the state capitals.

b. Role in Shore Protection.

(1) Marsh plants perform two functions in abating erosion. First, their aerial parts form a flexible mass which dissipates wave energy. As wave energy is diminished, both the offshore transport and the longshore transport of sediment are reduced. Dense stands of marsh vegetation may even create a depositional environment, causing accretion rather than erosion of the shoreface. Second, many marsh plants form dense root-rhizome mats which add stability to the shore sediment. This protective mat is of particular importance during severe winter storms when the aerial stems provide only limited resistance to the impact of waves.

(2) Wave attenuation in marshes has not been studied extensively. Wayne (1975) measured small waves passing through a smooth cordgrass marsh at Adams Beach, Florida, and Webb et al. (1984) measured wave attenuation in a human-made marsh in Mobile Bay, Alabama. Knutson et al. (1982) conducted a series of field experiments measuring wave attenuation in natural salt marshes. Knutson found that a 15-cm (0.5-foot) wave experienced a 72 percent energy loss while traversing 5 m (15 feet) of coastal marsh. As the wave energy impacting the shore is reduced, there is increased potential for sediment

deposition and decreased potential for erosion. Woodhouse et al. (1974) measured sediment deposition resulting from marsh plantings and reported the deposition at 15 to 30 cm (0.5 to 1 foot) of sediment along three planted profiles at Snow's Cut, North Carolina, during a 30-month period.

(3) Studies have shown that plant roots do significantly increase soil stability (Gray 1974), In these studies the shear strength of vegetated soils was as much as two and three times greater than unvegetated soils. In addition, the shear strength of soils was higher when the volume fraction or weight density of the root system was greater.

c. Physical Considerations. The planting of shore vegetation is accomplished with a minimum of equipment and physical disturbance. When erosion control plantings are successful, they create a region of sediment deposition along the shoreline and reduce erosion.

d. Water Quality Considerations.

(1) Salt marshes have substantial absorptive capacities for potential pollutants such as nitrogen, phosphorus, and heavy metals (Williams and Murdock 1969, Woodhouse et al. 1974). Increased growth of salt marsh species in response to nutrients has been noted at several locations. Apparent recovery of applied nitrogen may be as high as 40 to 60 percent in shoot growth alone (Woodhouse et al. 1974 and 1976), a value that compares favorably with upland field crops. The potential for substantial recycling of nutrients between salt marshes and estuaries exists. The absorption, conversion, and recycling capabilities of marsh plants offer potential opportunities for water purification (Woodhill 1977).

(2) There has been concern expressed that intertidal marshes planted on polluted sediments may be a source for release of potentially toxic heavy metals to estuarine systems and the ocean. This matter is a subject of extreme complexity. In general, the release of heavy metals is not a major concern for shore stabilization projects unless sediments with high levels of heavy metals are used to grade the site prior to planting (Gunnison 1978). In this case, the issue of heavy metal release should be resolved on a case-by-case basis. However, it is also advisable to consider this issue when sizable shore stabilization projects are proposed for areas with highly polluted sediments.

e. Biological Considerations.

(1) Marsh ecology.

(a) Salt marshes are valued as sources of primary production (energy), as nursery grounds for sport and commercial fishery species, and as a system for storing and recycling nutrients. Once established, erosion control plantings function as natural salt marshes and gradually develop comparable animal populations (Cammen 1976, Cammen et al. 1976, Newling and Landin 1985).

(b) Only about five percent of the biomass of a given salt marsh is consumed while the plant material is still living. Grasshoppers and plant hoppers graze on the grass and are, in turn, eaten by spiders and birds, Direct consumption of rhizomes and culms of marsh grasses by waterfowl may be significant locally near waterfowl wintering grounds (Lunz et al. 1978). Periwinkles graze on algae growing on the grass. The pathway of energy flow is believed to move through the detrital food chain. Dead grass is broken down by bacteria in the surrounding waters and on the surface of the marsh. This process greatly decreases the total energy content but increases the concentration of protein, thereby increasing the food value. Some detrital particles and microalgae are eaten by a variety of deposit and filter feeders such as fiddler crabs, snails, and mussels; these organisms are, in turn, eaten by predators such as mud crabs, fish, rails, and raccoons. The remaining detritus, augmented by the dead matter from the primary and secondary consumers, is washed from the marsh by tidal action. This exported detritus, with material from submergent aquatic plants and the plankton, feeds the myriad of larvae and juvenile fish and shellfish which use estuaries, bays, and adjoining shallow waters. Marsh grasses may account for most of the primary production of the system in waters where high turbidity reduces light penetration, thereby reducing phytoplankton and submergent aquatic production.

(c) The rigorous environment of the salt marsh controls the number of animals living there. These areas are used by fur-bearing animals, such as the muskrat, nutria, and raccoon, and by birds such as herons, egrets, rails, shorebirds, raptors, waterfowl, and some songbirds. A much larger population of animals lives in or on the mud surface. The more conspicuous inhabitants are fiddler crabs, mussels, clams, and periwinkles. Less obvious but more numerous are annelid and oligochaete worms and insect larvae. In addition, larvae, juveniles, and adults of many shellfish and fish are commonly found in the marsh creeks.

(2) Introducing nuisance species.

(a) Although most coastal marsh species are highly regarded as ecologically beneficial, some are not. Common reed (<u>Phragmites</u> <u>communis</u>) particularly has a reputation in United States coastal areas as a nuisance plant. More literature is available on eradicating common reed than on planting it. It is purported to be of little direct value to wildlife and aggressively crowds out other desirable species. It grows in dense monotypic stands often to a height of about 10 feet (3 meters), which can interrupt views of the water and preclude public access. Because of these considerations common reed is usually not planted for shore stabilization in coastal areas even though it has demonstrated potential for this use (Benner et al. 1982). It is, however, planted at interior United States reservoirs and lakes for erosion control in drawdown zones (Allen and Klimas 1986).

(b) The introduction of nonnative species may also have negative impacts. Most marsh plants are aggressive colonizers. When introduced to regions where they do not occur naturally, they may spread rapidly in the absence of the diseases and predators which act as biological controls in their native environments. Introduced nonnatives may displace species which have ecological or agricultural significance. For this reason, careful consideration must be given before marsh plants are planted outside their natural ranges.

f. Recreation Considerations. Vegetative stabilization discourages certain recreational activities. Vegetation discourages public access for water-oriented activities such as swimming, wading, and sunbathing. In addition, vegetation discourages fishing from the shore; other shore protection structures often provide a platform for fishing use, and wave reflection may increase nearshore depths. Marshes may substantially increase the number of fish and wildlife in an area. As a result, nonconsumptive wildlife oriented recreational activities such as photography, observation, and nature study and consumptive uses such as fishing, bird hunting, and trapping are benefited.

g. Aesthetic Considerations. Marshes are a visual transition between land and water and a natural feature of the landscape adding form, color, and texture to the shore. Unlike other forms of shore protection, once plants are established no visible evidence remains to indicate that there has been a human effort to reduce erosion (Figure 6-2). In addition, the unique assemblage of birds and mammals associated with marshes are interesting subjects of photographic and illustrative art forms. Standard structural methods of shore protection may visually alter the shoreline (Figure 6-2), creating a barrier rather than a transition between land and water.

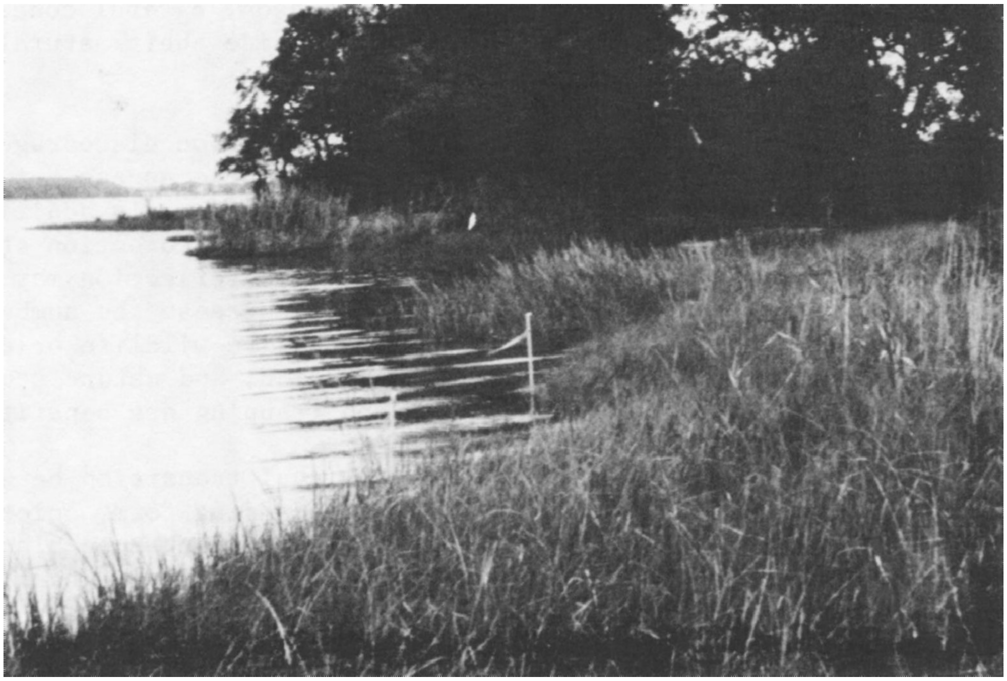
h. Summary.

(1) Establishing marsh plants to abate shore erosion generally will be considered as an environmental improvement. Positive water quality, biological, recreational, and aesthetic benefits are typically associated with vegetative stabilization projects. In addition, vegetative stabilization is the least costly of all erosion control measure. A 33-foot-wide, (10-meter-wide), (landward to seaward) shoreline planting requires an investment of only about $12 per linear yard (linear meter) to hand plant sprigs and about $28 per linear yard to hand plant nursery seedlings (based on labor costs of $15 per hour plus 100 percent overhead). Costs for structural alternatives will range from $50 to $1,000 per linear yard (Figure 6-3).

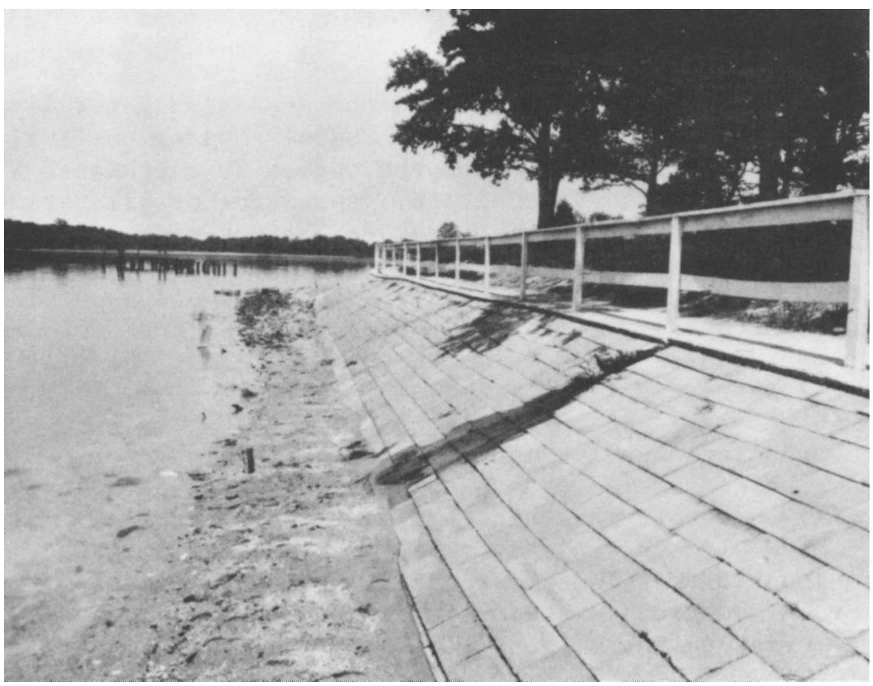
(2) Due to associated environmental benefits and low cost, this alternative should always be considered when shore protection is planned in sheltered bays and estuaries. However, this alternative is effective only within a limited range of wave climates and never on open, exposed coastlines, unless it is done in conjunction with energy-reducing structures. Refer to Knutson et al. (1981) for information on a simple method for evaluating site suitability on a "case-by-case" basis.

6-2. <u>Seagrasses</u>.

a. General. The establishment of seagrass meadows to aid in shore protection has only recently been recognized as a potential nonstructural



a. Vegetative erosion control project (Maryland)



b. Erosion control structure (Maryland)

Figure 6-2. Aesthetic comparison of nonstructural (salt marsh planting) and structural (revetment) measures

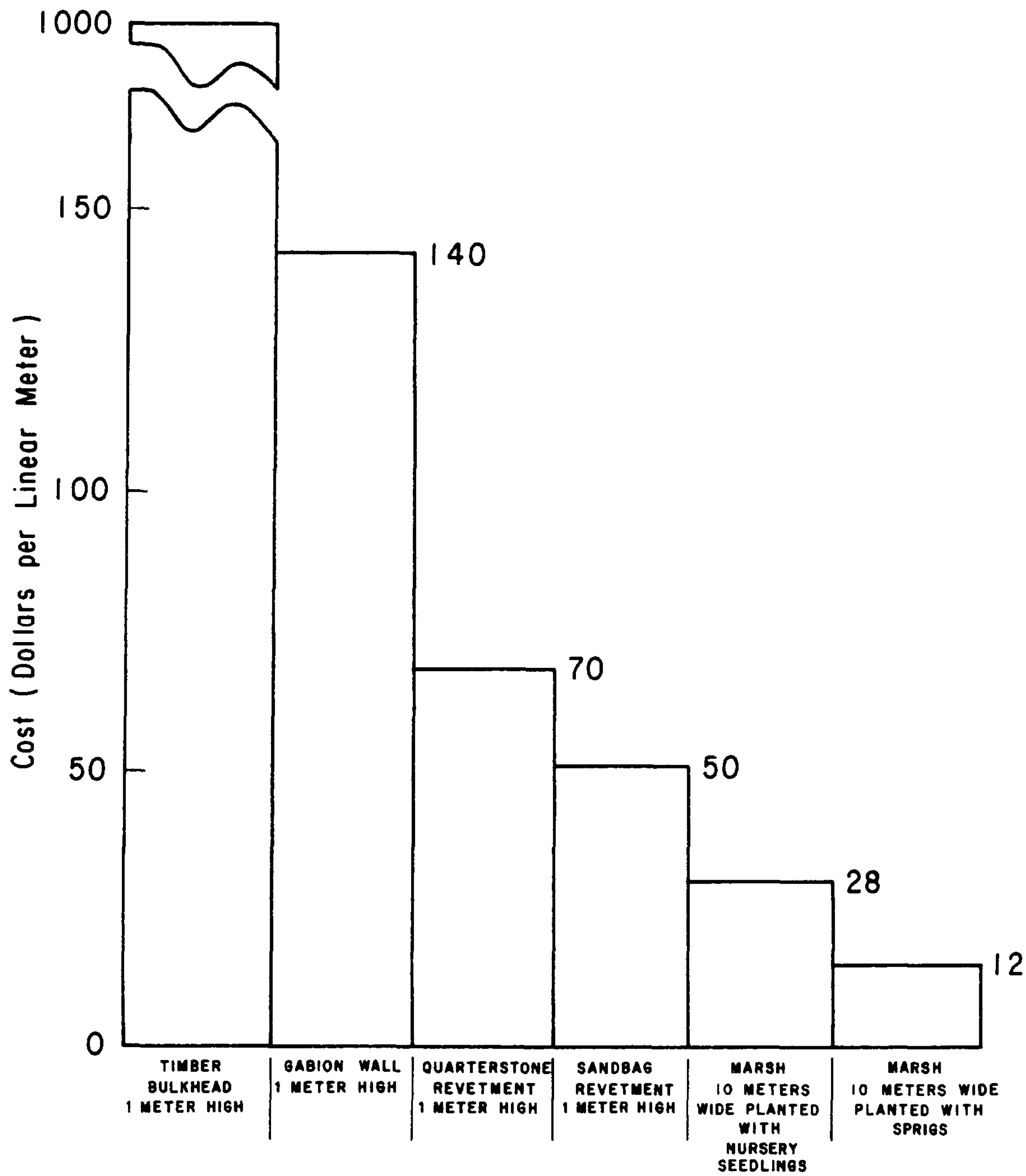


Figure 6-3. Cost comparison of alternative erosion control measures (after Knutson and Woodhouse 1983)

alternative. Restoration of seagrass for sediment stabilization and habitat enhancement is now possible due to recent developments in seagrass planting technology (Phillips 1980, Fonseca et al. 1982 and 1985).

(1) Seagrass meadows. Seagrasses are underwater marine vascular plants occurring primarily in shallow soft-bottom habitats and frequently forming extensive meadows. The plants can generally be characterized as having long, flat, grass-like leaves anchored to the sediment by extensive root and rhizome systems. Five species are common to the marine coasts of the United States--eelgrass (Zostera marina), widgeongrass (Ruppia maritima), shoalgrass (Halodule wrightii) manateegrass (Syringodium filiforme), and turtlegrass (Thalassia testudinum). Seagrasses normally occur in sediments ranging from sand to mud in relatively protected environments. Depth is limited to generally less than 10 feet (3 meters) by light attenuation in the water column. Salinity tolerance ranges from 20 to 40 parts per thousand (ppt), except for widgeongrass (0-15 ppt).

(2) Planting guidelines.

(a) Methods for transplanting seagrasses and guidelines for determining initial densities of transplants have been developed for most of the common species of seagrasses. Recommended procedures involve four relatively simple steps: obtain seagrass shoots from healthy donor beds by digging sods containing shoots, roots, and rhizomes; gently wash sediment out of sod; attach 5-15 shoots to wire anchors (Figure 6-4); and replant shoot bundles at designated site.

(b) Initially a seagrass transplant will consist of an array of shoot bundles arranged in a grid fashion with the individual bundles separated by areas of bare sediment. Coverage of the sediment will occur through lateral growth of the plants as new shoots develop runners in a similar fashion to plant spreading in strawberry patches. Depending on initial spacing, complete coverage may take one or more years.

(c) It should be noted that candidate locations for seagrass transplanting are limited by certain physical factors (i.e., large waves or low salinity). It is recommended that a monitoring survey be conducted before a decision to transplant is made. This survey should include measurements of depth, light penetration, salinity, temperature, erosion and deposition rates, currents, and wave conditions. Surveys should be conducted as frequently as possible and should encompass seasonal variation (Fredette et al. 1986). If the project is large, then it is prudent to establish and monitor pilot plantings before the full-scale project is begun.

b. Physical Considerations. Seagrasses are capable of dampening waves and currents, decreasing sediment transport, and protecting low-energy shorelines for erosion. These plants influence their physical environment by binding sediments with dense mats of roots and rhizomes and absorbing current energy via their flexible strap-shaped leaves (Figure 6-5). For example,

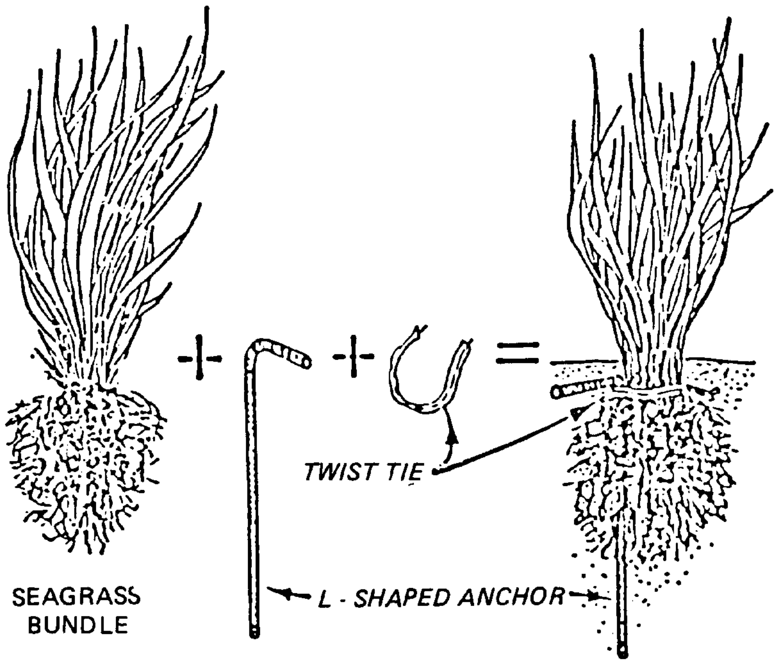


Figure 6-4. Typical seagrass and generalized method of making transplant unit.

Fonseca et al. (1982) report nearly 118 cubic yards (90 cubic meters) per hectare (2.5 acres) of sediment capture in a two-year old eelgrass planting.

c. Biological Considerations. Seagrass meadows serve as nursery sites and primary habitat for numerous fish and invertebrate species of both commercial and ecological importance and as feeding sites for wading birds and over-wintering water fowl. Seagrasses are an important part of the food chain base, influencing estuarine and nearshore production well beyond the physical boundaries of the meadows.

d. Summary. Though seagrass meadows dampen waves as they approach the shore and capture sediments, seagrass plantings alone are seldom considered an adequate shore protection alternative. However, plantings can be a viable alternative when used in conjunction with other shore protection measures. Seagrass planting technology can also be used for the repair or replacement of seagrass meadows that have been damaged or displaced by the construction of other erosion control alternatives.

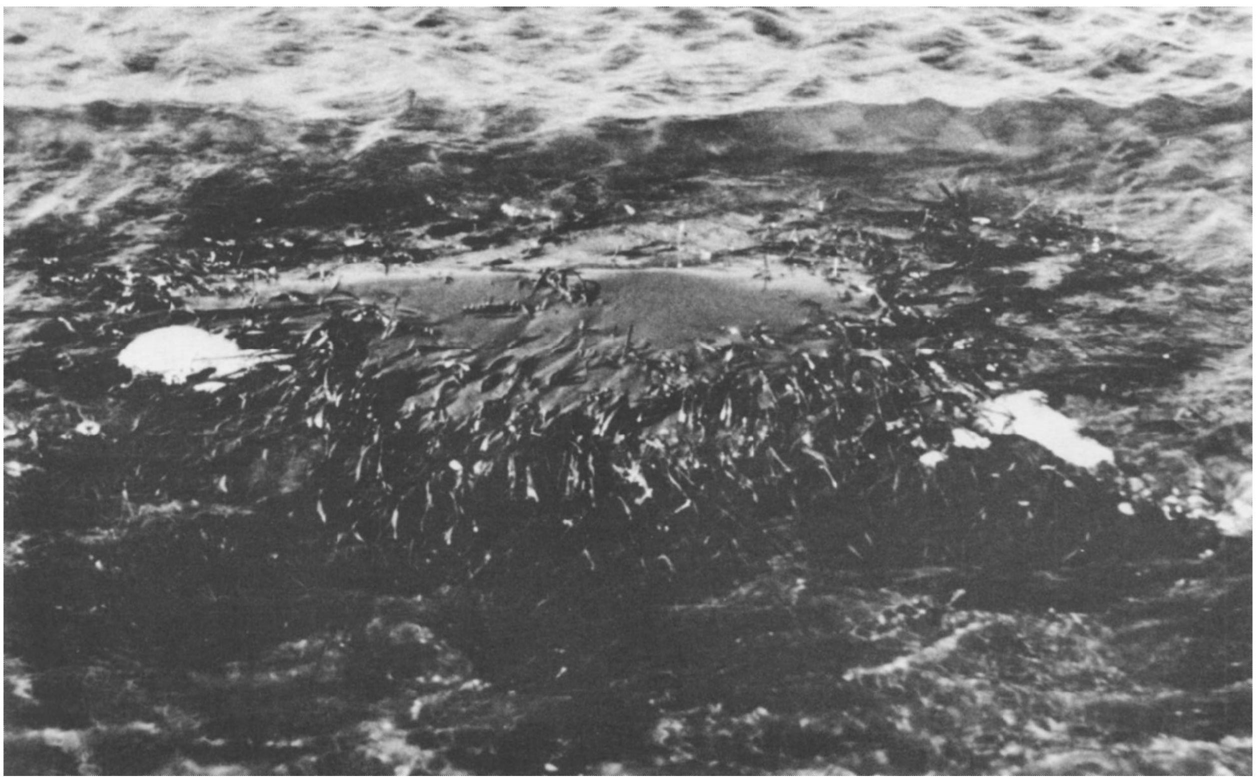


Figure 6-5. Sediment capture in seagrass meadow

CHAPTER 7

ENVIRONMENTAL MONITORING

7-1. Monitoring Program.

a. General.

(1) Monitoring refers to the overall process of data collection, analysis, and interpretation of either short-term, immediate impacts, or long-term changes over the life of a project. This chapter covers only the coastal aquatic/marine habitat. Readers should refer to EM 1110-2-5026, Chapter 16, if interested in monitoring wetland/terrestrial birds and mammals. Environmental monitoring is usually conducted for several purposes as described below.

(2) Monitoring activities are used to document compliance with standards, control the impacts of construction and operation of projects, evaluate predictions from the planning phase, and guide any necessary remedial work. These predictions are found in the environmental effects section of the project Environmental Impact Statement or environmental assessment, and relate to changes expected to result from the project. Before and after measurements are then compared to establish the accuracy of project predictions. Predictions may be either qualitative, such as a change in fish stomach content, or quantitative, such as a 20 percent reduction in crustacean biomass. Quantitative predictions are of greater value in that threshold levels can be set at which an impact (reduced crustacean biomass) can be deemed significant. If a predicted change does not occur, or if an unexpected changed does occur, either is an indication that the predictor model) is faulty. However, the model may not be totally at fault because of the dynamic system it is attempting to predict. Although the monitored predictions cannot be redone for the existing project or activity being monitored, predictive procedures can be improved for future projects.

(3) Monitoring is also used to determine if project operation meets water quality or other environmental standards. Coordination with other agencies or groups and examination of the Environmental Impact Statement and legal requirements (consent decrees, stipulations, rules and regulations, etc.) will usually reveal areas in which monitoring may be desirable. Monitoring should be limited to parameters that provide information about issues of genuine concern and should produce information (data) that can be compared against environmental quality criteria that exist either in Federal or State regulations or that are negotiated and established for the specific project.

(4) Project operations may also be monitored to assess their effects on cultural resources. This monitoring, if appropriate, should include, but not be limited to, soil erosion and accretion rate in, on, and around cultural resource sites, water table increases or decreases, and vandalism. Vandalism protection devices such as cover, fencing, and masking devices should be evaluated for effectiveness. Such monitoring must be tailored to specific site requirements.

b. Setting Objectives.

(1) The most essential part of an environmental data collection and analysis effort is the establishment of clear and concise objectives. If not done, the net result is often a mass of data that defies rational analysis, an inability to solve the problem for which the data were generated, and a waste of money and effort. Without good objectives, any data collection/analysis effort faces a high probability of failure or the collection of unnecessary or worthless data. Phenicie and Lyons (1973) present a logical and complete approach to setting objectives; the approach is applicable to all fields of study.

(2) A good objective is a specific action or activity, not a goal or wish. It places bounds on the work to be done, excluding nonapplicable or unnecessary efforts. Wording of an objective should be clear, concise, and simple. An objective must be <u>realistic</u> and therefore <u>attainable</u>, and <u>measurable</u> to allow evaluation of results and development of conclusions.

(3) Because of different objectives and environmental circumstances, scopes of monitoring programs need to be carefully developed on a case-by-case basis and are rarely identical for different projects.

c. Controls.

(1) Monitoring program design should provide for adequate controls. Data on baseline conditions serve as a temporal reference, and reference site data serve as a spatial reference.

(2) A set of baseline data is required to measure change. By definition, baseline data must be collected prior to the construction, dredging, or other environmental disturbance of interest. Depending upon study objectives, these data may or may not need to be collected over a multiyear period to lessen the statistical impact of the variability in natural systems. The use of a "typical year" may not be a valid approach because "typical years" may not be definable. The changes that occur in a system may not occur in a single annual cycle but may require several years to detect. However, data collected over any given year may still be valuable compared to the collection over part of a year or no collection at all.

(3) Reference sites representative of without-project conditions should be included in the monitoring program if at all possible. The purpose of reference sites is to evaluate changes that occur through time but are not related to the project. Without reference sites it is often very difficult to establish that observed changes are project related, and a question may remain as to whether natural variability or other perturbations were responsible for observed changes. In some cases, it may be possible to control for other perturbations by establishing more than one reference site. Reference stations may also be used to ensure that changes which occur within some designated boundary around an activity remain restricted within that boundary. Stations

may be situated in such a way that those nearer the activity would be impacted if the boundary was exceeded.

d. Quantitative Data. If the study objectives call for scientifically and legally defensible conclusions, baseline monitoring and reference data should be quantitative and the experimental design such that hypotheses concerning change can be statistically tested. Quantitative data sufficient for application of statistical tests are often expensive to obtain, a fact which underlines the prerequisite for well-defined objectives and importance of careful selection of parameters for measurement.

e. Remedial Action. The monitoring program design should include consideration of potential remedial action either during or following construction. If a desirable change does not occur or if an undesirable change is detected, this information is of little value unless a remedy is provided. The only positive result would be the lesson learned if a remedy is not provided. Of course, should a predicted change not occur or an unexpected change be observed, it is an indication that the predictive procedure was not accurate. In many cases, environmental processes are complex, and their interactions sometimes are not well understood. In such a case, understanding of the processes and interactions can serve as a useful feedback mechanism indicating a need for more environmental data and a need to modify and improve the predictive procedure.

7-2. Data Collection. This section provides general guidance necessary to plan an environmental monitoring program that will meet stated objectives of the study design. The most critical aspect of data collection is selecting proper parameters to sample and measure in order to address identified problems.

a. Primary Consideration. The quality of the information obtained through the sampling process is dependent upon these factors: collecting representative samples, using appropriate sampling techniques, protecting the samples until they are analyzed (sample preservation and handling), accuracy and precision of analysis, and correct interpretation of results. Other factors impacting on the sampling process are time, cost, and equipment constraints, which will limit the amount of information that can be gathered. Under such conditions, careful tailoring of the monitoring program is required. It will often be necessary to focus on a single basic objective rather than dilute available effort on tangential questions such that none are completely resolved.

b. Representative Sampling. The purpose of collecting samples is to acquire the basis for adequate representation and definition of the cultural, physical, chemical, or biological characteristics of the project area environment. To do so requires that sampling be conducted or samples be taken in locations which are typical of ambient conditions found at the project site. Failure to obtain samples that are truly representative of a given location will result in inaccurate data and misinterpretations.

c. Sampling Site Selection and Location. The following factors should be considered in sampling site selection:

(1) Objectives of the study.

(2) Accessibility of the site.

(3) Physical characteristics such as tides (consider extremes in amplitude, duration, and velocity), currents (mixing processes), salinity (means and extremes), and presence of vegetation.

(4) Available personnel and facilities.

(5) Cost or funding limitations.

(6) Past history and past studies conducted at or near the site.

(7) Type sampling proposed (random, stratified, or systematic).

d. Number of Stations. If reference areas, control areas, or former study sites are to be sampled for comparative purposes, multiple stations should be sampled. Sample composition from these areas will also be variable and cannot be defined based on single samples. If habitats or cultural horizons to be sampled are known to be heterogeneous, then stations should be allocated to strata (area of uniformity, such as depth, substrate type, and vegetated versus unvegetated) in proportion to spatial coverage of each stratum (e.g., stratified sampling). Therefore, more stations would be required to monitor impacts in physically, ecologically, or culturally complex environments.

e. Number of samples.

(1) Guidance in this section is limited to general concepts. First, the greater the number of samples collected, the better the sampled parameters will be defined. Second, on the other hand, the greater the number, the larger the cost; hence some reasonable compromise must be defined. Third, the mean of a series of replicated measurements is generally a better estimate of actual site conditions than any individual measurement. Fourth, statistics generally require calculation of two characteristics, usually a mean and a standard deviation, because single measurements are inadequate to describe a sample. Fifth, the necessary number of samples is proportional to the source heterogeneity.

(2) Consideration of the above factors suggests that replicate samples should be collected at each station location and that a minimum of three replicates are required to calculate standard deviations. Beyond the replication at a single point, the factors listed above do not limit the number of samples needed since the number of samples depends on site-specific heterogeneity (distribution pattern) and the desired level of source definition (degree of precision). The total number of necessary samples is controlled by the type

of dispersion pattern displayed by the organisms or habitat units to be sampled (random, aggregated, uniform) (Figure 7-1) and the level of precision desired. Additional information regarding "number of samples" can be found in Elliott (1977), Green (1979), and Snedecor and Cochran (1967).

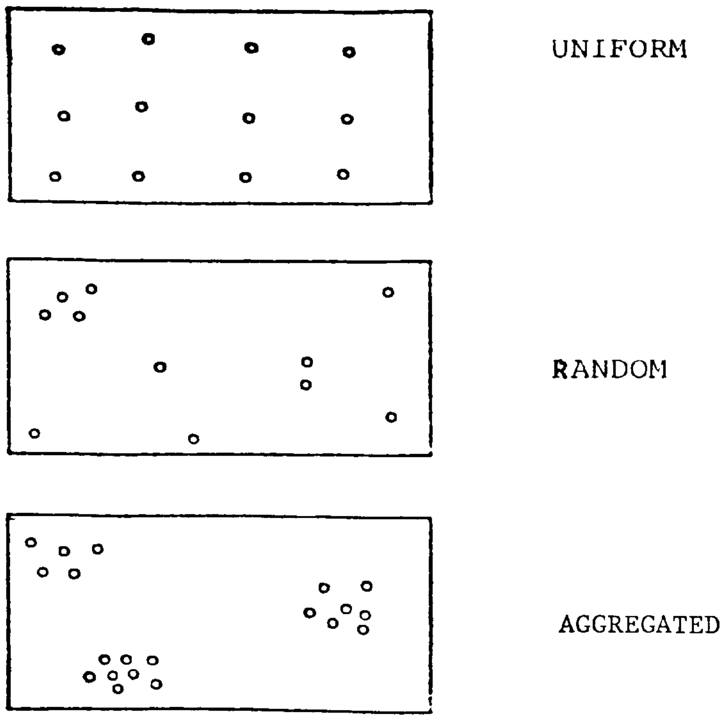


Figure 7-1. Three possible distribution patterns

(3) A rapid method for determining number of samples necessary when investigating a biological population is to calculate the cumulative mean of a few samples obtained in a pilot survey. A cumulative mean (or running average) consists of taking the average of samples 1 and 2; then of samples 1, 2, and 3 (first, second, and third, etc.); then of samples 1, 2, 3, and 4 (and so on), until all samples have been included. If the results are displayed (Figure 7-2), the plot of mean values will stabilize as more and more samples are included. In a population with a uniform distribution (when the variability is low), the mean stabilizes more quickly and in random populations less quickly. In the cluster distribution pattern, the cumulative mean value stabilizes most slowly and never stops fluctuating, although as can be seen in Figure 7-2, after about 15 samples the data begin to stabilize. In the illustrated examples, 8 to 10 samples would be minimally adequate to describe the randomly distributed population, whereas at least 15 to 20 samples would be required for the clustered population.

(4) A more sophisticated technique for estimating the number of samples is described by Green (1979). A preliminary or pilot survey is taken from the

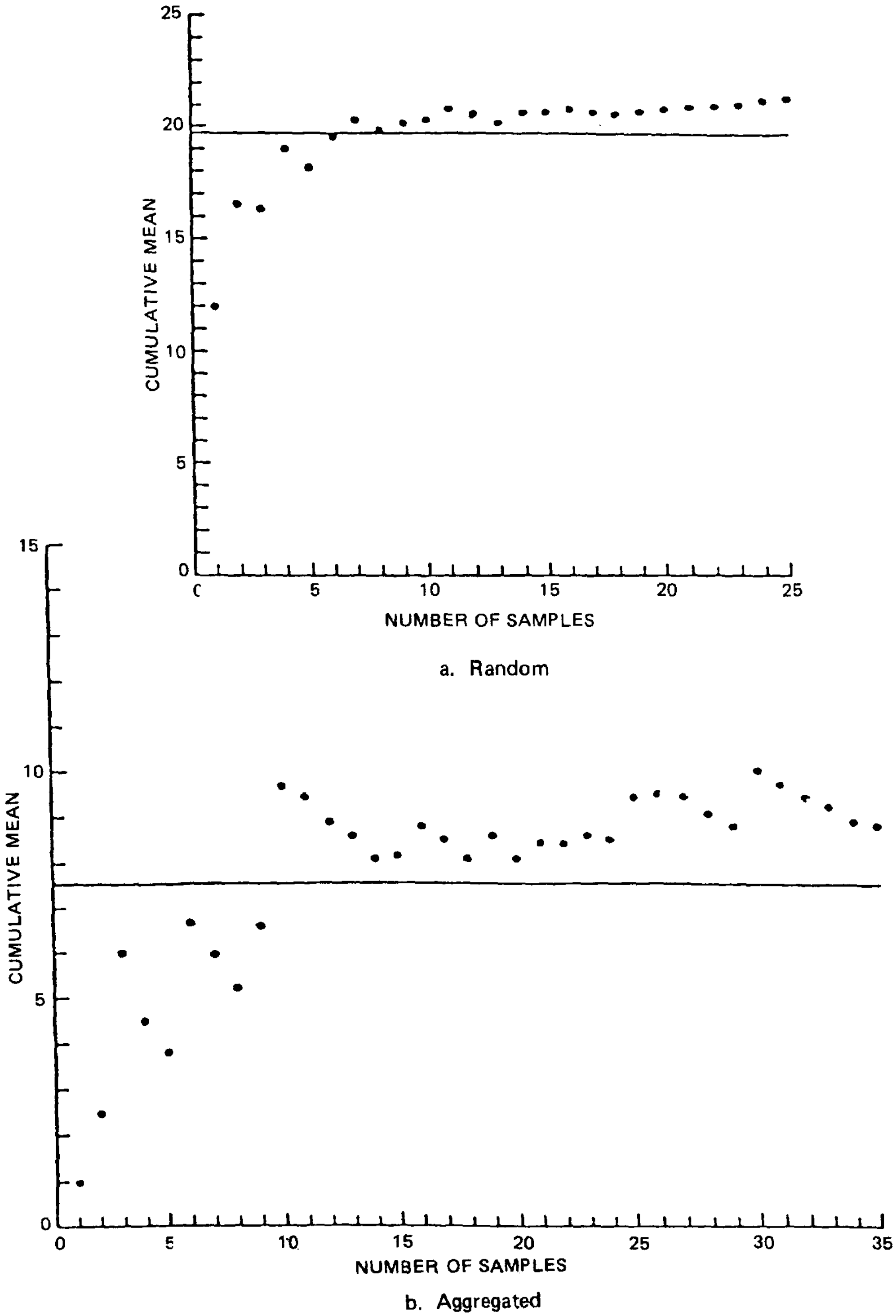


Figure 7-2. Cumulative means calculated for a random and a cluster distribution

population, and individual counts are made from each collection to calculate the sample mean and standard deviation. The following formula is then used:

$$\bar{X} \pm t_{1-(1/2)\alpha} \frac{s}{\sqrt{n}}$$

where $\bar{x}$ is the sample mean, t is the t statistic, • is the significance level, s is the standard deviation, and n is the number of samples. For example, assume that an investigator wishes to estimate the mean density of a species in a population within 10 percent of the actual number and with a 1-in-20 chance of being wrong (0.95 confidence limits). The t value is unknown and is a function of n-1 degrees of freedom; however, for large sample sizes, t is a weak function of n and is approximately 2. If it can be estimated, then the formula can be solved for n . Refer to Green (1979) for an additional explanation.

(5) An additional factor which will serve to limit the number of samples is financial resources. For example, the number of samples upon which bioassays can be performed is determined by the ratio of available dollars and cost per sample:

$$\textbf{Maximum number of samples} = \frac{\textbf{Dollars available}}{\textbf{Cost per sample}}$$

This approach will provide one method of estimating the number of samples that can be collected and analyzed. However, should the calculated number of samples not be sufficient to establish an adequate sampling program (i.e., the number of samples is insufficient to allow replicate sampling at all locations indicated in para 7-2e) one of the following options will have to be considered. The first option is to reduce the replicate sampling at each station. This option will allow the distribution of a parameter within the project area to be determined, but variability at a single sampling station location could not be calculated. The second option is to maintain replicate sampling but reduce the number of sampling stations. This option will result in the project area being less well-defined, but sampling variability can be calculated. The consideration of these two options should be based on project-specific goals. If the first option is used (more stations but fewer replicates), the results will provide a better indication of distribution patterns in the project area, but it will be difficult to compare individual stations. If the second option is used (fewer stations but more replicates), the results will provide a better indication of variability at a given station and will improve comparison between sampling stations. However, the project area will be less well-defined. A third option is, of course, to increase the financial resources available for sample analysis. This option will increase the number of samples that can be collected and analyzed in order to establish an adequate sampling program.

(6) It is suggested that consideration be given to collecting samples (stations and numbers) in excess of that determined by the above process. The

samples do not have to be analyzed and may even be discarded later without analysis. Should sample analysis indicate abnormal results, it is easier and ultimately less expensive to analyze additional samples on hand rather than to remobilize a field crew. Also, the additional and potentially confounding variable of different sampling times is avoided with this approach.

f. Frequency of Sampling. Frequency of sampling will depend on the original objectives of the monitoring program, the availability of resources, and the size of the project. Seasonal fluctuations of physical and biological parameters may be or may not be suspected or known; therefore, seasonal sampling may be required. A sampling frequency of once per year may be sufficient for an annual maintenance project, unless there is a reason to believe otherwise (e.g., some major change in point sources or basin hydrology). If subtle impacts are to be detected, then long-term quarterly or more frequent sampling may be required to overcome the masking effect of wide seasonal and annual variation in the natural system.

g. Sampling Equipment. Sampling equipment should be selected based on the reliability and efficiency of the equipment and on the habitat to be sampled. Several types of water and sediment samplers used in the coastal zone are described in Table 7-1. The water column and sediments are frequently stratified vertically as well as horizontally, and this source of variability should be considered when choosing a method of sampling (i.e., grab versus corer). Additional techniques and equipment available to meet the particular needs of beach and rubble structure sampling are discussed in the following sections.

h. Sample Preservation.

(1) The importance of sample preservation between time of collection and time of analysis cannot be overemphasized particularly for water quality parameters. The purpose of collecting samples is to gain an understanding of the source (point of origin) of the sample; any changes in sample composition can invalidate conclusions regarding the source of the samples. Results based on deteriorated samples negate all efforts and costs expended to obtain reliable data.

(2) The most effective way to ensure a lack of sample deterioration is to follow instructions in the appropriate manuals or to analyze the samples immediately. However, this method may not be practical, and preservations may have to be used to assure the integrity of the samples until the analyses can be completed. In taking this approach, it must be remembered that complete stabilization is not possible and no single preservation technique is applicable to all parameters.

(3) Preservation is intended to retard biological action, hydrolysis, and/or oxidation of chemical constituents, and reduce volatility of constituents. Refrigeration in an airtight container is the only acceptable method to preserve sediments for bioassays. The elapsed time between sample collection and sample preservation must be kept to an absolute minimum.

TABLE 7-1

Sediment Sampling Equipment

Sampler	Weight	Remarks
Peterson	39-93 lb	Samples 144-in, area to depth of up to 12 in., depending on sediment texture
Shipek	150 lb	Samples 64-in. area to a depth of approximately 4 in.
Ekman	9 lb	Suitable only for very soft sediments
Ponar	45-60 lb	Samples 81-in. area to a depth of less than 12 in. Ineffective in hard clay
Reineck box	1,650 lb	Samples 91.3 in. to a depth of 17.6 in.

(4) The effects of transportation and preservation of sediment samples have not been fully evaluated. However, it is suggested that sediment samples should be sealed in airtight glass containers to preserve the anaerobic integrity of the sample and maintain the solid phase-liquid-phase equilibrium.

(5) Animals stored in the field should be preserved with a buffered 10 percent formalin-seawater solution stained with rose bengal. If stored for a period of time greater than three months, the benthic samples should be transferred to 70 percent isopropyl alcohol. After identification and enumeration, voucher specimens should be archived in 70 percent isopropyl alcohol. Reference collections should be maintained for reasonable postproject periods for quality control insurance (e.g., cross checking of taxonomic identifications should questions arise).

i. Sampling Beaches and the Nearshore Zone.

(1) Sampling methods.

(a) There have been few quantitative studies of the communities along high-energy coastal beaches because these areas are difficult and hazardous to sample. The Coastal Engineering Research Center (CERC) published a report that provided a standardized system for sampling macroinvertebrates on high-energy sand beaches (Hurme, Yancey, and Pullen 1979). This report suggests that samples on the upper beach be taken by excavating 0.1-square-meter quadrats with a trenching shovel and sieving the samples through a 0.5-millimeter mesh soil sieve. Compaction of the upper beach sediments can be measured in situ as a function of penetrability with a cone penetrometer. In the surf zone, a coring device generally provides a better and more consistent sample of the infauna (living in the sediments) than grabs or dredges. Beyond the surf zone, in deeper water, cores, grabs, and dredges may be used. Cores taken by a diver applying the quadrat techniques yield the most consistent quantitative samples (Figure 7-3). Trawls and beach seines are less quantitative, but they provide samples that are useful in interpreting biological changes in nektonic and epibenthic communities.

(b) When working in the surf, divers should use a transect line to stay on station (Figure 7-4); range markers on the beach are also helpful for keeping divers on station. Samples are generally collected along lines or transects perpendicular to the beach or parallel to the depth contours, depending upon objectives, and are stored in plastic bags, labeled, and preserved. Sorting of the animals from the sediments is done on the beach or in the laboratory. The animals preserved are later identified and counted.

(c) In clear water beyond the surf zone, diver observations and underwater photographs provide additional information on the epifauna (living on the surface of the bottom) that supplements core samples (Figure 7-5). Divers can observe and count attached reef animals, burrowing and reef fish which tend to be territorial, and pelagic fish.

(2) Sampling design. Sampling plans for a specific area depend on the nature and magnitude of the project, the use and purpose of the data, and the animals to be evaluated. The animals may be sessile or motile with populations that vary seasonally and distributions that are random or clustered. Refer to paragraph 7-2 for sampling design. In most cases, quantitative studies of the beach and nearshore will concentrate on the benthic community, especially the infauna. Epifauna and flora are usually not conspicuous on beaches. The following are general sampling design guidelines for the beach and nearshore zone.

(a) The infaunal sampling device should be reliable and accurate. It should ensure consistent substrate penetration, no loss of sample during retrieval, and minimal variation between sample sizes. Refer to Table 7-1 for typical benthic sampling devices.

(b) Sieve size for processing benthic (infauna) animals should be selected to ensure complete retention of macrofauna (Reish 1959, Hurme, Yancey, and Pullen 1979). By convention, a 0.5-millimeter mesh sieve is recommended for quantitative macrobenthic collections.

Figure 7-3. Core sampling at sandy-bottom stations

Figure 7-4. Diver using transect line in the surf

Figure 7-5. Quadrat sampling of epibiota at reef stations

(c) The number and the locations of stations should be chosen carefully before the project begins. Addition and deletion of stations should be avoided as much as possible. The number of stations should be adequate to address spatial variability of the infauna.

(d) Replications should be adequate to account for variability within station fauna and to collect the majority of the species inhabiting the study site. Refer to paragraph 7-2e on replicate sampling.

(e) There should be a sufficient temporal frequency of sampling to address seasonal variations in the physical and biological parameters.

(f) Sampling methods for "pre," "during," and "post" construction should be consistent and comparable.

(g) Because taxonomic identification is one of the costliest exercises in a monitoring program, level of identification of animals should be no greater than required by the stated objectives.

(h) Consistency in all procedures (sampling methods, sample processing, sample preservation, and sample analysis) should be maintained.

(3) Manpower requirements. Manpower estimated for collecting, processing, and analyzing benthic data varies depending on the location of sampling, site conditions and areal extent, number and type samples to be taken, the size of animals collected (macrobenthos or meiobenthos), and the level of taxonomic identification. As a general rule, project time for an assessment can be prorated as follows: field time - 10 to 25 percent; sample processing - 50 to 75 percent; data analysis - 5 to 10 percent; and preparation of an assessment document - 10 to 20 percent. Picking (separating benthos from sediments and debris) and sorting macrobenthic samples generally takes 1 to 4 hours per sample depending on whether or not the sediment is fine or coarse and whether the benthos are rare or abundant. Processing time, which includes taxonomic identification, counting, and weighing varies from 1 to 4 hours for beach samples with 25 to 75 species and 6 to 10 hours for nearshore samples with 200 to 300 species.

j. Sampling rubble structures. Although they provide excellent habitat for many fishes and shellfishes, rubble structures present difficulties in assessing these resources. The exposed armor layer of rubble structures creates an extremely rough and irregular surface such that obtaining biological samples of standardized volume, surface area, or other unit of habitat measure becomes a distinct problem. Specific biological sampling methods of potential application to rubble structure assessment are recommended below.

(1) Sampling epibenthic communities.

(a) Line transects. Van Dolah et al. (1984) used the following procedures to estimate the percent coverage of sessile biota on jetties at Murrells Inlet, South Carolina. Their methodology was adapted from line transect techniques described by Loya and Slobodkin (1971), Porter (1972a-b), and Loya (1972, 1978). A clear plastic strip with 15 inscribed marks at 2.5-centimeter intervals along its edge is placed against the rock surface. All organisms found directly under each mark (point) are identified and recorded. To accommodate the patchy distribution of many organisms on the same rock as related to the rock's orientation, assessments are made on each of the seaward, landward, outer, inner, and top surfaces of structure quarrystone at a station. The transect strip is always positioned horizontally on sloping or vertical rock faces. Ideally, the strip should be placed randomly upon each rock face rather than selecting areas of high-organism density. Nonrandom placement would introduce bias into the sampling. If more than one species is present under a point, all are recorded. At each station on the structure, samples are taken at predetermined elevations, including subtidal, intertidal, and supratidal levels. Percent cover estimates are then calculated based on the percentage of points each species occupied at a level or at a station. Because this procedure may result in estimates of total biota coverage of over 100 percent (more than one species can contribute to coverage at any given point), total biota coverage is adjusted by subtracting the estimated percent of unoccupied space from 100. For in situ observations, individual rocks can often be removed from the appropriate depth and brought to the surface for examination. Organisms unidentifiable in the field should be preserved and taken to the laboratory for identification.

(b) Scrape sampling. Manny et al. (1985) documented periphyton colonization of a rubble-mound jetty in Lake Erie. Samples were obtained with a bottle-brush sampler as described by Douglass (1958). Each sample covered 12.56 square centimeters (5.0 square inches) of rock surface. At a given station replicate samples can be taken and dedicated to separate analyses such as biomass estimation, taxonomic identification, and chlorophyll content determination.

(c) Quadrat sampling. Johnson and Dewit (1978) used randomly placed quadrats to characterize the biomass and densities of macrobenthic species assemblages on a rubble-mound island at Punta Gorda, California. Samples from subtidal and lower intertidal elevations were taken by using a 0.25-square meter (10.0-square-inch) quadrat, whereas samples in the upper intertidal zone were taken with duplicate 0.1-square-meter (40.0-square-inch) quadrats. Numbers drawn from a random numbers table, used as vertical and horizontal distances from fixed points on the structure, determined the location of each sample. Divers measured the specific distances along a steel tape measure, then dropped the quadrat behind them in order to minimize sampling bias in placement. To arrive at estimates of density, numbers of percent coverage (estimated visually) were recorded for each species in each quadrat. All detachable biota were removed and placed in labeled plastic bags for weighing in the laboratory. Subsamples of encrusting biota were scraped off rock surfaces with a steel chisel and hammer, then collected with a slurp gun (suction apparatus consisting of a plastic tube plunger system) fitted with a collecting chamber lined with plankton netting. Contents of the chamber were then processed with the biomass samples. Quadrant sampling can be adapted to other habitat types, including coral reefs, seagrass beds, and epibenthic communities that may occur in project areas.

(d) Suction samples. Motile epifauna can be sampled with devices such as slurp guns (Van Dolah et al. 1984) and pumps (Manny et al. 1985). Replicate or pooled samples can be taken with slurp guns by standardizing the number of pulls of the plunger rod. A flexible gasket around the opening of the slurp gun barrel can improve the fit of the device when placed against an uneven rock surface. Holes drilled in the base of the barrel and covered with fine mesh netting allow water to enter as the plunger is pulled, creating suction through venturi action. The volume of water and surface area of rock sampled can be calculated from the internal volume of the device and the barrel opening diameter, respectively. The pump sampler used by Manny et al. (1985) consisted of a gasoline-powered centrifugal pump fitted with a 5-centimeter-ID (inside diameter) hose. Incoming water passed through a screen head with 9-millimeter openings. Replicate three-minute pump samples were taken at each station, then filtered through standard mesh-size sieves. Samples were obtained by placing the intake hose in the interstices among the rock rubble. Thus, data were compared on a catch per unit effort basis because the absolute amount of surface area sampled was unknown.

(2) Sampling nekton. Assessment of fish and shellfish populations near rubble structures requires care to avoid the hazards of fouled nets and traps on the structures themselves.

(a) Nets and traps. If the bottom type is suitable, conventional trawling techniques can be used to sample demersal (bottom dwelling) fishes and shellfishes in the vicinity of rubble structures. Trawling would not, however, adequately sample nekton above the bottom and in the immediate area of the structures. Baited traps can be set directly on the rock surfaces but suffer from inherent selectivity in catch and susceptibility to loss during turbulent wave conditions or due to vandalism. Traps may be useful for assessment of specific target species (e.g., of commercial or recreational value) such as crabs or fishes intimately associated with the rubble substratum. In many cases, an appropriate gear type would be gill nets. Properly set, gill nets can be used to sample the water column immediately adjacent to a structure (generally set perpendicular to the axis of the structure) and can be set either high or low in the water column. Gill nets are less useful in deep water because the proportion of the water depth range sample of the net is less. Ideally, the same gear should be used at all sampling locations to avoid problems in comparing catch per unit effort data.

(b) Diver observations. Where water clarity conditions allow, underwater visual census techniques can be applied to assessments of rubble structure fish populations. A number of standard transect or point count techniques can be modified for use by swimmer-observers (Jones and Thompson 1978, Clarke 1986). Detailed studies of the fish fauna associated with rubble structures have been accomplished by divers (Hasting 1979, Stephens and Zerba 1981, Lindquist et al. 1985).

7-3. Habitat Assessment. In resource management decision making, questions that arise in the environmental review process can differ in specifics but have a fundamental theme: Will a project result in unacceptable changes in the functional "value" of the habitat involved? Two habitat assessment techniques and a series of marine and estuarine species profiles are available to assist in answering this important question.

a. Habitat Evaluation Procedures.

(1) Habitat-based evaluation procedures are designed to document the quality and quantity of habitat available for aquatic and terrestrial animals. These procedures can be used to compare the relative value of different areas at the same time (baseline studies) and/or the relative value of one area at different points in time (impact assessment), e.g., present conditions to future conditions. The effect of a project or environmental disturbance on animals can thus be quantified and displayed. One such procedure, the Habitat Evaluation Procedure (HEP), has not been applied frequently in estuarine! marine settings, although Cordes et al. (1985) provided one published example for Mobile Bay, Alabama. The limited application of HE? in coastal environments is primarily due to the small number of Habitat Suitability Index (HSI) models available for estuarine species (zero for marine species), and concerns over the sensitivity of HSI models in documenting impacts of Corps of Engineers activities on estuarine/marine species (Nelson 1987).

(2) HEP is computerized for use in habitat inventory, planning, management, impact assessment, and mitigation studies. The method consists of a basic accounting procedure that outputs quantitative information for each species evaluated. The information can pertain to all life stages of a species, to a specific life stage, or to groups of species. A HEP analysis includes the following (Refer to US Fish and Wildlife Service 1980b, Armour et al. 1984, and O'Neil 1985 for guidance and suggestions on conducting a HEP analysis.):

(a) Scoping. Scoping includes defining study objectives, delineating the boundary of the study area, and selecting aquatic evaluation species. The selection of evaluation species can be based on ecological importance, importance for human use (e.g., sport or commercial fishing), or other factors, including legal protection status.

(b) Development and use of Habitat Suitability Index models. An HSI model can be in one of several forms, including equations for standing crop or harvest, mathematical and nonmathematical mechanistic models that involve aggregations of variables that affect life requisites of a species, pattern recognition models, or narrative (word) models. The mechanistic model (Figure 7-6) is a commonly used model and requires development and use of Suitability Index (SI) curves (Figure 7-7). The tree diagram in Figure 7-6 illustrates the relationship of habitat variables and life requisites to the HSI for juvenile Atlantic croaker (Diaz and Onuf 1985). The value of each variable (V_n) is determined from a suitability curve as shown in Figure 7-7. HSI models published by the US Fish and Wildlife Service (Schamberger et al. 1982)

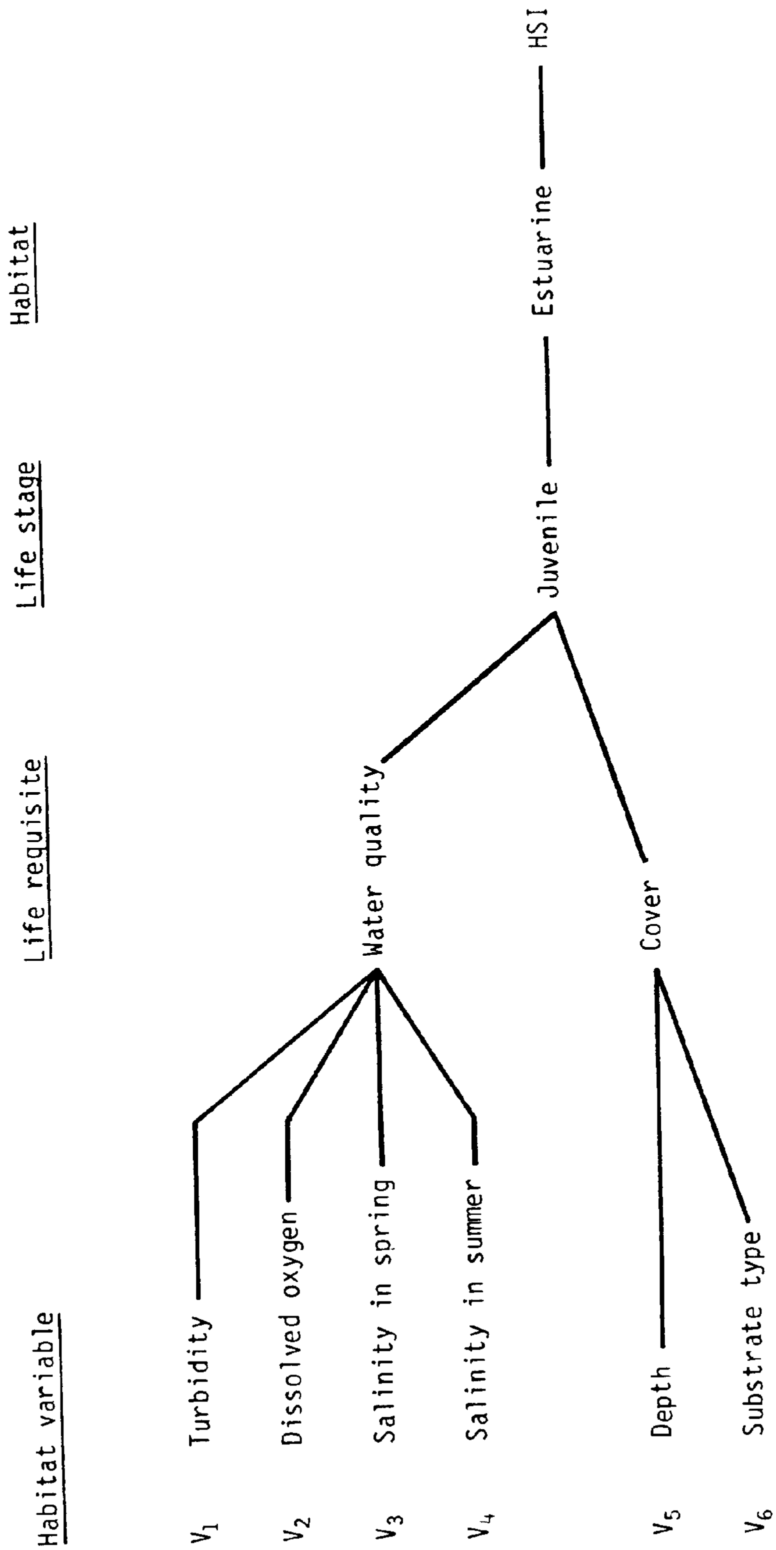


Figure 7-6. Example of a mechanistic Habitat Suitability Index model

V_6 Dominant substrate type:

1) >75% mud.

2) 25% to 75% mud.

3) >75% sand, shell, or other hard material.

4) Seagrass beds or mostly rock and shell; no soft material.

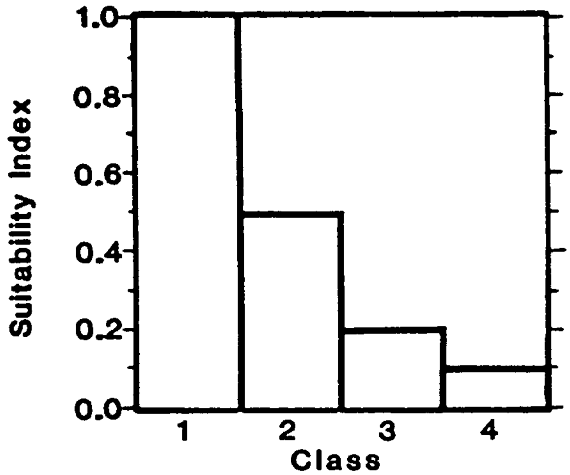


Figure 7-7. Suitability index curve for substrate type for juvenile Atlantic croakers Habitat Suitability Index model (Diaz and Onuf 1985)

should be evaluated by users to determine if they meet site-specific requirements. If the requirements are not met, the models can be modified or the user can develop new models for application. Guidance for developing HEP models is presented in "Standards for the Development of Habitat Suitability Index Models" (US Fish and Wildlife Service 1981). Availability of models is regularly updated in an instruction report by O'Neil (1985).

(c) Baseline assessment. Existing or baseline HU's are quantified within the study area for each evaluation species. HU's are derived by delineating the area of each habitat type for each evaluation species and then multiplying the area by its average HSI (HSI x area = HU). The number of HU's in the study area for an evaluation species is derived by summing the individual HU's for all habitat types and locations that provide habitat for the species for a particular life stage within the study site (Armour et al. 1984).

(d) Impact assessment. Target years are designated at specific points in time throughout the lifespan of the proposed project or study. A target year is defined as a specific year for which habitat conditions can be predicted and evaluated. Target years should be selected for points in time when rates of loss or gain in HSI, or area of available habitat, are predicted to change. The values for habitat variables for evaluation species must be predicted for each target year. Therefore, the planning agency must be able to predict habitat conditions for each alternative at each target year.

(e) Mitigation. Because HEP can be used to quantify losses resulting from proposed projects or construction activities, it can be used in mitigation studies. Habitat losses are determined, and the areas or measures designated for compensation are evaluated for various management alternatives to determine habitat gains. Partial or full compensation or enhancement to fish and wildlife habitat can be quantified. The analyses can be for in-kind compensation (one HU is provided for each HU lost for an evaluation species), equal replacement (a gain of one HU for a species to offset the loss of one HU for another, equally important, species), and relative trade-off.

(f) Decision on course of action. After the HEP analysis is completed, information is prepared for evaluation and use by decision makers and should include complete and clear documentation.

b. Benthic Resources Assessment Technique.

(1) Procedures have been developed at the US Army Waterways Experiment Station that use benthic characterization information to produce semiquantitative estimates of the potential trophic value of soft-bottom habitats. These procedures are called the Benthic Resources Assessment Technique (BRAT). As presently configured, BRAT can be applied under any circumstances in which the pre- or post-project fishery value of an unvegetated soft bottom is an important issue. Although developed primarily for application to subtidal estuarine and coastal marine systems, it may be feasible to apply the BRAT to evaluations on unvegetated intertidal or shallow subtidal bottoms as foraging habitat for wading birds and some waterfowl.

(2) In essence, BRAT estimates the amount of the benthos at a given site that is both vulnerable and available to target fish species that occur at the site. Here "vulnerable" and "available" are the key words. Different species of bottom-feeding fishes, by virtue of their particular morphological, physiological, and behavioral adaptations, can detect, capture, and ingest only a portion of the total benthos present. According to optimal foraging theory, fishes should feed on those food items which afford the greatest net nutritional/caloric benefit for the required energy expenditure for search, capture, and handling of prey. Thus, the optimal diet will depend on the abundance of the prey item, its size relative to the predator, its spatial and temporal distributions, and its defensive adaptations (camouflage, burrowing behavior, etc.). Bottom-feeding fishes will consume different prey at different locations and during different seasons, reflecting those vulnerable prey items that happen to be situated where they are available for capture. In the BRAT, vulnerability is taken to be a function of the depth of the prey's location below the sediment-water interface. Both factors, vulnerability and availability, are estimated by examination of the diets of target predatory fishes.

(3) The overall BRAT approach is quite simple. Figure 7-8 depicts a flow chart of the major steps of the BRAT up to the point at which statistical and numerical analyses come into play. Benthos and fishes are collected simultaneously at the project site. Benthos are retrieved using a modified box-corer which enables the obtained sediment core to be partitioned into vertical depth intervals. The benthos are then removed and segregated according to their respective depth intervals. After separation from the sediments, the benthos from individual depth intervals are sorted into major taxonomic

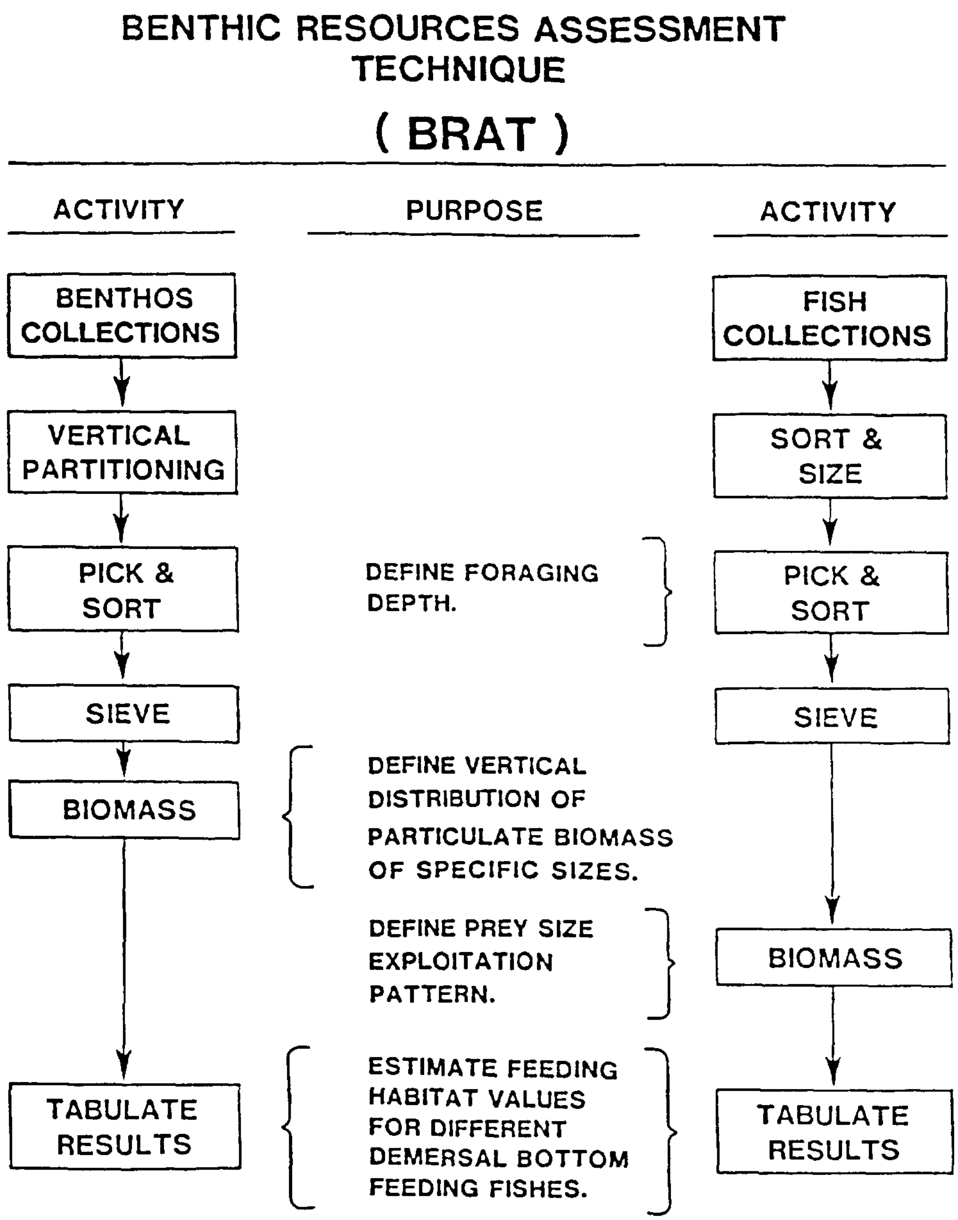


Figure 7-8. Benthic resources assessment technique (BRAT)

categories, then passed through a series of standardized mesh-size sieves. Each size fraction is then wet-weighed. At this point, the vertical distribution by size and weight of all potential food items has been established.

(4) Fishes that have been collected by conventional trawling methods are measured (standard length) and separated into size classes. Stomach content samples for fishes within each size class are pooled, then treated in a manner identical to the benthic samples. First, the food items are sorted into major taxonomic categories, then sieved into standardized size classes, and finally wet-weighed. Thus, there is a record of the size of prey items and the relative proportions of prey items utilized by bottom-feeding fishes in a project area at a given time. There is also a record of the locations of those utilized prey in the sediment column. What follows is simply a means of comparing the two records (actual food items eaten and food item size/depth distribution) to arrive at an estimate of the potential trophic support represented by a specified area of bottom habitat.

(5) Each size class of fish species will exhibit a particular prey exploitation pattern, i.e., its diet will be composed predominantly of prey items in a certain size range. This size range may be either narrow or broad. For projects at which there are multiple target fish species, and multiple size classes of each species, it will be necessary to use cluster analysis to assign each predator species size class to a prey exploitation pattern. Cluster analysis, also known as ordination, is a multivariate statistical technique which objectively sorts entities (in this case fish species size classes) into groups based on their attributes (sized-sorted prey items as used here). Cluster analysis is not an end in itself but rather an exploratory tool that assists in the recognition of patterns in large or complex data sets. The output in the BRAT is in the form of fish species size classes sorted into groups having similar prey exploitation patterns, or feeding strategies.

(6) Next, a second component of prey exploitation to be evaluated is the vertical foraging capability within the sediment column for each fish species size class. Qualitative examination of each food habitats sample provides evidence of the kinds of prey and their relative abundances. Comparison of this information with the vertical distribution patterns of these prey in the sediment column (derived from published reports or from the vertically partitioned box-core samples) gives an indication of the sediment depth to which a particular fish species or guild of species can forage. For example, hypothetical group A fish species size classes may eat prey less than 1 millimeter in size (vulnerable prey size) and be limited to foraging in the upper 5 centimeters of sediment (available foraging zone). The total amount of benthic biomass potentially exploitable by group A predators can be calculated as the cumulative biomass of all food items less than 1 millimeter in size for all sediment intervals down to 5 centimeters. Because the original box-core samples represented a standardized surface area of bottom habitat, an estimate of the total amount of food potentially available to group A predators in a project area can be extrapolated. By repeating this process for all bottom-feeding predator groups found in the project area, and taking the sum of their

exploitable prey biomasses, an estimate of the potential trophic support for all target fish species can be obtained. An example of BRAT data tabulation is presented in Table 7-2. In this example, the potential food value of the sampled bottom habitat was found to be 12.3 grams per square meter of vulnerable available biomass. The tabulation would be repeated for each benthic feeding predator group.

TABLE 7-2

An Example of a BRAT Data Tabulation

Benthic Community Analysis						
Prey Taxa	Vulnerable Size	Proportion of Biomass in Available Zone		Biomass/ Productivity		Potential Food Value
1	+	100%	×	10 g/m^2	=	10 g/m^2
2	-	0%	×	3.1 g/m^2	=	0 g/m^2
3	+	50%	×	1.4 g/m^2	=	0.7 g/m^2
o	o	o	o	o	o	o
o	o	o	o	o	o	o
o	o	o	o	o	o	o
n	+	70%	×	2.3 g/m^2	=	1.6 g/m^2
				Total food value	=	12.3 g/m^2

NOTE: The food value in grams per square meter (g/m^2) can be converted to units of energy to compute potential fish production or to a suitability index (actual/optimum) value for input to a HEP analysis.

The analysis would be conducted separately for each predator guild (guild = n species).

(7) The utility of the BRAT lies in the ability to provide meaningful information relevant to value decisions by the resource manager. The BRAT does not provide an assessment of the overall status of the habitat but can be viewed as an in-depth assessment of a single habitat variable, that of trophic support. As such it may potentially contribute semiquantitative input to habitat-based assessments such as the Habitat Evaluation Procedures.

c. Species Profiles. A series of 126 profiles on marine and estuarine animals are being prepared for seven United States coastal biogeographic regions (Appendix D). The profiles are designed to provide coastal managers, engineers, and biologists with a brief but comprehensive sketch of the biological characteristics and environmental and habitat requirements of coastal species. They will assist the planners in predicting how populations of coastal species may react to environmental modifications resulting from engineering projects. The profiles are jointly developed by the US Army Corps of Engineers and the US Fish and Wildlife Service and may be acquired by contacting the Coastal Ecology Group at the Waterways Experiment Station in Vicksburg, Mississippi.

7-4. Data Analysis, Interpretation, and Presentation.

a. Data Analysis Plan and Presentation. A preliminary idea of the data analysis and presentation techniques to be used should be formulated during the study design stage. Green (1979) has outlined principles important to planning successful study design and data analysis. Several techniques are readily available for data analysis and presentation.

(1) Qualitative analysis. Results of qualitative analyses are generally prose statements based on visual observations and perhaps a few measurements.

(2) Maps and graphical analysis. Patterns inherent in data can often be revealed by mapping or graphing the data. Maps are used to show two- and three-dimensional spatial patterns, whereas graphical approaches are most useful for showing temporal relationships or variations with a single dimension such as distance or depth. In general, variables can be divided into two types-continuous and discontinuous (or discrete)--and appropriate map and graphical techniques vary, depending on how variables are measured and distributed.

(a) Phenomena to be mapped may be distributed in a continuous or discrete manner. Discrete distributions are composed of individual elements that are countable or measurable (individual fish, species of fish, etc.), whereas with continuous distributions there are no recognizable individuals (dissolved oxygen concentration, turbidity, etc.). Symbols such as dots may be used to map discrete distributions to reveal patterns. Discrete data are often converted into densities by dividing counts of individuals (frequencies) by the areas of the spatial observation units. The results (animals per square meter, biomass per square meter, etc.) may be plotted on maps. Patterns are often enhanced by grouping all values into five or six classes and mapping each class with a separate tone or color. Data representing continuous distribution are usually plotted and contoured to reveal patterns.

(b) Graphic techniques specialized for certain disciplines or types of data are too numerous to describe. As with maps, however, graphic techniques vary with the type of data. Discrete data are often graphed as frequency histograms (or by graphs), with frequencies on the vertical axis and classes or categories on the horizontal axis. Continuous data are usually plotted as curves, with the spatial or temporal dimension on the X-axis. Logarithmic scales are often used when the data to be graphed vary over more than one order of magnitude. Patterns or trends in irregular curves may be more evident if the data are smoothed with a moving average or by fitting generalized mathematical functions to the plotted points. Schmid and Schmid (1979) provide a thorough review of graphs and charts. Tukey (1977) provides a discussion of graphical smoothing techniques. Tufte (1983) is an excellent source of ideas on clearly and accurately displaying quantitative data.

(c) More complex maps and graphs such as three-dimensional contour plots, trend surfaces, and perspective plots are also useful but more difficult to comprehend. Various mapping and geographical display options are available as part of most data management systems.

(3) Statistical analysis. Statistical analysis can be used to summarize or describe complex data bases. Statistics can also be used as a formal decision-making tool to decide whether measured temporal or spatial differences between samples are real or whether they may be the result of sampling variability. Commercially available data management systems have options for computing and displaying several types of statistics.

(a) Large amounts of data can be summarized by calculating statistics such as measures of central tendency (mean, median, and mode) and dispersion (standard deviation and range). Statistics can be used to compare sets of data to determine if differences exist among them and, if so, whether the differences are significant.

(b) Formulas are available for determining if observed differences between sample data sets are real, or if they may have occurred by chance because of insufficient sample size used in calculating the statistics. These techniques are called significance tests, and theories and formulas for their use are given in basic texts on statistics and experimental design. Users should be cautioned, however, that observed differences may be statistically significant and yet not be very meaningful. Special techniques have been developed or modified for analysis of biological data, particularly benthic biota data, e.g., Boesch (1977).

(c) Relationships among variables may be explored using correlation and regression analyses. For example, the relationship between the density of a certain benthic species and certain physical (water depth, temperature, sediment grain size, etc.) and chemical (dissolved oxygen, salinity, etc.) parameters might be explored using correlation and regression. Basic theory and formulas for correlation does not imply cause and effect relationships. Kenney (1982) discusses spurious self-correlations that result when two or more variables have a common term. The use of correlation and regression with several variables should be accompanied by a good understanding of the basic assumptions that must be met in order to use the techniques effectively. Mather (1976) presents a thorough discussion of the basic assumptions of multiple correlation and regression and of some of the mathematical and data constraints that influence results.

(d) Most data management systems contain programs for a variety of advanced statistical techniques. Pattern recognition techniques, such as cluster or character analysis, are powerful procedures for describing patterns and complex relationships when employed by individuals with sufficient training to understand the statistical and mathematical constraints to proper use of the technique.

b. Data Interpretation.

(1) Editing. Data checking and editing should precede analysis. Extreme errors may be detected by computer programs that check for boundary conditions and ensure that data values are within reasonable limits. Quality work requires human judgment. Simple computer plots of the raw data should be generated and examined for unreasonable values, extreme values, trends, and outliners. More detailed editing should include checking all or random samples of the computer data base values against data sheets from the lab or field.

(2) Analysis. The next step in data interpretation is to ensure that the assumptions on which the data analysis plan is based are still valid. New information or failure to collect all the data required in the original analysis plan may necessitate modification. Data analysis should then proceed according to plan, and a decision should be made to accept or reject the tested hypothesis. Following this step, an effort should be made to identify additional quantitative or qualitative conclusions that may be warranted, and additional hypotheses that may be tested using the data base. If resources permit, this additional analysis may be completed prior to formulation of final conclusions. Final conclusions should not be limited to acceptance or rejection of hypotheses but should extend to clear, verbal expression of the implications of the observed results. Decision makers who are not technical specialists may fail to grasp these implications unless they are clearly communicated.

(3) Maps and Graphs. When using maps and graphical techniques, one must be careful not to draw conclusions that depend on either interpolation between data points or extrapolation beyond the range of the data, unless such interpolation or extrapolation can be justified. Quantitative statements should not be based solely on map and graphical analysis. A choice of scales or coordinate axes that unduly exaggerate or minimize point scatter or differences should be avoided.

CHAPTER 8

MITIGATION DECISION ANALYSIS

8-1. Policy. Care must be taken to preserve and protect environmental resources, including unique and important ecological, aesthetic, and cultural values. The Fish and Wildlife Coordination Act of 1958 (Public law 85-624, 16 U.S.C. 61 et seq.) requires fish and wildlife mitigation measures when appropriate and justified. The National Historic Preservation Act of 1966 (Public Law 89-665, as amended, 16 U.S.C. 470 et seq.) does the same for cultural resources. The Water Resources Development Act of 1986 (Public Law 99-662) and implementing guidance provide further policy on fish and wildlife mitigation, including cost-sharing provisions. Specific Corps mitigation policy on fish and wildlife and historic and archaeological resources is included in ER 1105-2-50, Chapters 2 and 3, and current Engineering Circulars. All actions related to planning and implementing mitigation should incorporate appropriate Engineer Regulations and Engineer Circulars.

8-2. Definition.

a. Mitigation. The Council on Environmental Quality (CEQ), in its Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR Part 1508.20), published a definition of mitigation that has been adopted by the Corps (ER 1105-2-50) and includes:

(1) Avoiding the impact altogether by not taking a certain action or parts of an action.

(2) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

(3) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

(4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(5) Compensating for the impact by replacing or providing substitute resources or environments.

These will be referred to as the five elements of mitigation.

b. Significant Resources and Effects. Significance includes meanings of context and intensity. Context refers to the degree of technical, institutional, and/or public recognition accorded to a resource at local, regional, or national levels. Intensity refers to the severity of impacts as measured in duration, location, and magnitude of effects. The criteria for determining the significance of environmental resources and effects are provided in ER 1105-2-50, Appendix A, Section 1.7.3, and subsections 3.4.3, and 3.4.12. Significance of historic resources is further defined as a property listed or determined to be eligible for listing in the National Register of Historic Places (ER 1105-2-50, Chapter 3).

8-3. Key Concepts for Mitigation.

a. General.

(1) Significant resources are to be identified and specifically considered in all phases of a project. If significant losses to those resources will occur because of the project or action, then those losses must be mitigated.

(2) Mitigation consists of avoiding, minimizing, rectifying, reducing, or compensating for the impacts. The five elements of mitigation are logically stepwise, i.e., it is better, easier, and often cheaper to avoid an impact than to compensate for it. The elements are iterative in that the results from one step may require reexamination of previous actions. The first elements of mitigation can often be accomplished through the use of good engineering practices, e.g., changes in project design.

(3) Impacts resulting from coastal shore protection projects are largely on coastal and Great Lakes bottoms, shorelines, wetlands, submerged aquatics, coral reefs, and other tropical and subtropical ecosystems. These areas will usually be composed of or are considered to be significant resources. Chapters 4-6 of this EM discuss potential impacts on some of these resources.

b. Early and Continuous Coordination and Public Involvement. Planning for mitigation must occur concurrently and proportionally with overall project planning activities and with the involvement of personnel from all appropriate state and Federal agencies (ER 1105-2-35). An integrated planning effort assures that the significant resources are correctly identified, significant impacts are determined, all the elements of mitigation are considered, and the mitigation actions taken or recommended are appropriate and justified.

c. Monetary and Nonmonetary Concerns. Both monetary and nonmonetary aspects of significant resources and effects will be considered. Monetary aspects are quantified using dollars, and nonmonetary aspects are quantified using one of several appropriate measures such as Habitat Units, acres, population data, Visual Impact Assessment Units, parts per million, and use-days.

d. Mitigation Framework. A useful framework for describing mitigation has two of four conditions:

(1) In kind - resources physically, biologically, and functionally the same or similar to those being altered.

(2) Out of kind - resources physically, biologically, and/or functionally dissimilar to those being altered.

(3) Onsite - occurring on, adjacent to, or in the immediate proximity of the impact.

(4) Offsite - occurring away from the site of the impact.

The first four elements of mitigation in paragraph 8-2a generally take place onsite, the fifth one may be onsite or offsite. Mitigation in kind and onsite requires no trade-offs, while the out of kind and offsite conditions show that relative values have been assigned.

e. Mitigation Objectives. Mitigation objectives should be stated as a quantification of the amount of compensation required for significant losses to significant resources. Both the identity and character of the significant resources and the amount of losses to them should be clearly documented. Significant resources should be placed in a priority list or category, accompanied by any stipulations such as the weightings to be used in trade-off analysis, trade-offs not allowed, or mitigation to be onsite.

f. Incremental Cost Analysis. Incremental or marginal cost analysis is a process used in designing a compensation plan that meets the mitigation objectives. It investigates and characterizes how the cost of a unit of output increases as the level of output changes, e.g., change in dollars per Habitat Unit with increasing Habitat Units. An analysis will result in an array of implementable mitigation actions, ranked from most to least cost-effective. A mitigation measure such as beach nourishment or placement of a sand fence becomes an increment when it is combined with other measures into a plan and analyzed to determine the most cost-effective solution.

g. Justification for Mitigation. Justification for mitigation must be based on the significance of the resource losses due to a project, compared to the costs necessary to carry out the mitigation (ER 1105-2-50, paragraph 2-4c(1)). Endangered and threatened species and designated critical habitats will be given special consideration (Public Law 93-205, as amended, 15 U.S.C. 1531-1543).

8-4. Examples. Throughout the text of this EM are measures that can serve one or more of the mitigation elements. Example measures of each of the elements are listed below:

a. Avoid -- Time construction activities to avoid periods of fish migration or shorebird nesting; preserve a public access point.

b. Minimize -- Disturb an immature reef instead of a mature one; use rough surface-facing materials on a structure.

c. Rectify -- Replace a berm; restore flow to former wetlands.

d. Reduce -- Control erosion; place restrictions on equipment and movement of construction and maintenance personnel.

e. Compensate -- Use dredged material to increase beach habitat; construct an artificial reef.

APPENDIX A

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APPENDIX B

MODELS

Section I. Numerical Models

B-1. Introduction. Numerical models use computational methods to solve mathematical expressions describing physical, chemical, and biological phenomena. Computational methods such as approximation and iteration performed by high-speed digital computers allow solution of complex equations that cannot be solved by analytical methods.

a. Numerical modeling provides much more detailed results than analytical methods and may be substantially more accurate, but it does so at the expense of time and money. However, once a numerical model has been formulated and verified, it can quickly provide results for different conditions. In addition, numerical models are capable of simulating some processing that cannot be handled in any other way. They are also limited by the modeler’s ability to derive and accurately solve mathematical expressions that truly represent the processes being modeled.

b. The four types of numerical models that are pertinent in the investigation of the environmental impact of coastal shore protection projects include:

(1) Hydrodynamic models describe the velocity components, water surface elevations, and salinity (or any other conservative passive constituent) distributions within the study area.

(2) Sediment transport models predict the shoreline response (erosion or accretion) to man-made engineering structural or dredged channel modifications, and estimate the ultimate fate (resuspension, transport, and deposition) of dredged material disposed in an aquatic dredged material disposal site.

(3) Water quality models predict physical characteristics and chemical constituent concentrations of the water at various locations within the study area.

(4) Ecological models predict the interactions between water quality and the aquatic community.

c. The information derived from hydrodynamic models forms part of the data base for sediment transport, water quality, and ecological models, and the data from sediment transport and water quality models, in turn, form part of the data base for ecological models. Hence, it is essential that these foundation modeling activities be accomplished with adequate accuracy. The various described models require input data which may be classified as:

(1) Initial conditions. The data describe the initial state of the system prior to numerical modeling.

(2) Boundary conditions. The data specify the system geometry and the quantity and constituent concentrations of freshwater inflows or other depositions.

(3) Verification requirements. Any other data considered necessary for the verification (or calibration) of the numerical models.

B-2. Field Data.

a. Because no numerical model study can be more accurate than the information on which it is based, the importance of adequate field data cannot be overemphasized. The first steps in any numerical model study must be the specification of objectives: an assessment of the geophysical, chemical, and biological factors involved; and collection of data essential to describe these factors. Assessment and data collection should include:

(1) Identification of freshwater inflow sources, including their average, range, and time history distribution of such inflow.

(2) Assessment of the tides and tidal currents that exist within the region of interest.

(3) Evaluation of wind effects and other geophysical phenomena that may be peculiar to the specific study and that may contribute to aeolian sediment transport within or beyond the study boundary limits.

(4) Complete understanding of wave climate throughout the region of interest, including seasonal and annual distribution with frequencies of occurrence by height, period, and direction of approach.

(5) Knowledge of the resulting wave-induced currents.

(6) Evaluation of the effects of simultaneous occurrence of unidirectional flow (tidal currents or freshwater river inflow) and oscillatory currents (wave-induced particle motion).

(7) Assessment of effects and probability of occurrence of aperiodic extreme meteorological events such as severe storms or hurricanes.

(8) Identification of the sources of sedimentation and of the sediment types for development of a sediment budget analysis of the system under evaluation.

(9) Determination of sources and expected quantities and composition of industrial and municipal effluents, nonpoint contaminants, and tributary constituent concentrations.

(10) Identification and census of the aquatic community of the region, and the chemical, physical, and biological factors which influence its behavior.

(11) Archive of all available hydrographic, bathymetric, topographic, and other geometric data pertinent to preparation of numerical models.

b. The purpose of the preliminary assessment of pertinent and available data is to provide a basis for the selection of the models needed and for planning field data acquisition programs. The most satisfactory procedure is to plan the numerical modeling and field data acquisition program together. If possible, the basic hydrodynamic model should be operational during the period in which field data are being acquired. One major reason for concurrent model simulation and data acquisition is that anomalies in field data frequently occur, and the numerical model may be useful in identifying and resolving any such anomalies.

B-3. Data Analysis.

a. In conjunction with the field data acquisition program and the projected numerical modeling activity, a program of data analysis must be undertaken. For the data analysis program to be as efficient as possible, the field data should be recorded on media that can be automatically read by the computer equipment to be used for such data processing.

b. Data analysis includes isolation of the astronomical tide from the tidal record and for an identification of the decomposition of the constituents of the astronomical tide. The purpose of separating the astronomical tide from the observed tide is two-fold:

(1) This separation allows one to examine the residual and, by using statistical methods, to investigate the extent to which other geophysical phenomena, such as wind, influence the observed flow.

(2) The astronomical tide is deterministic and may be used in synthesizing tidal records for hypothetical events or during periods for which tide records are not available.

c. Three fundamental observations regarding data analysis should be considered:

(1) The astronomical tide is somewhat dependent on freshwater inflows into the study region, and the amplitude of the tidal constituents therefore tends to vary seasonally in many coastal areas.

(2) Past experience in the analysis of tidal data in conjunction with model studies has shown that a minimum of about 30 days of record for tidal elevation, velocity, and salinity data is essential for satisfactory analysis.

(3) Data should be synoptic, with all data stations being monitored during the same time period in order to properly verify the numerical models.

B-4. Hydrodynamic Models. Numerical models of hydrodynamic processes, sediment transport, and water quality processes are said to be coupled if they are applied simultaneously and interactively on a digital computer. The codes use the same spatial and temporal grid. If, conversely, the hydrodynamic model is run and the output from it used as input to the sediment transport or water quality model, the two models are said to be uncoupled. With uncoupled codes, the hydrodynamic output may be spatially and/or temporarily averaged and subsequently used as input to the water quality model. In many instances, it is more economical to run uncoupled models. Uncoupled models are unacceptable where thermal gradients or the concentration of dissolved or suspended material causes a large enough variation in the fluid density to substantially affect the flow.

a. General. The various numerical models may be classified as one-, two-, or three-dimensional. The one-dimensional models treat the system by averaging over a succession of cross sections. One-dimensional models are well suited to geometric situations such as channels with relatively uniform cross-sectional shape and with center lines whose radius of curvature is relatively large compared to the width, provided the water density is uniform over the cross section. Two-dimensional depth-averaged models are the type most commonly employed and are well suited to studies in areas such as shallow estuaries where the water column is relatively well mixed. Laterally averaged models are used in studies of relatively deep and narrow bodies of water with significant variation of density vertically through the water column. Three-dimensional hydrodynamic models are relatively new and have been applied to only a limited number of practical studies. In general, two-dimensional models are substantially more expensive to operate than one-dimensional models, and three-dimensional models are more complex and more expensive than two-dimensional models. Hence, in situations where it is known a priori that one of the simpler models will produce satisfactory results, the simpler model should be employed for economy.

b. Two-Dimensional Depth-Averaged Models. Two-dimensional depth-averaged models are most commonly employed in the investigation of tidal flows in inlets, bays, and estuaries. The two distinctly different formulations that have been employed are finite difference and finite element. Models currently being used at the Waterways Experiment Station (WES) include the finite difference model WIFM (WES Implicit Flooding Model), which evolved from early work by Leendertse (1967, 1973). The model and its application have been refined and significantly improved at WES, and have been described at different stages of development by Butler (1980). The finite element flow model of Research Management Associates (RMA-2V) (Ariathurai and Arulanadan 1978) evolved rom work by Norton et al. (1973) sponsored by US Army Engineer District, Walla Walla. The WES version of this model and a companion sediment transport model, STUDH, and their application to project studies have been described by McAnally et al. (1983). A user's manual for these finite element models and support programs (TABS-2) has been prepared by Thomas and McAnally

(1985). Most existing finite difference models employ cartesian coordinates which, even with variable grid spacing capabilities, may lead to undesirable approximations in schematization of complex study areas. Recent work by Johnson (1980) has resulted in a finite difference model VAHM (Vertically Averaged Hydrodynamic Model) for flow and transport which employs a generalized coordinate transformation technique called boundary-fitted coordinates to overcome this limitation. Development of this approach is continuing.

c. Two-Dimensional Laterally Averaged Models. Laterally averaged models are applicable in studies of relatively deep, narrow channels with small radius of curvature in which lateral secondary, currents of appreciable magnitude do not develop. Since fewer systems meet this criterion, work on models of this type has been more limited than on the depth-averaged models. However, work performed during the last few years has produced a useful model CE-QUAL-W2 (Environmental Laboratory, Hydraulics Laboratory 1986). CE-QUAL-W2 was originally developed as a two-dimensional laterally averaged free surface and heat conducting model (LARM) for computing reservoir flow patterns (Edinger and Buchak 1979). In more recent developments, the water density was allowed to be a function of both temperature and salinity, and estuarine boundary conditions were incorporated. This version was called LAEM (Edinger and Buchak 1981). LARM and LAEM were combined with multiple branching capabilities and renamed GLVHT (Buchak and Edinger 1983). WES included water quality algorithms and named the resulting code CE-QUAL-W2. These codes have been used to investigate the effect of navigational channel deepening on salinity intrusion in the Lower Mississippi River and the Savannah River estuary.

d. Three-Dimensional Models. Depth- and laterally averaged two-dimensional models obviously lack the ability to predict secondary flows involving the plane that has been averaged. In some instances, these secondary currents may be appreciable and affect such things as salinity intrusion, sediment transport, thermal distribution, and water quality. Leendertse et al. (1973) pioneered the development of one of the early three-dimensional models of an estuary. Leendertse ' s model employed cartesian coordinates. A three-dimensional model that utilizes stretched coordinates in both the horizontal and vertical directions has been developed and applied in studies of the Mississippi Sound (Sheng and Butler 1982, Sheng 1983). This model CELC3D (Coastal, Estuarine, and Lake Currents; Three-Dimensional) may be used to provide detailed computations of the currents within several tidal cycles or time scales of a storm event. For a scenario of repeatable hydrodynamics, CELC3D may be combined with the sediment transport algorithm for long-term computations on the order of weeks, months, or longer. Three-dimensional versions of the finite element flow and sediment models have also been developed and have been applied to several field sites (Ariathurai 1982, King 1982). Improvements in the efficiency of computational equipment and modeling technology are increasing the feasibility of applying three-dimensional models.

B-5. Sediment Transport Models. The transport of noncohesive and cohesive sediments under the simultaneous action of waves and currents takes place along natural beaches, coastlines, bays, estuaries, and elsewhere when waves become superposed upon currents. The currents may be wave-induced, wind-driven, tidal, and stream, or may originate from some other less cause.

a. CIP (Coastal and Inlet Processes Numerical Modeling System). Coastal processes of tides, waves, wave-induced currents, and sediment transport can be modeled by using the numerical modeling system CIP (Coastal and Inlet Processes). The system utilizes the WES Implicit Flooding Model (WIFM) for tides, the Regional Coastal Processes Wave Propagation Model (RCPWAVE) for waves, the model CURRENT for wave-induced currents, and a sediment transport model for transport of sediment due to the combined action of tides, waves, and wave-induced currents. All four models generally use the same computational grid for a given set of conditions.

(1) WIFM is a general, long-wave model which can be used for simulation of tides, storm surges, tsunamis, etc. It allows flooding and drying of land cells near the shoreline. It is a depth-averaged model so that variations in the vertical direction are averaged in the model. It is used to determine tidal elevations and velocities in the two horizontal coordinate directions.

(2) RCPWAVE is a linear, short-wave model which considers the transformation of surface gravity waves in shallow water, including the processes of shoaling, refraction, and diffraction due to bathymetry, and allows for wave breaking and decay within the surf zone (the region shoreward of the breaker line). Unlike traditional wave-ray tracing methods, the model uses a rectilinear grid so that model output in the form of wave height, direction, and wave number is available at the centers of the grid cells. This method is highly advantageous since the information can be used directly as input to the wave-induced current and sediment transport models, and the problem of caustics due to crossing of wave rays is avoided.

(3) CURRENT computes the wave-induced currents that result when wave breaks and decay in the surf zone. In general, such breaking induces currents in the longshore and cross-shore directions with resulting changes in the mean water level. These currents play a major role in the movement of sediment in the nearshore region.

(4) The sediment transport model predicts the transport, deposition, and erosion of sediments in open coast areas as well as in the vicinity of tidal inlets. It accounts for both tides and wave action by using for input the results of WIFM, RCPWAVE, and CURRENT in terms of tidal elevations and currents, wave climate information, wave-induced currents, and setups at the centers of grid cells. The model computes transport separately for straight open coast areas, and areas in the vicinity of tidal inlets. In the case of straight open coast areas, transport inside and outside the surf zone is treated separately.

(a) Transport inside the surf zone. Inside the surf zone, it is the wave-breaking process that is primarily responsible for the transport of sediment. This process is quite complex and not entirely understood. There is even disagreement on the primary mode (bed load or suspended load) of sediment transport in the surf zone. Thus, a model that determines transport in the surf zone must be empirical to some degree in its formulation. The surf zone transport model is based upon an energetics concept which considers that the wave orbital motion provides a stress that moves sediment back and forth in an amount proportional to the local rate of energy dissipation. Although there is no net transport as a result of this motion, the sediment is in dispersed and suspended state so that a steady current of arbitrary strength will transport the sediment. Thus, breaking waves provide the power to support sediment in a dispersed state (bed and suspended load), while a superposed current (littoral, rip, tidal, etc.) produces net sediment transport.

(b) Transport beyond the surf zone. Beyond the surf zone, waves are not breaking. Currents (tidal, littoral, rip, etc.) still transport sediments, but the sediment load is much smaller than the load in the surf zone. Waves still assist in providing power to support sand in a dispersed state. However, there is little turbulent energy dissipation, and frictional energy dissipated on the bottom represents most of the energy dissipation. Bed load is the primary mode of sediment transport beyond the surf zone. Since beyond the surf zone it is the tractive forces of currents (including wave orbital velocity currents) that produce sediment movement, an approach is applied which considers sediment transport by such currents which may exist in the area. Again, since the complete physics of the problem is not entirely understood, a semiempirical approach must be undertaken. To model this zone, the approach of Ackers and White (1973) is followed, after appropriate modification for the influence of waves.

(5) The CIP (Coastal and Inlet Processes Numerical Modeling System) has been applied by WES to the entrance region of Kings Bay Naval Submarine Base, Georgia. The sediment transport model was verified by comparing computed erosion and deposition rates in the navigation channel with those obtained from field surveys. There was good agreement both with respect to trends and magnitudes.

b. Shoreline Change Model. A numerical model for predicting shoreline evolution has been developed by Le Mehaute and Soldate (1980), which evaluates long-term three-dimensional beach changes. The combined effects of variations of sea level, wave refraction and diffraction, loss of sand by density currents during storms, by rip currents, and by wind, bluff erosion and berm accretion, effects of man-made structures such as long groins or navigation structures, and beach nourishment are all taken into account. A computer program has been developed with various subroutines which permit modifications as the state-of-the-art progresses. The program has been applied to a test case at Holland Harbor, Michigan.

c. N-Line Sediment Transport Model. An implicit finite-difference, N-Line numerical model has been developed by Perlin and Dean (1983) to predict bathymetric changes in the vicinity of coastal structures. The wave field transformation includes refraction, shoaling, and diffraction. The model is capable of simulating one or more shore-perpendicular structures, movement of offshore disposal mounds, and beach fill evolution. The structure length and location, sediment properties, equilibrium beach profile, etc., are user-specified along with the wave climate. The N-Line model has been used to simulate sediment transport of dredged material disposal in the vicinity of Oregon Inlet, North Carolina.

d. CELC3D Sediment Transport Model.

(1) The most recent advance in the area of mathematical modeling of coastal currents and sediment dispersion (resuspension, transport, and deposition), as well as the state of the art at the present time has been conducted by Sheng and Butler (1982) and Sheng (1983). An efficient, three-dimensional, and comprehensive numerical model of coastal currents, CELC3D (Coastal, Estuarine, and Lake Currents; Three-dimensional), has been developed and is operational. The authors have provided a thorough quantitative analysis of the role of turbulence in affecting the deposition, entrainment, and transport of cohesive sediments. Detailed dynamics within a turbulent boundary layer, under pure wave or wave-current interaction, has been studied by means of a turbulent transport model. Model predictions compare well with prototype data and are more accurate than simpler parametric models. Dispersions of sediment due to tidal currents, wind-driven currents, and waves have been studied. Waves were found to be generally more effective in causing entrainment (resuspension) of sediments.

(2) Physical models, field studies, and laboratory investigations were utilized to aid in the ultimate construction of CELC3D. Special features of CELC3D include:

(a) A "mode-splitting" procedure which allows efficient computation of the vertical flow structures (internal model).

(b) An efficient alternating direction implicit (ADI) scheme for the computation of the vertically-integrated variables (external mode).

(c) An implicit scheme for the vertical diffusion terms.

(d) A vertically and horizontally stretched coordinate system.

(e) A turbulence parameterization which requires relatively little tuning.

(3) Slowly varying currents and wave orbital velocities generally both contribute to the generation of bottom shear stress in shallow or intermediate waters. To remove empiricism from CELC3D simulation, Sheng (1983) used a dynamic turbulent model to predict the wave-current interaction within the bottom boundary layer. Calibration data were collected at a 90-meter water depth site about 1 kilometer off the California coast during the Coastal Ocean Dynamics Experiment (CODE-1) program. Due to the relatively long fetch from the north, high seas (6-8 feet) were typical, and wavelengths were sufficiently long for the wave to feel the bottom. Velocity profiles (averaged over 6-minute intervals) at this site showed typical logarithmic variation

with height above the bottom. The values of the frictional velocity, u_*, were typically between 0.22 and 0.66 centimeter per second. Using reference velocities at 1 meter, these u_* values correspond to drag coefficients of 0.019 and 0.026, respectively. Corresponding values of the effective roughness height, z_o , in the presence of waves are 1.3 and 3.0 centimeters, respectively. These values are an order of magnitude greater than the z_o based on physical roughness alone.

B-6. Water Quality Models. Historically, the analysis of water quality has concentrated on the dissolved oxygen (DO) and biochemical oxygen demand (ROD). The balance between DO and BOD concentrations was the result of two processes: the reaeration of the water column, and the consumption of DO in oxidation of BOD. Later emphasis has been on extending and refining the Streeter-Phelps formulation by using a more generalized mass balance approach and by the inclusion of additional processes such as benthic oxygen demand, benthic scour and deposition, photosynthesis and respiration of aquatic plants, and nitrification. The more comprehensive water quality models have been developed to include the nitrogen and phosphorus cycle and the lower trophic levels of phytoplankton and zooplankton. A number of investigations have modeled the algal nutrient silica. Selected chemical constituents have been modeled by assuming thermodynamic equilibrium. The fate of toxicants such as pesticides, metals, and PCB’s is very complicated, for they involve adsorption-desorption reactions, flocculation, precipitation, sedimentation, volatilization, hydrolysis, photolysis, microbial degradation, and biological uptake. Selection of a water quality methodology requires consideration of Water Quality Constituents and Dimensional and Temporal Resolution.

a. Water Quality Constituents. The water quality constituents most frequently simulated include salinity, light, temperature, DO, ROD, coliform bacteria, algae, nitrogen, and phosphorus. Each of these constituents interacts with the others, but the significance of their dependencies varies among constituents, and their inclusion in a numerical water quality model depends upon the study objectives and the water body under consideration. The environmental impact analysis of most coastal shore protection projects can use salinity and DO as indices of environmental change. Salinity plays a dominant role in physio-chemical phenomena such as flocculation of suspended particulates, is used as a variable to define the habitat suitability for aquatic organisms, and is frequently employed as a conservative tracer to calibrate mixing parameters. Dissolved oxygen is a respiratory requirement for most organisms and is used as a measure of the "health" of aquatic systems. Dissolved oxygen can be used to evaluate the environmental significance of stratification resulting from channel deepening and realignment of deep-draft navigation projects, or most other coastal shore protection projects.

b. Dimensional and Temporal Resolution.

(1) In a numerical water quality model the choice is between a one-dimensional model and one that incorporates two or three spatial dimensions.

A long, narrow, and vertically well-mixed water body may be represented by a one-dimensional model consisting of a series of segments averaged over the cross section. Where there is pronounced vertical stratification, it is likely that a laterally averaged two-dimensional model will be needed. In other situations where there are marked lateral inhomogeneities that are accompanied by pronounced stratification, a three-dimensional model may be required. Most existing water quality models are one-dimensional, Practical application of two-dimensional laterally and depth-integrated models has been made and is feasible. The Corps has recently developed and applied three-dimensional water quality models.

(2) The basis of all water quality models is a velocity field either specified by empirical measurements or computed by numerical hydrodynamic models. The current trend in hydrodynamic modeling is toward development of three-dimensional models with increased spatial and temporal resolution in order to resolve important scales and minimize the need for parameterization. As a result, modern time-dependent hydrodynamic models normally have time steps on the order of minutes to 1 hour. The chemical and biological equations of water quality models have characteristic time scales determined by the kinetic rate coefficients. These time scales are usually on the order of 1 to 10 days. The phenomena of interest, such as depletion of DO and excessive plant growth, occur on time scales of days to several months. Direct coupling of hydrodynamic and water quality models may provide unnecessary spatial and temporal resolution, and the high resolution water quality model results cannot be effectively interpreted or verified. Present field sampling programs resolve constituent concentrations on the order of a kilometer to tens of kilometers in the horizontal, meters in the vertical, and days to weeks in time. In addition, the kinetic rate coefficients presently used in water quality models resolve dynamics on the order of days to weeks.

c. Numerical Water Quality Models. Linkage of the hydrodynamics and water quality using the same spatial and temporal grid is practical with one-dimensional and some two-dimensional models even for long-term simulations. However, long-term water quality simulations are computationally very expensive when water quality is directly coupled to two-dimensional vertically averaged and three-dimensional hydrodynamic models. Therefore, the Environmental Laboratory has developed not only one-dimensional and two-dimensional laterally averaged numerical water quality models that use the same spatial and temporal grid used by the hydrodynamic driver but also a method for averaging fine scale hydrodynamic data to drive a coarser scale water quality model for two-dimensional depth-averaged and three-dimensional applications.

(1) CE-QUAL-RIVI is a dynamic, one-dimensional (longitudinal) hydrodynamic and water quality model originally developed for flows in streams. Recent enhancements included provision for tidal boundary conditions and reversing flows. The hydrodynamic and water quality codes are separate but use the same spatial and temporal grid. Simulated water quality constituents include temperature, DO, CBOD, organic nitrogen, ammonia nitrogen, nitrate nitrogen, orthophosphate phosphorus, coliform bacteria, dissolved iron, and dissolved manganese.

(2) CE-QUAL-W2 is a two-dimensional laterally averaged hydrodynamic and water quality model developed for reservoirs and estuaries (Environmental Laboratory, Hydraulics Laboratory 1986). The water quality coding is arranged into hierarchial levels of complexity, allowing the user to select the level of water quality detail desired for a particular study. The first level of complexity deals with conservative and noninteractive constituents (e.g., conservative tracer and coliform bacteria), the second level with DO-BOD or DO-nutrient-phytoplankton dynamics, the third with PH and carbonated species, and the fourth level with reduced chemical species.

(3) The MULTIPLE-BOX model method consists, of driving a finite segment, box-type water quality model with temporally and/or spatially averaged hydrodynamic output. The box model segment sizes, time step, and dispersion coefficients are adjusted to assure that transport with the box model adequately reproduces that of the finer scale hydrodynamic/transport model. The EPA’s multiple-box model WASP (Water Quality Analysis Simulation Program) was selected as the transport framework for a versatile water quality model that could be interfaced with hydrodynamic model (Ambrose et al. 1986). WASP contains a variety of water quality kinetic algorithms that the user may select, including toxic substances. The WASP code may be applied in one-, two-, or three-dimensional configurations. The code does not compute hydrodynamics; the use of the WASP code requires hydrodynamic input. A methodology for spatially and temporally averaging hydrodynamic output is being developed by WES.

B-7. Ecological Models. Ecological models include numerous biological species and emphasis food chain and species interactions. No general ecological model exists. Existing ecological models are site-specific and dependent upon the local aquatic community. The Environmental Laboratory at WES serves as a clearinghouse for Corps inquiries and is becoming an active participant in ecological model application.

B-8. Modeling Systems.

a. Consideration has been given to some of the more important aspects of numerical model selection and application. Hydrodynamic, sediment transport, water quality, and ecological models may not be considered as individual entities. The various models must be coupled, or the output of one model must be used as input to a subsequent model. If the applicable models are to be used efficiently and economically, the data transfer between the models must be considered and steps must be taken to ensure output-to-input compatibility. In modeling there are, in addition to the modeling itself, data to be collected, analyzed, and put into appropriate data bases. Each of these activities requires substantial data processing, and the aggregate cost of these activities may far exceed the cost of the actual modeling exercise. Also associated with most studies are other requirements, such as reports, which lead to additional data processing for such activities as computer graphs. The development of the models and other programs requires a broad spectrum of technical talents, and the execution of a comprehensive study may require the interaction of several individuals.

b. A comprehensive, integrated system of modeling and utility programs, which are documented to the extent that the system may be understood and used by the various individuals participating in the study, is essential to an effective study. Such systems are emerging. The WES Hydraulics Laboratory has developed a system for Open Channel Flow and Sedimentation (TABS-2) that uses depth-averaged finite element models to predict hydrodynamics, salinity, and sediment transport. The WES Environmental Laboratory has developed the one-dimensional (CE-QUAL-RIVI), the two-dimensional laterally averaged (CE-QUAL-W2) (in conjunction with the Hydraulics Laboratory), and the arbitrarily dimensioned multiple-box model. The WES Coastal Engineering Research Center has developed and made operational an efficient, comprehensive, and three-dimensional numerical model system of coastal currents and sediment transport, CELC3D, which provides for the resuspension, transport, and deposition of coastal sediments where sediment particle dynamics is modeled by a consideration of particle groups and coagulation processes. The emergence of such comprehensive systems is a significant aspect of the advancement of numerical modeling of the environmental engineering aspects of coastal shore protection projects.

Section II. Physical Models

B-9. Physical Coastal Models.

a. Earlier sections of this EM discuss specific considerations that must be addressed to evaluate the impacts of coastal shore protection projects on hydrodynamics, sediment transport, water quality, biological, or ecological conditions. One of the tools that often is applied to make the necessary predictions of these conditions is the physical coastal model. This section provides a brief description of physical coastal modeling and its relation to other models. It is intended to familiarize engineers and scientists with the use of this technique in preparing impact studies. The relative strengths and weaknesses are discussed so that, depending on the specific situation, physical coastal models might be considered in a modeling strategy. The basis and methods used in physical coastal modeling are also briefly described.

b. For projects in which dependable, accurate results warrant the additional expense, a physical coastal model study is recommended. This approach is especially recommended if the system is partially mixed or stratified in vertical salinity structure, or if it has a complicated geometry. Guidance for initiating physical (hydraulic) models studies is given in ER 1110-2-8102, ER 1110-2-1403, and related ER's. The Coastal Engineering Research Center's comprehensive report by Hudson et al. (1979) discusses physical models to assist in the solution of complex coastal engineering problems. This report provides information for use by both the laboratory research engineer and the field design engineer on the capabilities and limitations of coastal hydraulic modeling procedures. The report is intended to provide sufficient information to document the state of the art of scale modeling practiced by WES. It is also intended for field design engineers and other laboratory research engineers to better understand the principles of scale models and the application of these principles in the design, construction, and operation of scale hydraulic coastal models in the solution of problems involving the interaction of waves, tides, currents, and related sediment movements in estuaries, coastal harbors, coastal erosion, and stability of coastal structures and inlets. Estuarine and coastal physical hydraulic model studies performed at WES usually require from 18 to 48 months, and cost approximately $20 per square foot of model to build, and approximately $20,000 per month to operate (1986 dollars).

c. Physical coastal models are scaled representations of a coastal problem area under study. Seawater supply, tide generators, wave generators, and gaged freshwater inflows are necessary appurtenances. The models are often molded in concrete between closely spaced templates, although many coastal models are constructed with movable-bed boundaries. Instrumentation may be mounted on the models or experimental samples may be withdrawn from the models to measure such attributes as water surface elevation, current speed and direction, salinity, and tracer concentrations. Water surface tracers and dye patterns are often photographed to qualitatively and quantitatively examine their behavior or patterns of flow.

d. Boundaries and features of models should be carefully planned. A physical coastal model is designed and constructed to include the region of interest and any other areas necessary so that boundary data or conditions can be satisfactorily applied. If the effects of assimilative capacity on the area of interest are to be tested, effluent outfalls or diffusers are included in model design and construction. If all the modifications to be tested in the model study are anticipated at the time of model design, provisions can be made to make them quickly and much less expensively.

B-10. Similarity Criterion.

a. In any coastal model study, the physical phenomena observed in the model should represent those phenomena occurring in the prototype, so that the prototype action can be predicted by operating the model. The general theory of model design is based on the fundamental principle that a functional relationship exists among all the variables associated with the system. Further, the number of variables can be significantly reduced by forming a complete set of dimensionless variables for which a new function expressing the relationship between the dimensionless terms exists. If the model is designed so that each of the dimensionless terms of the complete set is the same in the model as in the prototype, then the nature of the unknown function is identical for the model and the prototype. If all these conditions are satisfied, the model is considered a "true" model which provides accurate information concerning the behavior of the prototype.

b. Although space limitation for the construction of the model may sometimes dictate that the model be distorted, a physical model can usually be operated with the same linear scale in all three dimensions (i.e. an undistorted-scale model). This undistorted-scale model dictates that geometric similarity exists, as the ratios of all homologous dimensions on the model and prototype are equal. In addition to geometric similarity, a true undistorted-scale model requires that kinematic similarity and dynamic similarity also exist. Kinematic similarity exists when the ratios of all homologous velocities and accelerations are equal in the model and prototype. Dynamic similarity requires that the ratios of all homologous forces be the same in the model and prototype. Since force is related to the product of mass and acceleration, dynamic similarity implies the existence of kinematic similarity which, in turn, implies the existence of geometric similarity.

c. For dynamic similarity, the ratio of the inertial force between model and prototype must be the same as the ratio of the individual force components between the model and prototype. The ratios of the inertial force to the other component forces must also be the same between model and prototype. These ratios have developed a reference to specific names, such as the ratio of the inertial force for the pressure force as:

$$E_n = \frac{F_i}{F_{pr}} = \frac{p}{\rho V^2} \text{ (Euler No.)} \qquad \text{(B-1)}$$

$$F_n = \frac{F_i}{F_g} = \frac{V}{(gL)^{1/2}} \text{ (Froude No.)} \qquad \text{(B-2)}$$

$$R_n = \frac{F_i}{F_\mu} = \frac{VL\rho}{\mu} \text{ (Reynolds No.)} \qquad \text{(B-3)}$$

$$W_n = \frac{F_i}{F_{st}} = \frac{\sigma}{\rho V^2 L} \text{ (Weber No.)} \qquad \text{(B-4)}$$

Since only three of these equations are independent, the Euler number will automatically be equal. in the model and prototype if the other numbers are equal. For the remaining three equations,

$$\left[\frac{V}{(gL)^{1/2}}\right]_r = \left(\frac{VL\rho}{\mu}\right)_r = \left(\frac{\sigma}{\rho V^2 L}\right)_r = 1 \qquad \text{(B-5)}$$

It can be demonstrated that no single model fluid will permit all of these equations to be satisfied at once. Therefore, absolutely true dynamic and kinematic similarity apparently cannot be achieved between a model and the prototype. However, one or more of the specific forces are often found to be negligible, and the number of equations to be satisfied can be reduced accordingly. In fact, the phenomena in a particular instance often involve the effect of only one force ratio, and the others are negligible.

d. The use of water as a model fluid is usually necessary in physical coastal models. Surface tension, the least important term if the depths of the fluid are not excessively small, will have a negligible effect on the flow of water more than 0.25 foot deep, or on waves with lengths exceeding about 1 foot in the same water depth. By ensuring that the flow and waves exceed these limiting values, the effect of surface tension can be neglected.

e. When both viscous and gravity forces are important, the Froude and Reynolds numbers should both be satisfied simultaneously. This requirement can only be met by choosing a special model fluid. Since water is the only practical model fluid, an approximate similarity requirement may be used, based on empirical relationships which include the major effects of frictional forces (such as Manning's equation). Since fairly high Reynolds numbers are usually associated with tidal flows through coastal models, the shear stresses are primarily determined by form drag. The use of Manning's formula as a similarity criterion requires that the flow be fully rough turbulent in both the model and prototype. When a bulk Reynolds number, defined as Vd/• , is greater than about 1,400 (where d is the depth of flow and • is the kinematic viscosity), fully rough turbulence will normally exist. A surface gravity wave is essentially a gravitational phenomenon; therefore, the controlling criterion of similitude is the Froude number, and waves may be represented correctly in undistorted-scale coastal models.

f. There are several physical interpretations that may be given the Froude number, but fundamentally it is the ratio of inertial to gravitational forces acting on a particle of fluid. It can be shown that this ratio reduces to $V/(gL)^{1/2}$, where V is a characteristic velocity, and L is a representative length. Here the velocity is taken to be a horizontal length divided by the time parameter. However, any representative velocity and any representative length can be used in the Froude number as long as dynamic similarity is maintained and corresponding regions are considered in the model and prototype. The Froude number, defined as $V/(gd)^{1/2}$, is related to the vertical scale (depth), so that the velocity ratios are equal to the square root of the depth ratios. The pertinent ratios required for geometric, kinematic, and dynamic similarity, based on the Froudian similarity criterion, are developed in Table B-1.

B-11. <u>Physical Coastal Model Design</u>.

a. After the purpose of the coastal model study has been defined, the actual design of the model can proceed. The significant steps are acquisition of prototype data to assure model accuracy, establishment of model limits, and definition and acquisition of model appurtenances.

TABLE. B-1

Froude Criteria Scaling Relationships for Physical Coastal Models

	Undistorted-scale model	Distorted-scale model
	Geometric similarity	
Length	L_r	
(horizontal)		$(Lh)_r$
(vertical		$(Lv)_r$
Area	L_r^2	
(horizontal)		$(Lh)_r^2$
(vertical)		$(Lh)_r(Lv)_r$
Volume	L_r^3	$(Lh)_r^2(Lv)_r$
	Kinematic similarity	
Time	$L_r^{1/2}$	$(Lh)_r/(Lv)_r^{1/2}$
Velocity	$L_r^{1/2}$	$(Lv)_r^{1/2}$
Acceleration	1	1
Discharge	$L_r^{5/2}$	$(Lh)_r(Lv)_r^{3/2}$
Kinematic viscosity	$L_r^{3/2}$	$(Lv)_r^{3/2}$

(Continued)

TABLE B-1 (Continued)

	Undistorted-scale model	Distorted-scale model
	Dynamic similarity	
Mass	L_r^3	$(Lh)_r^2(Lv)_r$
Force	L_r^3	
(horizontal)		$(Lh)_r^3$
(vertical)		$(Lh)_r^2(Lv)_r$
Dynamic viscosity	$L_r^{3/2}$	$(Lv)_r^{3/2}$
Surface tension	L_r^2	$(Lh)_r^2$
Pressure intensity	L_r	$(Lv)_r$
Impulse and momentum	$L_r^{7/2}$	$(Lh)_r^2(Lv)_r^{3/2}$
Energy and work	L_r^4	$(Lh)_r^2(Lv)_r^2$
Power	$L_r^{7/2}$	$(Lh)_r(Lv)_r^{5/2}$

b. The importance of accurate prototype data cannot be overemphasized in model operation. The accuracy of the model is dependent on the use of proper field data. Although the similitude of fixed-bed, undistorted-scale models indicated that good approximation of bed-form losses can be derived in the model, assurance of accurate model results can only be achieved through a comparison of model and prototype results. To assure that the model is a geometric reproduction of the prototype, hydrographic and bathymetric surveys must include the pertinent bay and ocean approaches that influence the study region.

c. The final proof of model effectiveness is a comparison of current velocities and water surface elevations in both the model and the prototype. The requirements for a particular coastal model can vary extensively; however, a limited number of critically placed tide gages and wave gages, along with carefully located velocity stations, can provide enough information for confidence in the model operation.

d. The appurtenances required for an effective model study include:

(1) A tidal reproducing system for the ocean.

(2) A tide reproducing system for the bay if the bay is not completely modeled.

(3) Wave generator or generators.

(4) Tidal height measuring and recording system.

(5) Velocity measuring and recording system.

(6) Wave measuring and recording system.

(7) Photographic capabilities.

(8) Specialized equipment appropriate to the specific study under evaluation.

Each of these systems requires proper planning in designing the model as construction of the model depends on advanced knowledge of the specific requirements of each system.

B-12. Physical Coastal Model Construction.

a. Among the details that must be planned in model construction are the various modifications (plans) which will be evaluated during the model study. If, for example, the effects of dredging a feature (navigation channel, harbor, turning basin, etc.) are evaluated, the construction of the model should be based on this information. The templates prepared from detailed hydrographic and bathymetric maps to assure that the model is a true representation of the prototype should be modified to include the deepest possible navigation channel, deposition basin, turning basin, etc. This modification would allow the study of these features in later stages of the model testing program. A second set of templates can then be installed in the molded model to allow features of lesser depth to be incorporated into the model. Tests can then be conducted with the conditions of lesser depth in the model; when tests are completed, conversion of the model to evaluate a proposed change can be easily accomplished.

b. The construction of the coastal model requires the proper planning and sequencing of:

(1) Basic site preparation.

(2) Installation of buried features (i.e., pipelines, required bases for instrumentation support systems, etc.).

(3) Installation of control templates.

(4) Installation of base material.

(5) Placement of material (concrete, sand, etc.,) forming the model.

(6) Finishing the model for the desired surface texture.

(7) Fabrication and installation of tide-generating capabilities.

(8) Installation of wave generators, velocity recording systems, tide recording systems, wave recording systems, and photographic capabilities.

(9) Installation of other specialized monitoring equipment necessary to evaluate effects of proposed coastal projects on specific environmental or ecological parameters.

B-13. Fixed-Bed, Undistorted-Scale Coastal Models.

a. For coastal studies not concerned with the movement of sediments, fixed-bed models can often be easily developed to provide kinematic and dynamic responses indicative of the prototype conditions. Specifically, fixed-bed models reveal information regarding velocities, discharges, flow patterns, water surface elevations, and energy losses between points in the prototype. In the superposition of surface gravity waves on the fixed-bed flow conditions, an undistorted-scale model ideally provides greater insight at less effort into the refraction and diffraction phenomena associated with the wave passing the underwater topography and around coastal features. Accordingly, the fixed-bed, undistorted-scale model can be effectively used for the analysis of kinematic and dynamic conditions associated with waves, current intensities and patterns, discharges, and forces existing along coasts and in bays or estuaries.

b. A fixed-bed model (although not is primary purpose) may also be useful in studying shoaling of entrance and interior inlet channels. Saltwater intrusion and the effects thereon of proposed changes in the physical or hydraulic regimes of the system can be effectively studied by fixed-bed models. The diffusion, dispersion, and flushing of wastes discharged into coastal regions, as well as the hydraulics as related to location and design of channels suitable for navigation, can be expediently studied. Tidal flooding by hurricane surges or other tidal phenomena can also be readily analyzed.

(1) Model verification.

(a) The verification of a fixed-bed, undistorted-scale coastal model consists basically of conducting sufficient tests in the model to reproduce model boundary conditions (i.e., ocean tides, ocean waves, bay tides, and current velocities). The model data are then compared with prototype data for duplicate locations in the model and prototype to define the accuracy with which the model reproduces the prototype. If reproduction of the prototype is not achieved, the differences are evaluated for possible sources of error. Frequently, the differences are a result of either incorrect location of roughness in the model or improper magnitude of model roughness. If the comparison shows isolated stations to differ, the differences are usually caused by incorrect model results or erroneous prototype data collection. Repeating the model test will clearly indicate which of these causes produced the difference between the model and prototype information. If it is concluded that the model data were in error, then new model data can be quickly obtained.

(b) Model verification can also include definition of the model operating characteristics required to achieve reproduction of fixed-bed shoaling patterns throughout the coastal model. This procedure consists of a trial-and-error operation until the model operating conditions required to reproduce known changes in prototype shoaling are developed.

(2) Model tests.

(a) Tests in undistorted-scale, fixed-bed models can provide useful information on not only the hydrodynamics of a coastal region but also the expected changes to the hydrodynamics due to changes in the region. An effective model test program should include initially a complete set of tests to define the conditions that exist in the model for hydrographic, bathymetric, topographic, and hydraulic conditions for which the model was verified. These data then form the base conditions to which all future tests can be compared to evaluate the effects of changes to the coastal area under consideration.

(b) The data obtained from the model for the base conditions should include: detailed current velocities at critical locations throughout the model for a complete tidal cycle, detailed surface current patterns of the entire area of interest at incremental times throughout the tidal cycle, detailed wave characteristics throughout the inlet for an array of expected prototype conditions, and a complete documentation of tidal elevations throughout the area of interest. The evaluation of a particular proposed change in the model duplicates the procedure followed in obtaining a base set of data and compares the results of each set of data.

B-14. Fixed-Bed Distorted-Scale Coastal Models.

a. Physical coastal models are frequently distorted for various reasons. Many regions of interest are large and flood and ebb tidal deltas may be quite shallow, leading to large model energy attenuation and viscous friction scale effects on waves. These effects can be minimized through distortion and at the same time decrease model costs. Reproduction of the entire tidal estuary in the model is often desirable, since inclusion of the tidal estuary results in the flexibility to study the effects of proposed improvements on the tidal prism, tidal circulation, tidal flushing, and salinity of the estuary. Inclusion also results in the correct nonlinear energy transfer from various tidal constituents to higher order harmonics. Deletion of a major part of the estuary leaves reproduction of this phenomenon more uncertain.

b. Distorted-scale models for use in the study of coastal harbors, inlets, etc., have generally been universally accepted. The horizontal scale ratio is often dictated by the size of the facility in which the model is placed or the construction cost. The vertical scale ratio needs not be larger than the ratio of model measurement accuracy to prototype measurement accuracy. The accuracy of laboratory measurements of water surface is generally on the order of 0.001 foot; the accuracy of prototype measurements varies with equipment and field conditions but is generally within 0.1 foot. Thus, a vertical scale ratio, model-to-prototype, of 1:100 will fully utilize the capabilities of the model in simulating the prototype. Models of larger vertical scale are often used to simplify operational techniques and to assure model depths larger enough that surface tension does not affect flow.

c. A second factor to be considered in the selection of scales is the "distortion." Distortion is the ratio of the horizontal scale to the vertical scale, and its value relates the order that all slopes of the prototype are steepened in the mode. In the study of coastal regions, particularly with movable-bed models, efforts are made to design models with distortion values of five or less. Otherwise, the slopes required in the movable-bed model for accurate reproduction of the prototype may be steeper than the angle of repose of the model material, thus creating a difficult scale effect to overcome. This point is emphasized because coastal models are often constructed with both a fixed bed and a movable bed, and with a distorted scale. Vertical scale ratios, model-to-prototype, are generally in the order of 1:40 to 1:100; horizontal scale ratios are generally in the order of 1:100 to 1:500.

d. Distorted-scale coastal models are frequently constructed for multiple purposes, e.g., an investigation of an inlet may be necessary where a jetty is to be installed. A prediction will be required of the effects of the jetty on tidal currents and water levels near the inlet and also the degree to which the jetty interrupts the littoral drift and affects deposition patterns near the inlet. Other water quality and biological questions may also be addressed in such a coastal model study at the same time. In this case, a multipurpose model is needed. This model would first be built with a distorted-scale, fixed-bed design and then adjusted and tested to determine the effects of the jetty on tidal heights and currents. A segment of the fixed part of the model surface would then be carefully removed and replaced with a movable material to evaluate the effects of the jetty on the littoral drift or other phenomena of interest.

e. Model verification and testing in a distorted-scale, fixed-bed model follow essentially the same procedures as for an undistorted-scale, fixed-bed model. However, because of distortion effects, the transference equations from the model to a prototype situation are, in general, completely different.

B-15. Movable-Bed Coastal Models.

a. Theoretical Aspects of Movable-Bed Modeling.

(1) The movement of loose bed material is governed by the inertial forces of the particles and of the water against them, by the weight of the particles, and by the viscous forces acting between the water and the particles. Three physical laws have evolved from an analysis of these forces: Newton's law of inertia, the law of gravitation, and the viscous friction law of Newtonian fluids. These laws have provided two well-known dimensionless terms which must be equated between the model and the prototype for kinematic and dynamic similarity to prevail; i.e., the Reynolds Number, R_n, and the Froude Number, F_n, expressed as

$$R_n = \frac{Vd}{\nu} \tag{B-6}$$

and

$$F_n = \frac{V}{(gd)^{1/2}} \tag{B-7}$$

where V is the fluid velocity, d is the depth of flow, • is the fluid kinematic viscosity, and g is the acceleration of gravity.

(2) The simultaneous conformation of the model and prototype to both the Reynolds number and Froude number yields the familiar problem that the length-scale factor becomes a function of the scale factor of the kinematic viscosity. This function determines that no readily available fluid possesses the kinematic viscosity to make a useful model fluid. Schuring (1977) reasons that since the same fluid for model and prototype provides less than perfect similarity but probably must be used, design requirements can be relaxed if the inertial forces of the sediment are much smaller than the rest of the forces and, therefore, can be neglected. Then Newton's law of inertia must only be applied to the fluid. A further simplification, without loss of

generality, is achieved by restricting the law of gravitation to the weight difference of water and sediment. With these two modifications, a qualified Froude number evolves, often referred to as a densimetric Froude number, and the length-scale factor is freed from its dependence on kinematic viscosity:

$$F_* = \frac{V}{\left[\left(\frac{\rho_s}{\rho_w} - 1\right) gd\right]^{1/2}} \qquad \text{(B-8)}$$

The penalty for this simplification is a restriction of the particles to a state of rolling or sliding with small or no inertial forces acting upon them. The model becomes invalid when the particles begin to leave the bed and are carried upward, such as in the surf zone or in relatively shallow water affected by surface gravity waves. Very good correlation between variables was achieved in flume experiments with unidirectional flow (Schuring 1977).

(3) A different approach, advanced by Gessler (1971), assumes that both the prototype sediment and the material used as model sediment are given, and the model geometric scales are determined to fit the requirements of these materials. In this approach, supplemental information should be used in the form of the Shields parameter regarding the critical tractive force necessary to produce incipient motion. However, model scales based on the principles of unidirectional motion may not be strictly applicable to the case of oscillatory wave motion, but a first approximation is probably permissible. By setting a lower limit to the model Reynolds number and computing the prototype Reynolds number, the ratio of the prototype-to-model Reynolds number will determine the scale of the characteristics length used in the vertical direction of the model. In this procedure, it is assumed that the ratio of model-to-prototype velocity is a function only of the depth ratio, as determined by the Froude law.

(4) If the model sediment material has not been selected beforehand, a revised approach can be developed (Gessler 1971). To have similarity in incipient motion and bedload transport, the bed mobility in the model and prototype should be the same at homologous points. This mobility is determined by the ratio of the actual Shields parameter to the critical Shields parameter. The reason for this modification in approach is that the critical Shields parameter depends somewhat on the grain Reynolds number for values below about 150. For ordinary model materials (fine-grained sands), the grain Reynolds number is on the order of 5 to 10. The Shields diagram is poorly verified in this range, so the grain Reynolds number should not be smaller than about 15. This grain Reynolds number can be achieved by using a coarser bed material in the model than in the prototype, but one that is less dense. The Shields parameter is

$$\tau_* = \frac{\gamma_w dS}{(\gamma_s - \gamma_w)D_s} \tag{B-9}$$

where S is the bed slope and d is the particle size. By using this definition and evaluating the ratio of the prototype-to-model Shields parameter, a generalized criterion will evolve which can be solved for the specific weight (submerged) of the bed material to be used in the model. The reason for using a lightweight material refers to the idea that the grain size is relatively too large in the model. The final selection of the model material will depend on the materials available; however, a slight adjustment in the desired grain size may be necessary.

(5) The analyses of Gessler (1971) are applicable only to unidirectional flow at one specific discharge; thus highly unsteady flow processes like surface gravity waves cannot adequately be modeled by this process. Changes in discharge require that the time scale of the discharges be modeled according to the time scale associated with the sedimentation process to obtain similarity in bed-forming processes. The considerable discrepancy between the hydrodynamic and sedimentological time scales means that the sedimentation processes are advancing too rapidly in the model. Gessler (1971) concludes that no matter how carefully the design is done, it remains absolutely essential for distorted-scale as well as undistorted-models to be verified against field data.

(6) When studying problems of scour and deposition, it becomes necessary to add the critical shear stress and sublayer criteria to the gravity and frictional criteria, as developed by Graf (1971). Introducing the empirical relationship between the bed particle diameter and Manning's n value produces

$$(d_r)^{1/6} = n_r = (R)_r^{2/3} \left(\frac{1}{L_{h_r}}\right)^{1/2} \tag{B-10}$$

where d is the bed particle diameter and R is the hydraulic radius. When model and prototype fluids are identical, four independent variables are found, and three equations provide a solution. The problem is determined if one of the four parameters is chosen, and the remaining three variables are found from the equation solutions. A distorted-scale model was assumed in this analysis. Various researchers have stated that some model laws can be relaxed with little harm to the overall investigation. Einstein and Chien (1954) suggested that the friction criterion, the Froude criterion, or the sublayer criterion might absorb further distortions. Under certain circumstances, small deviations from the exact similarity may be allowed, making it possible to arbitrarily select more than one single variable.

(7) For the application of strictly coastal sediment modeling problems, Migniot et al. (1975) have stated that since all of the similitude conditions involved cannot be satisfied, the model scales, the material size and density, and the current exaggeration cannot be determined by straightforward computations but must be chosen to obtain the most favorable balance between all relevant phenomena. In many respects, movable-bed physical modeling is more an art than a science. A feeling of the problem, previous experience, and a perspective of the relative importance of each factor are of paramount value in applying the method. The sedimentological time scale can be derived from general transport formulas. When sand is simulated with a lightweight material such as plastic with a density of 1.4, the sedimentological time scale will be in the range of 1:1,000 which means that a year will correspond to some 8 hours of model time. Although it is disquieting to note that so much empiricism prevails in the design of coastal movable-bed models, the model is only fit for predictive use when it has successfully reproduced past evolution. While the various similitude conditions may not all be satisfied, the conditions do not differ too much from each other, so fairly satisfactory compromises can usually be found. For instance, model material density required to satisfy these various prototype conditions may typically vary from 1.3 to 1.6, while size exaggeration may vary from 1.0 to 1.7.

(8) The movable-bed coastal model by Kamphuis (1975) is a wave model incorporating coupled wave motion and sediment motion relationships which have been determined experimentally. The unidirectional flow phase is then added to the basic wave model and adjusted to yield correct results for different situations. This philosophy is basically different from Le Méhaute (1970) who assumed that a coastal movable-bed model is a unidirectional flow model modified by waves. The difference in scale laws is quite evident when the results of their models are compared.

(9) According to Kamphuis (1975), the movable-bed phase of the model study is subjected to four relaxed basic scaling criteria: the particle Reynolds number, the densimetric Froude number, the relative density, and the relative length-scale relating water motion to sediment size. Ideally, all of these basic scaling criteria must be satisfied simultaneously but cannot be satisfied in practice. As more of these criteria are ignored, the model will perform successively less like the prototype, and scale effects (nonsimilarity between model and prototype) increase. Only a lightweight material can be used to keep the model and prototype particle Reynolds number identical. Any deviation from unity is rather small (in all cases) and is not considered to limit the model seriously. Similarity of the densimetric Froude number is considered to be the most important of the four modeling criteria. If the model densimetric Froude number is less than some critical value and the prototype number is greater than this critical value, the model is useless. The model and prototype densimetric Froude numbers should be equal, or incorrect scaling will result in considerable distortion of the sediment motion parameters with exaggerated time scales for sediment motion, and the model will take longer to move the material than it theoretically should. Thus, the sediment motion will start later in the model (in shallow water), but in the area where material moves freely, the nonsimilarity of the densimetric Froude

numbers will manifest itself in adjustment of the time scale for sediment motion. The time scale also varies with depth, and moreover, if initial motion and depositional patterns are important, it is necessary to model the densimetric Froude number correctly.

(10) The nonsimilarity of the model and prototype ratios of sediment particle density to water density affects the process in two distinct ways. The acceleration of the particle is changed, and the particle becomes relatively too heavy when no longer submerged. For a lightweight material, the individual particles are relatively heavier in the surf zone than if sand were used. Therefore, the beach material has a tendency to pile up immediately past the surf zone, and the particles will remain in this location because they become relatively heavier when not submerged. As a result, there is a highly distorted version of sediment transport in the surf zone. It is very difficult to duplicate prototype conditions in the littoral zone using lightweight materials.

(11) Coastal movable-bed models suffer from various scale effects when the particle sizes are not scaled down geometrically. Since this fact is true for most coastal movable-bed models, the prediction of bed morphology time scales is virtually impossible. Thus, verification using historical survey data remains a necessary step. Because of the variety of scale effects, coastal movable-bed modeling continues to be as much an art as an exact science.

b. Prototype Data Requirements.

(1) Perhaps the most important aspect of the design phase of a movable-bed coastal model study is to assure the adequacy of the prototype data. The model is constructed to conform to prototype surveys; adjustment of the model to accurately reproduce prototype hydraulics or sedimentation patterns is based on prototype measurements. Any errors or insufficiencies in prototype information will result in inadequate and incorrect performance of the model.

(2) Prototype information required for a movable-bed coastal model study includes geometry and sediment properties, adjacent beach configuration, wave measurements, littoral drift estimates, water surface time histories, and synoptic tidal currents in the ocean, bay, inlets, and harbors. The occurrence of storms of low-return frequency should be noted, since large volumes of sand can be displaced during these activities. Hydrographic and wave observations should also be made frequently enough to detect seasonal and yearly fluctuations.

(3) A longer data collection period is needed for a movable-bed study than for a fixed-bed model. The period length also varies with the data type; e.g., longer term wave data are needed than tide level and current data to calibrate a movable-bed model. Prototype observations for several consecutive years before the model study will allow an evaluation of both short- and long-term tendencies of the coastal region -and the selection of a typical period on which to base the model verification. A three-year documentation period is

probably the minimum length, since major trends cannot usually be detected in shorter time periods.

c. Model Verification.

(1) The verification phase of a coastal movable-bed model study is perhaps the most important. A well-accomplished verification will minimize or eliminate the effects of small errors in construction and will allow the evaluation of the effects of poorly understood variables on the coastal region during the testing phase. Verification requires the adjustment of model boundary conditions to recreate or correct conditions that were altered in the scaling process. Sedimentation verification is based on prototype observations and is accomplished by selecting an appropriate model sediment and developing the necessary model operating technique to reproduce the observed scour and fill patterns. Verification of a coastal movable-bed model is, theoretically, more difficult than for a fixed-bed model. The purpose of a movable-bed model is to simulate the evolution of the coastal bathymetry. This evolution takes place in response to many factors, but primarily to the sediment washed from adjacent beaches by wave action, to erosion of the inlet channels by tidal currents, and to entrapment of material at the bars on the ocean and bay sides of the tidal inlets. Coastal harbors also accumulate littoral drift and shoal material. These same factors must be included in the model to simulate degree as well as type of bathymetry evolution.

(2) Since a movable-bed coastal model simulates shoaling and scouring patterns, the requirement that the model also simulate the basic hydraulic quantities (tidal heights, tidal phases, velocities, etc.,) is somewhat relaxed. In practice, the verification of a movable-bed coastal model is a little easier than for a fixed-bed model, since the experimenter has more variables available with which to work to achieve the desired verification. The validity of tests of proposed improvement plans in movable-bed model is based on the following premise: if model reproduction of the prototype forces known to affect movement and deposition of sediments (tides, tidal currents, waves, etc.) produces changes to model bed configuration similar to those observed in the prototype under similar conditions, then the effects of a proposed improvement plan on the movement and deposition of sediments will be substantially the same in both model and prototype.

(3) One of the most important reasons for the verification of a movable-bed coastal model is the establishment of the time scale with respect to bed movement. The model-to-prototype time scale for bed movement cannot be computed from the linear scale relations because the interrelation of the various prototype forces affecting movement and deposition of sediments is too complicated for accurate definition. Therefore, the time scale is determined empirically during the model verification; i.e., the actual time required for the model to reproduce certain changes that occurred in a given period of time in the prototype is used to determine the model time scale for bed movement.

d. Model Tests.

(1) The actual testing phase of a coastal movable-bed model is perhaps the easiest of all phases to accomplish. The model has been carefully designed and built based on measurements obtained from the prototype. The model has performed similarly to the prototype by responding to events to which it was subjected during verification in the same manner the prototype was observed to response when similar events occurred in its history. The model may now be justifiably expected to respond as the prototype would respond to an event or sequence of events, which has not yet occurred to the prototype at the particular point being investigated, for the same hydrography and operating conditions. This response of the model is termed the "predictive capability" of the model, since the behavior of the prototype under similar conditions can be inferred from that response.

(2) A model test series always involves at least two separate tests. The first test is a "base" test, which studies the existing coastal region and provides a basis for comparison with later tests that have alternative plans. The next test or tests in the series are the "plan" tests, so-called because the plan or plans for improving the coastal region are installed in the model and tested. The plan tests are always conducted with model conditions identical to those of the base test. This test procedure allows straightforward interpretation of the test results, as differences in results are attributable to the plan under investigation although some differences may occur because similitude criteria have not been completely satisfied.

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APPENDIX C

ENVIRONMENTAL PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS

C-1. Federal Statutes.

Clean Air Act of 1963, as amended, 42 U.S.C. 7401, et seq.

Clean Water Act of 1977, as amended (Federal Water Pollution Control Act), 33 U.S.C. 1344, et seq.

Coastal Barrier Resources Act of 1982, (16 U.S.C. 3501 Public Law 97-348).

Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451, et seq.

Deep Water Port Act of 1974, as amended, 33 U.S.C. 1501, et seq.

Endangered Species Act of 1973, as amended, 16 U.S.C. 1531, et seq.

Estuary Protection Act, 16 U.S.C. 1221, et seq.

Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), et seq.

Fish and Wildlife Coordination Act of 1958, as amended, 16 U.S.C. 661, et seq.

Historic Site Act of 1935, as amended, 16 U.S.C. 461, et seq.

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River and Harbor Act, 3 March 1899, 30 stat, 1151, 33 U.S.C. 401 and 403, and 30 stat, 1152, 33 U.S.C. 407, et seq.

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Wild and Scenic Rivers Act of 1968, as amended, 16 U.S.C. 1271 ,et seq.

Water Resources Development Act of 1986 (Public Law 99-662).

C-2. Executive Orders and Memoranda.

Protection and Enhancement of Cultural Environment, 13 May 1971 (E.O. 11593).

Floodplain Management, 24 May 1977 (E.O. 11988).

Protection of Wetlands, 24 May 1977 (E.O. 11990).

Protection and Enhancement of Environmental Quality (E .0. 11514, amended by EO 11991, 24 May 1977).

Environmental Effects Abroad of Major Federal Actions (E .0. 12114).

Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, 11 Aug 80).

Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory (CEQ Memorandum, 11 Aug 80).

Guidance on Applying Section 404 (r) of the Clean Water Act to Federal Projects Which Involve the Discharge of Dredged or Fill Materials into Waters of the U.S. Including Wetlands (CEQ Memorandum, 17 Nov 80).

C-3. Agency Regulations.

US Environmental Protection Agency:

Ocean Dumping Regulations and Criteria	(40 CFR 220-229)
Guidelines for Specifications of Disposal Sites for Dredged or Fill Material	(40 CFR 230)

Council on Environmental Quality:

Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act of 1969	(40 CFR 1500-1508)

Appendix D

Estuarine/Marine Species Profiles

D-1. Species Profiles: Published.

Biological Report (*)	Title	Date Published	
	Gulf of Mexico		
82/11.4	Spotted Seatrout	February	1983
82/11.3	Atlantic Croaker	February	1983
82/11.2	Gulf Menhaden	February	1983
82/11.1	Brown Shrimp	February	1983
82/11.14	Bay Anchovy and Striped Anchovy	October	1983
82/11.5	Sea Catfish and Gafftopsail Catfish	October	1983
82/11.20	White Shrimp	September	1984
82/11.29	Sheepshead	March	1985
82/11.30	Southern Flounder	April	1985
82/11.26	Pinfish	September	1984
82/11.31	Common Rangia	April	1985
82/11.35	Grass Shrimp	March	1985
82/11.36	Red Drum	June	1985
82/11.51	Black Drum	April	1986
82/11.55	Blue Crab	June	1986
82/11.64	American Oyster	July	1986
82/11.71	Pigfish	March	1987
82/11.72	Sand Seatrout and Silver Seatrout	March	1987
82/11.83	Red Snapper	August	1988
	South Florida		
82/11.16	Snook	October	1983
82/11.17	Pink Shrimp	October	1983
82/11.21	Stone Crab	March	1984
82.11.34	Striped Mullet	April	1985
82.11.39	White Mullet	May	1985
82.11.42	Florida Pompano	April	1986

* All Biological Reports are published under Technical Report EL-82-4, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

82/11.58	King and Spanish Mackerel	June	1986
82/11.52	Gray, Lane, Mutton, and Yellowtail Snapper	June	1986
82/11.54	Southern, Gulf and Summer Flounder	July	1986
82/11.61	Spiny Lobster	August	1986
8/11.43	Spotted Sea Trout	August	1986
82/11.73	Reef-Building Corals	August	1987
82/11.77	Long-Spined Black Sea Urchin	August	1987

South Atlantic

82/11.11	Atlantic Menhaden	October	1983
82/11.15	Summer Flounder	October	1983
82/11.19	Blue Crab	March	1984
82/11.25	Atlantic Sturgeon	July	1984
82/11.24	American Eel	July	1984
82/11.27	White Shrimp	September	1984
82/11.45	American Shed	April	1986
82/11.57	American Oyster	July	1986
82/11.75	Hard Clam	August	1987
82/11.91	Spot	January	1989
82/11.90	Brown Shrimp	January	1989

North Atlantic

82/11.7	White Perch	October	1983
82/11.18	Hard Clam	October	1983
82/11.23	American Oyster	July	1984
82/11.22	American Salmon	July	1984
82/11.33	American Lobster	April	1985
82/11.38	Atlantic Herring	April	1986
82/11.66	Sand Lance	June	1986
82/11.53	Softshelled Clam	June	1986
82/11.56	Alewife/Blueback Herring	July	1986
82/11.59	American Shad	July	1986
82/11.67	Sea Scallop	August	1986
82/11.76	Atlantic Tomcod	August	1987
82/11.74	American Eel	August	1987
82/11.80	Sandworm and Bloodworm	April	1988
82/11.87	Winter Flounder	January	1989

Mid-Atlantic

Ref. No.	Title	Date Published	
82/11.8	Striped Bass	October	1983
82/11.9	Alewife/Blueback Herring	October	1983
82/11.10	Atlantic Silverside	October	1983
82/11.12	Bay Scallop	October	1983
82/11.13	Surf Clam	October	1983
82/11.41	Hard Clam	February	1985
82/11.37	American Shad	April	1985
82/11.40	Mummichog and Striped Killifish	June	1985
88/11.65	American Oyster	July	1986
82/11.68	Softshell Clam	August	1986
82/11.94	Bluefish	February	1989
82/11.97	Bay Anchovy	February	1989
82/11.98	Spot	February	1989

Pacific Northwest

82/11.6	Chinook Salmon	October	1983
82/11.48	Coho Salmon	April	1986
82/11.63	Dungeness crab	August	1986
82/11.62	Steelhead Trout	August	1986
82/11.69	Amphipods	August	1986
82/11.78	Common Littleneck Clam	August	1987
82/11.81	Chum Salmon	March	1988
82/11.85	Pacific Oyster	September	1988
82/11.86	Sea-Pun Cutthroat Trout	January	1989
82/11.88	Pink Salmon	January	1989
82/11.89	Pacific Razor Clam	January	1989
82/11.93	Ghost Shrimp and Blue Mud Shrimp	January	1989

Pacific Southwest

82/11.28	California Grunion	February	1985
82/11.32	Black, Green, and Red Abalone	March	1985
82/11.44	California Halibut	April	1986
82/11.46	Common Littleneck Clam	April	1986
82/11.47	Spiny Lobster	April	1986
82.11.49	Chinook Salmon	April	1986
82/11.50	Northern Anchovy	April	1986
82/11.61	Steelhead	June	1986
82/11.70	Coho Salmon	August	1987

82/11.79	Pacific Herring	February	1988
82/11.82	Striped Bass	March	1988
82/11.84	California Sea Mussel and Bay Mussel	September	1988
82/11.95	Pismo Clam	February	1989
82/11.92	Amphipod	January	1989

D-2. Species Profiles: Unpublished.

South Florida

Ladyfish and Tarpon
Reef-Building Tube Worm
Black, Red and Nassau Grouper

South Atlantic

Bluefish
Black Sea Bass
Alewife/Blueback Herring
Fiddler Crab
Striped Bass

North Atlantic

Rainbow Smelt
Blue Mussel
Tautog/Cunner

Mid-Atlantic

Summer and Winter Flounder
Atlantic Menhaden
Blue Crab
Weakfish
Atlantic and Shortnose Sturgeon
Blue Mussel
Mud Fiddler Crab

Pacific Southwest

Crangonid Shrimp
Pile Perch and Striped and
Rubberlip Seaperch
Dungeness Crab

Brown, Copper, and Black Rockfishes
Pacific and Speckled Sanddabs
Rock Crabs: Brown, Red, and Yellow Crab

Pacific Northwest

Sockeye Salmon
English Sole
Pacific Herring
Geoduck
Dover and Rock Soles
Lingcod

GLOSSARY

TERMS

Accretion: May be either natural or artificial. Natural accretion is the buildup of land, solely by the action of the forces of nature, on a beach by deposition of water or airborne material. Artificial accretion is a similar buildup of land by reason of an act of man, such as the accretion formed by a groin, breakwater, or beach fill deposited by mechanical means.

Algae: Any of a group of nonvascular plants with chlorophyll, lacking true stems, leaves, and roots.

Anadromous: A life cycle in which maturity is attained in the ocean and adults ascend rivers and streams to spawn in fresh water (e.g., salmons, shad, etc.).

Anaerobic: An oxygen-independent type of respiration.

Backshore: That zone of the shore or beach lying between the foreshore and the coastline comprising the berm or berms and acted upon by waves only during severe storms, especially when combined with exceptionally high water.

Baseline data: Data used as a temporal control, collected prior to the environmental disturbance of interest.

Basin: A naturally or artificially enclosed or nearly enclosed harbor area for small craft.

Bathymetry: The measurement of depths of water in oceans, seas, and lakes; also information derived from such measurements.

Bay: A recess in the shore or an inlet of a sea between two capes or headlands, not so large as a gulf but larger than a cove.

Beach: The zone of unconsolidated material that extends landward from the low-water line to the place where there is marked change in material or physiographic form, or to the line of permanent vegetation (usually the effective limit of storm waves).

Benthic: Pertaining to the subaquatic bottom or organisms that live on the bottom of water bodies.

Benthos: A collective term describing (1) bottom organisms attached or resting on or in the bottom sediments, and (2) community of animals living in or on the bottom.

Berm: A nearly horizontal part of the beach or backshore formed by the deposit of material by wave action. Some beaches have no berms; others have one or several.

Biomass: The amount of living material in a unit area for a unit time.

Biota: The living part of a system (flora and fauna).

Breaker: A wave breaking on a shore, over a reef, etc.

Breakwater: A structure protecting a shore area, harbor, anchorage, or basin from waves.

Bulkhead: A structure or partition to retain or prevent sliding of the land. A secondary purpose is to protect the upland against damage from wave action.

Carrying capacity: The maximum number of individuals or biomass that any particular area can support over an extended period of time.

Channel: (1) A natural or artificial waterway of perceptible extent which either periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. (2) The part of a body of water deep enough to be used for navigation through a body of water otherwise too shallow for navigation.

Coast: A strip of land of indefinite width (may be several kilometers) that extends from the shoreline inland to the first major change in terrain features.

Continental shelf: The zone bordering a continent and extending from the low-water line to the depth (usually about 180 meters) where there is a marked or rather steep descent toward a greater depth.

Coral: (Biology) Marine coelentrates (Madreporaria), solitary or colonial, which form a hard external covering of calcium compounds or other materials. The corals which form large reefs are limited to warm, shallow waters, while those forming solitary, minute growths may be found in colder waters to great depths. (Geology) The concretion of coral polyps, composed almost wholly of calcium carbonate, forming reefs and tree-like and globular masses. May also include calcareous algae and other organisms producing calcareous secretions, such as bryozoans and hydrozoans.

Current: A flow of water.

Delta: An alluvial deposit, roughly triangular or digitate in shape, formed at a river mouth.

Demersal: Organisms (usually fish) that live on or slightly above the bottom.

Dissolved oxygen (DO): The amount of oxygen dissolved in water.

Dredge: An apparatus used in the removal of substrate usually to deepen water passages.

Dunes: Ridges or mounds of loose, wind-blown material, usually sand.

Ebb current: The tidal current away from shore or down a tidal stream; usually associated with the decrease in height of the tide.

Ebb tide: The period of tide between high water and the succeeding low water; a falling tide.

Eddy: A circular movement of water formed on the side of a main current. Eddies may be created at points where the main stream passes projecting obstructions or where two adjacent currents flow counter to each other.

Epibenthic: Organisms that attach themselves to structures (e.g. rocks) which lie on the aquatic bottom.

Erosion: The wearing away of land by the action of natural forces. On a beach, the carrying away of beach material by wave action, tidal currents, littoral currents, or by deflation.

Escarpment: A more or less continuous line of cliffs or steep slopes facing in one general direction which are caused by erosion or faulting (also scarp).

Estuary: (1) The part of a river that is affected by tides. (2) The region near a river mouth in which the fresh water of the river mixes with the salt water of the sea.

Fauna: The entire group of animals in an area.

Flora: The entire group of plants found in an area.

Forage: Food for animals especially when taken by browsing or grazing.

Foreshore: The part of the shore, lying between the crest of the seaward berm (or upper limit of wave wash at high tide) and the ordinary low-water mark, that is ordinarily traversed by the uprush and backrush of the waves as the tides rise and fall.

Geomorphology: That branch of both physiography and geology which deals with the form of the earth, the general configuration of its surface, and the changes that take place in the evolution of landform.

Groin: A shore protection structure built (usually perpendicular to the shoreline) to trap littoral drift or retard erosion of the shore.

Harbor: Any protected water area affording a place of safety for vessels.

Hydrolysis: A chemical process of decomposition involving splitting of a bond and addition of the elements of water.

Hypothesis: A tentative conclusion made in order to draw out and test its logical or empirical consequences.

Inlet: (1) A short, narrow waterway connecting a bay, lagoon, or similar body of water with a large parent body of water. (2) An arm of the sea (or other body of water) that is long compared to its width and may extend a considerable distance inland.

Inshore: The zone of variable width extending from the low-water line through the breaker zone.

Intertidal zone: See littoral zone.

Jetty: On open seacoasts, a structure extending into a body of water, which is designed to prevent shoaling of a channel by littoral materials and to direct and confine the stream or tidal flow. Jetties are built at the mouths of rivers or tidal inlets to help deepen and stabilize a channel.

Lee: Shelter, or the part or side sheltered or turned away from the wind or waves.

Levee: A dike or embankment to protect land from inundation.

Littoral transport: The movement of littoral drift in the littoral zone by waves and currents.

Littoral zone: The zone from high-tide level to edge of continental shelf.

Longshore: Parallel to and near the shoreline.

Macrofauna: Those animals equal to or larger than 0.5 millimeter in size.

Marsh: An area of soft, wet, or periodically inundated land, generally treeless and usually characterized by grasses and other low growth.

Mean high water (MHW). The average height of the high waters over a 19-year period. For shorter periods of observation, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19-year value. All high-water heights are included in the average where the type of tide is either semidiurnal or mixed. Only the higher high-water heights are included in the average where the type of tide is diurnal. So determined, mean high water in the latter case is the same as mean higher high water.

Mean low water (MLW): The average height of the low waters over a 19-year period. For shorter periods of observation, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19-year value. All low-water heights are included in the average where the type of tide is either semidiurnal or mixed. Only lower low-water heights are included in the average where the type of tide is diurnal. So determined, mean low water in the latter case is the same as mean lower low water.

Meiofauna: Generally those interstitial animals below 0.5 millimeter.

Mitigation: Avoiding the impact of a certain action or part of an action; minimizing impacts by limiting the degree of magnitude of an action; rectifying an impact by repairing, rehabilitating, or restoring the affected environment; reducing an impact over time by preserving and maintaining operations during the life of the action; compensating the impact by replacing or providing substitute resources or environments.

Nearshore: An indefinite zone extending seaward from the shoreline well beyond the breaker zone.

Nekton: Those aquatic animals able to swim efficiently, and not mainly at the mercy of currents.

Onshore: A direction landward from the sea.

Osmoregulatory: The maintenance of constant osmotic pressure in the body of a living organism.

Overwash: That portion of the uprush that carries over the crest of a berm or of a structure.

Pelagic: All ocean waters covering the benthic region.

Periphyton: Any organism attached or clinging to stems, leaves, or other surfaces of plants under the water.

Plankton: Those organisms passively drifting or weakly swimming in marine or fresh water.

Primary production: The rate at which energy is stored by photosynthesizing organism (chiefly green plants) in the form of organic substances.

"Red Tide" organism: Planktonic organism that produces toxic substances that can contribute to killing of great numbers of marine animals.

Revetment: A facing of stone, concrete, etc., built to protect a scrap, embankment, or shore structure against erosion by wave action or currents.

Riprap: A protective layer or facing of quarrystone, usually well-graded within wide size limit, randomly placed to prevent erosion, scour, or sloughing of an embankment or bluff; also the stone so used. The quarrystone is placed in a layer at least twice the thickness of the 50 percent size, or 1.25 times the thickness of the largest size stone in the gradation.

Rubble: (1) Loose angular waterworn stones along a beach. (2) Rough, irregular fragments of broken rock.

Rubble-mound structure: A mound of random-shaped and random-placed stones protected with a cover layer of selected stones or specially shaped concrete armor units. (Armor units in a primary cover layer may be placed in an orderly manner or dumped at random).

Salt marsh: A marsh periodically flooded by salt water.

Scour: Removal of underwater material by waves and currents, especially at the base or tow of a shore structure.

Seagrass: Members of marine seed plants that grow chiefly on sand or sand-mud bottom. They are most abundant in water less than 9 meters deep.

Seawall: A structure separating land and water areas, primarily designed to prevent erosion and other damage due to wave action.

Sessile: Any organism which usually is fixed but may move infrequently or may be permanently attached.

Sheet pile: A pile with a generally slender flat cross section to be driven into the ground or seabed and meshed or interlocked with like members to form a diaphragm, wall, or bulkhead.

Shellfish: Any aquatic invertebrate with a hard external covering; more commonly mollusks and crustaceans.

Shoreline: The intersection of a specified plane of water with the shore or beach (e.g., the high-water shoreline would be the intersection of the plane of mean high water with the shore or beach). The line delineating the shoreline on National Ocean Survey nautical charts and surveys approximates the mean high-water line.

Sorption: The process of being taken up and held by either adsorption or absorption.

Sound: A relatively long arm of the sea or ocean forming a channel between an island and a mainland or connecting two larger bodies, as a sea and the ocean, or two parts of the same body; usually wider and more extensive than a strait.

Subtidal: The region extending below the intertidal to the edge of the continental shelf.

Supratidal: The zone immediately adjacent to the mean high-water level; commonly called the splash zone.

Surf zone: The area between the outermost breaker and the limit of wave uprush.

Tide: The periodic rising and falling of the water that results from gravitational attraction of the moon and sun and other astronomical bodies acting upon the rotating earth.

Tombolo: A bar or spit that connects or "ties" an island to the mainland or to another island.

Topography: The configuration of a surface, including its relief and the positions of its streams, roads, buildings, etc.

Toxicant: A poisonous agent.

Turbidity: A condition where transparency of water is reduced. It is an optical phenomenon and does not necessarily have a direct linear relationship to particulate concentration.

Volatile: The tendency of a substance to erupt violently or evaporate rapidly.

Wave: A ridge, deformation, or undulation of the surface of a liquid.

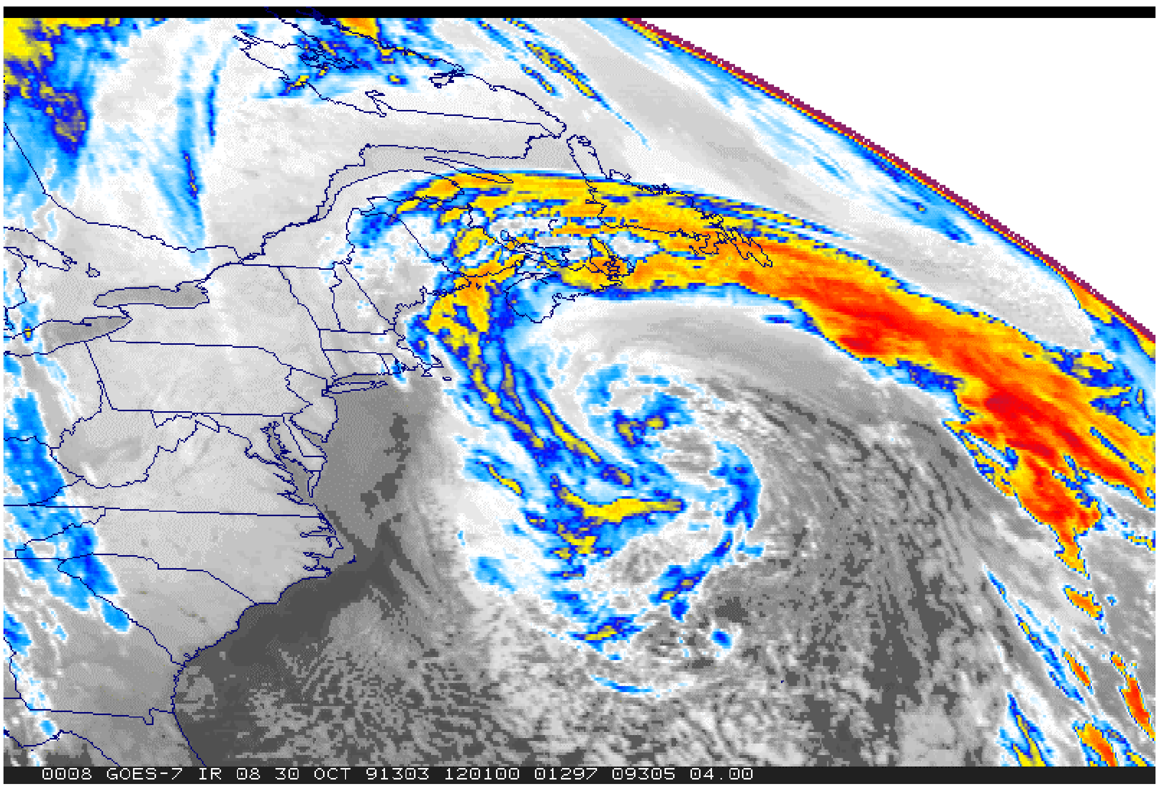
Weir: A low section in an updrift jetty over which littoral drift moves into a predredged deposition basin which is dredged periodically.

DOYLE EXHIBIT C TO CERTIFICATION IN SUPPORT OF OPPOSITION TO NWW MOTION TO FILE COUNTERCLAIM

NEW JERSEY SEA GRANT COLLEGE PROGRAM

MANUAL FOR COASTAL HAZARD MITIGATION

Compiled by
Thomas O. Herrington



PREFACE

New Jersey is often used as an example of a natural system gone awry. The unflattering term "New Jerseyization" was coined by a prominent scientist to describe a developed, eroding coast, where natural beaches have been replaced by engineering structures. This view may have been correct in the past, when seawalls and bulkheads replaced many of our beaches, but our beaches are being brought back by artificial nourishment projects. Hard protection structures are only one phase in the cycle of changes on a developed coast. Human efforts can help regenerate landforms and biota, providing we take a pro-active approach to shore protection that accommodates a wide range of resource values.

The preferred method of shore protection in New Jersey has changed from groins, to bulkheads and seawalls, to beach nourishment. Hard protection structures are less likely to be built in the future, but many structures still exist, and some new structures may have local usefulness. Accordingly, it is important to know how these structures function. It is also important to know that all protection strategies have usefulness, but they are not readily interchangeable at a given location.

Beach nourishment can help restore lost natural values, but many municipalities have elected to grade and rake their nourished beaches, preventing them from evolving into topographically and biologically diverse natural environments. The large amount of sand scheduled to be pumped onto New Jersey beaches in the future represents an invaluable resource, but the full potential of nourishment will not be realized without addressing habitat improvement and nature-based tourism in addition to the goals of protection from erosion and flooding and provision of recreation space. A dune is another valuable natural resource that is often overlooked. Dunes provide protection from flooding and valuable habitat, but they are often eliminated or prevented from growing because they restrict views or access to the beach. It is within our capability to recapture many of the natural values of beaches and dunes that have been lost by building too close to the water, but we must know the tradeoffs involved in selecting the best management option.

Successful mitigation of coastal hazards requires preparedness by municipalities and individual residents. This preparedness, in turn, requires knowledge of the processes causing these hazards and the alternatives available to reduce vulnerability and maintain our future options. This manual will help in that decision-making process by providing information stakeholders can use in managing properties and becoming more involved in decisions made by municipal, state and federal managers. Management of beaches and dunes is not simply a government responsibility. Property owners and visitors can help determine the kind of coast we will have in the future and help maintain that coast as stewards of the resources we own and use. Millions of dollars are spent to keep our beaches viable and protect valuable shorefront property. It is up to all of us to make sure that the money is well spent.

Karl F. Nordstrom
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FOREWORD

Beginning on March 6, 1962, the most devastating coastal storm in modern history assailed the New Jersey coast for three days. At its peak on March 6th and 7th, the storm generated a 3.5 ft storm surge over three successive high tides, each tide peaking at 8.8 ft above mean lower low water (MLLW). Massive waves of up to 40 ft high generated by sustained winds of 45 knots blowing over a 1000 miles of open ocean came crashing toward the New Jersey coast. By the end of the storm, 9 people lost their lives, 16,407 structures suffered damage and 21,533 structures experienced significant flooding. A total of $120 million (1962 dollars) in damages resulted from this event. On December 11, 1992, the New Jersey coast was once again battered by a major coastal storm. A peak storm surge of 4.3 ft was measured on the 11th as the water reached an elevation of 9.14 ft MLLW. The water never receded until December 14th, three days later. Waves of up to 44 ft were measured 25 miles offshore of Long Branch during the storm. By storm's end, 2 deaths were recorded, 3,200 homes were damaged and $750 million (1992 dollars) in damages were assessed.

Why were the damages so different between the two storms? The answer lies in the proactive measures – *hazard mitigation-* taken to prevent further damage after the March 1962 storm. The engineering of shore protection structures, beach replenishment projects, dune construction, improved siting and building codes, and the establishment of sound floodplain management through the National Flood Insurance Program all contributed to reducing the vulnerability of New Jersey's coastal communities. Thirty years of ongoing mitigation efforts were tested on December 11, 1992, and they proved successful. Hazard mitigation, however, is a continuous endeavor and although our coastal communities weathered the 1992 storm, we must be prepared for the next major and possible more severe storm.

This Manual for Coastal Hazard Mitigation (MCHM) introduces the concept of coastal hazard mitigation through community and individual preparedness, identifies the unique hazards associated with living in the coastal zone and provides information for implementing effective hazard reduction efforts. Broad in scope, and presenting a wide range of mitigation techniques from grassroots initiatives to regional efforts promoted by the federal government, the MCHM is a comprehensive document that references the underlying coastal processes that form the basis of each coastal hazard mitigation technique.

The MCHM first provides an overview of the concept of natural hazard mitigation and risk assessment, followed by detailed descriptions of hazards present in the coastal zone. The mitigation tools and techniques section of the manual presents nine broad categories of mitigation practices; beach nourishment, coastal regulation, building elevation, siting, shore protection structures, coastal resource management, natural resource restoration, building techniques and community maintenance and preparedness. Each mitigation technique presented begins with a synopsis of the mitigated hazard, level of effort required and the agencies that typically implement the technique, followed by a detailed description of the technique and its application. Each section ends with a listing of local, state and national agencies that can be contacted to obtain more information. A complete listing of references and additional information resources is included at the end of the manual.

Throughout the MCHM an effort has been made to reference each hazard and mitigation technique to specific examples in New Jersey. However, the hazards and mitigation techniques presented are not just specific to this region but can be applied to almost any sandy coastline. The manual includes many figures, diagrams and photograph to illustrate the concepts and techniques presented, most of which depict the New Jersey coast. We hope it will be useful for individuals, communities and municipalities wishing to explore techniques to reduce their exposure to natural hazards in the coastal environment.

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Coastal Hazard Mitigation

To many, a day at the shore conjures up images of wide sandy beaches, gentle sea breezes and rhythmically rolling surf. The beach, however, is a landscape of constant change; sometimes evolving gradually on a scale of days, weeks, months or seasons, and sometimes occurring nearly instantaneously in response to violent winds, tides or waves generated by coastal storms. These changes occur with every rise and fall of the tide. For those living along the coast, the dynamic nature of the coastline exposes communities, properties and people to a unique set of hazards. To reduce the risks presented by coastal hazards, it is important to understand that we can make informed decisions on how best to build our coastal communities. By understanding the environment we live in and taking the proper steps to mitigate the potential dangers in our environment, we can create sustainable coastal communities that reduce our impact on the very natural resources that make the coast a desirable place to live.

Over 50% of the U.S. population resides within 50 miles of the coast and that population is currently growing at 4-5% per year. The coast attracts another 180 million visitors annually. In order to sustain the Nation's coast as a desirable place to live, work and play, it is in the national interest to mitigate damage that occurs during severe coastal storms. Over the next decade, these issues will have a substantial impact on building codes, construction technology, storm hazard preparedness and emergency response, all aimed at saving lives and minimizing property damage.

This Manual for Coastal Hazard Mitigation (MCHM) provides interested parties with information for implementing effective hazard reduction efforts. Broad in scope, and presenting a wide range of mitigation techniques from grassroots initiatives to regional efforts promoted by the federal government, the MCHM is a comprehensive document that references and integrates underlying coastal processes. The MCHM is intended to serve as a resource for individuals, and federal, state, and local officials with which to form the basis of informed coastal hazard mitigation decisions.

All mitigation techniques are not interchangeable. Most are site specific and many may be constrained by local, state or federal regulations. The probability of any given technique being successful is dependent on a number of independent factors including the type of hazard, resources available, legal requirements and amount of public support. To facilitate the usefulness of the manual, each mitigation technique presented starts with a synopsis of the mitigated hazard, level of effort required and which agencies typically implement each technique.

HAZARD MITIGATION

Natural hazards expose people, property and communities to the risk of injury, damage and economic hardship. By recognizing the danger posed by natural hazards, individuals and communities can take proactive steps to minimize potential impacts. Best Management Practices (BMP) are available that can reduce or eliminate the long-term impacts of natural hazards. When applied prior to an impending natural disaster, these techniques are collectively known as Hazard Mitigation. The Federal Emergency Management Agency defines Hazard Mitigation as "sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects.[1]" It describes ongoing efforts at the Federal, State, local, and individual levels to lessen the impact of disasters upon our families, homes, communities and economy.

Reducing a community's potential loss due to natural hazards requires a balanced approach that applies mitigation measures to both new construction and the existing built and natural environment. Improved decision-making in coastal planning and development will decrease the vulnerability of the built and natural environment to damage and reduce the financial cost of disaster relief. Retrofitting existing structures and infrastructure will likewise reduce the risk of future damage.

Hazard Mitigation can be implemented through education, planning and practice. Through the application of sound mitigation practices, managers can ensure that fewer communities will become victims of natural disasters. Mitigation measures can be applied to strengthen homes and public buildings, so that people and property are better protected against natural hazards. Businesses can implement mitigation strategies to avoid damages to facilities and remain operational in the face of catastrophe. Mitigation technologies can be used to strengthen critical facilities such as hospitals, fire and police stations, and other public service facilities so that they can remain operational or reopen more quickly after a natural disaster.

Hazard Mitigation can be achieved in many different ways and at many different scales. Agencies responsible for coastal hazard mitigation planning at various levels include the:

Federal Government
Regional Shore Protection
Inlet Stabilization
Flood Hazard Mapping
National Flood Insurance Program

[1]Information pertaining to Hazard Mitigation has been provided by the National Mitigation Strategy: Partnerships for Building Safer Communities, published by the Federal Emergency Management Agency. For more information see: http://www.fema.gov/mit/ntmstrat.htm

State Government
Coastal Land Use Regulation
Construction and Maintenance of Shore Protection Structures
Coastal Zone Management
Land Preservation and Restoration

Local Government/Community
Local Zoning Ordinances
Emergency Services
Maintenance of Public Works and Infrastructure
Building Codes, Permittin,g and Enforcement

Citizens and Property Owners
Knowledge of the Coastal Environment and Natural Hazards
Satisfying Minimum Building Standards
Acceptance and Enhancement of Natural Buffers including Dunes
Maintenance of Property and Structures

When individuals, local governments and independent organizations accept responsibility for mitigating natural hazards in their communities, cost-effective actions can be taken to reduce the loss of lives and property, damage to the environment, and economic and social disruption caused by natural disasters. When implemented, Coastal Hazard Mitigation will *lessen the likelihood that natural hazards will become natural disasters.*

RISK ASSESSMENT

Risk is broadly characterized as the measure of the potential *losses* associated with adverse events (e.g., a severe coastal storm), whereas, risk *assessment* is the means used to evaluate risks associated with a *specific hazard* in terms of the probability and frequency of occurrence, severity, exposure, and consequences. The MCHM is designed to help reduce risks by presenting ways to limit the exposure of coastal structures and residents. Hazards can include discrete events that recur over time, as well as continuous events the result in cumulative impacts. An accurate characterization of the risk of individual coastal hazards is necessary for the implementation of the most cost-effective mitigation technique for a given situation.

In a general sense the assessment *and* management of risk can be addressed by the answers to six questions:

Risk Assessment

1. What can go wrong?
2. What is the likelihood that it will go wrong?
3. What are the consequences?

Risk Management

1. What can be done?
2. What options are available and what are the associated tradeoffs in terms of costs, risks, and benefits?
3. What are the impacts of current decisions on future options?

<u>Risk Assessment</u>

Coastal Hazards *(or What can go wrong?)*

Hazards in the coastal zone encompass numerous unavoidable risks to life and property caused by natural forces in the environment. *Natural* hazards in this region include coastal flooding, waves, high winds, short-term and long-term shoreline erosion, storm surges and sea level rise. Each hazard creates associated risks to the built and natural environment as well as local communities.

Probability and Recurrence *(or What is the likelihood it will go wrong?)*

Natural hazards in the built environment can be characterized by the time between occurrences (recurrence interval) of a design event. Often, minimum building codes and regulations require that a building be designed to withstand the occurrence of a hazard with a magnitude and probability of the design event. As an example, in the coastal zones of the United States buildings must be constructed to withstand the 100-year flood, which occurs with a 1-percent probability of being exceeded in any given year. The 100-year storm event is chosen as the standard of protection or target state since such events generally are capable of permanently altering coastal landforms.

Once the recurrence interval and magnitude of the hazard is known, an architect and/or engineer can plan a structure to withstand the design event. Note however, that lifespan of the structure needs also to be considered in determining the actual probability that a design event will occur over the intended period of use. Using the 100-year flood event, as the period without the occurrence of a 100-year flood increases, so does the probability that a flood of this magnitude or greater will occur. For example, over a 30-year period (the length of a typical mortgage) the probability of a flood with a 1-percent probability of occurrence in a given year increases to 26 percent[2]. Over a 100-year period, there is a 63 % probability that a 100-year flood event or greater will occur. Clearly, in order to effectively mitigate the 100-year flood hazard one must determine how long the structure would likely remain in the hazard area.

What are the Consequences?

The nature and severity of a natural hazard's consequences is dependent on a number of factors, including: the magnitude of the event, how close you are to the hazard, the strength and integrity of the structure or system, and how well the structure or system is maintained. In many cases, an event will expose a structure or system to *multiple* hazards (e.g., flooding and erosion). Properly conducted, a risk assessment must account for *all* of potential hazards for a given event in order to accurately determine vulnerability. Additionally, many of these natural hazards have both short- and long-term consequences that complicate the risk assessment process. Overlooking one of the hazards or misrepresenting its associated risk can lead to disastrous consequences, including increased vulnerability, loss of property, damage to the natural ecosystem and even loss of life.

Risk Management

The management of natural hazard risk can be broadly categorized by:

- Hazard Mitigation
- Insurance
- Residual Risk

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[2] The formula for calculating the cumulative probability is $P_n = 1-(1-P_a)^n$, where P_a is the annual probability of occurrence and n is the length of the period.

Hazard Mitigation

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk generated by hazards to people and the built and natural environment. Mitigation can take several forms, including: siting, construction techniques, protective works (erosion control structures, beach fills, dune construction), maintenance, land use regulation, coastal zone management planning, and enhancement of natural buffers. Hazard mitigation seeks to *permanently* reduce risk or over long durations, rather than preparing for, or responding to, an impending event.

Insurance

Insurance provides property owners with a financial resource to mitigate the consequences of natural hazards. There are a variety of financial tools available, including homeowners insurance, flood insurance (through the National Flood Insurance Program, NFIP), insurance pools and self-insurance plans. Homeowners insurance will generally cover wind and earthquake damage but not flood damage. If a community is part of the NFIP, a homeowner is eligible for federally underwritten flood insurance with rates that vary with risk level. If standard insurance is not available due to unacceptable risk levels or the assessed value of the property, insurance pools and self-insurance are methods used to provide financial security against hazard damage.

Residual Risk

Eliminating all risk is impossible. All structures, systems and protective works have costs associated with their design, construction and maintenance. Property also has an assessed value based on location, improvements and market worth ("willingness to pay"). In the course of risk assessment and hazard mitigation, the cost associated with these protective actions must be weighed against the value of the property or system over the duration of its useful life. If the BMP exceeds the value of the structure being protected, then the solution is not cost-effective and a lesser mitigation technique may be warranted. If a natural disaster exceeding the design event were to occur, a lower protection level may not completely cover the potential loss in value of the property or system. Such losses are a trade-off to the cost of complete protection. These trade-offs are collectively viewed as residual risk that must be accepted by the property or system owner. The principle of an acceptable level of residual risk underlies all protective works and mitigation techniques.

COASTAL HAZARDS

What are Coastal Hazards?

Hazards in the New Jersey coastal zone include unavoidable risks to life and property generated by: coastal flooding, waves, high winds and waves, short-term and long-term shoreline erosion, storm surges, and sea level rise. Each of these natural hazards creates a series of associated risks to coastal communities from hydrostatic and hydrodynamic forces on structures generated by coastal floodwaters and breaking waves, debris impacts, undermining of structures by scour and erosion and damage from high winds. A single severe coastal storm is capable of generating multiple short-term and long-term hazards. For instance, hurricanes will generate short duration hazards during landfall associated with high winds, storm surge, severe coastal flooding, large wave attack, and debris impact, as well as a long-term increased susceptibility to significant shoreline erosion. The effects of hazards associated with a specific event are often immediate, severe, and readily apparent, while those associated with longer term accumulative processes, such as shoreline recession and sea-level rise, become apparent only after extended periods.

Coastal Flood Hazards

Coastal flooding originates from tropical storms, hurricanes and mid-latitude low-pressure systems often referred to as extratropical storms or northeasters. Flooding often results from storm surges generated by high winds and low air pressure, heavy rainfall, or both. Coastal floodwaters expose coastal residents, structures, and public infrastructure to significant risks from standing water, high-velocity flows, and waterborne debris.

Standing Water

Standing or slowly moving water can produce increased pressure against structures exposed to floodwaters. Such pressures are referred to as *hydrostatic forces* by engineers and builders. If the water level on different sides of a structure is unequal, significant hydrostatic forces can build in one direction leading to the displacement of the structure in the direction of least resistance (Figure 1). In cases where floodwaters rise equally along the exterior walls of a structure but the interior space remains dry, catastrophic collapse of the building can occur as the structure crumples inward under the exterior water pressure (Figure 2). Flooding can also cause significant vertical hydrostatic forces, or *flotation,* as floodwaters exert an upward pressure on floors and decking (Figure 3). Prolonged periods of flooding poses a health risk to coastal residents from waterborne pollutants, diseases, and pests such as mosquitoes.

Figure 1. Damage to breakaway walls under an oceanfront house in Brant Beach, Long Beach Island, as a result of a storm in December 1992. Note hole in wall facing the viewer and buckle in wall out to the ocean side due to hydrostatic load (Photo courtesy of Dr. Susan D. Halsey).

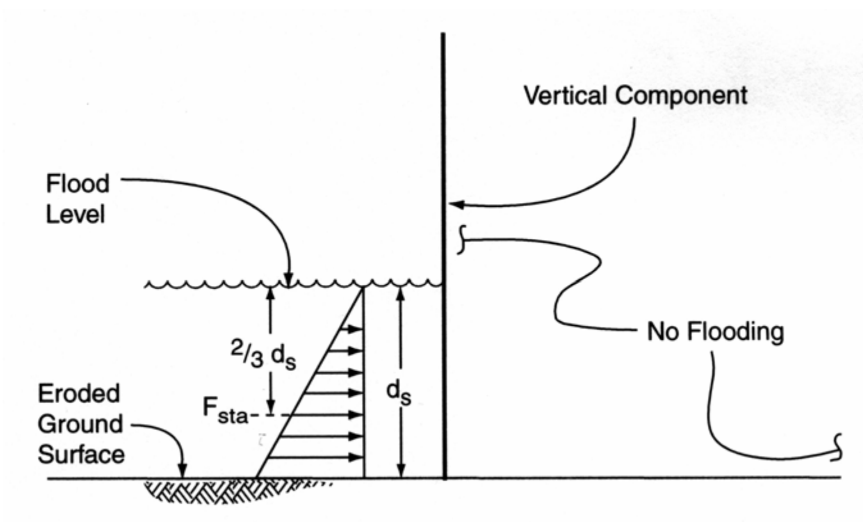

Figure 2. Pressure distribution due to standing water on the outside of a vertical wall. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

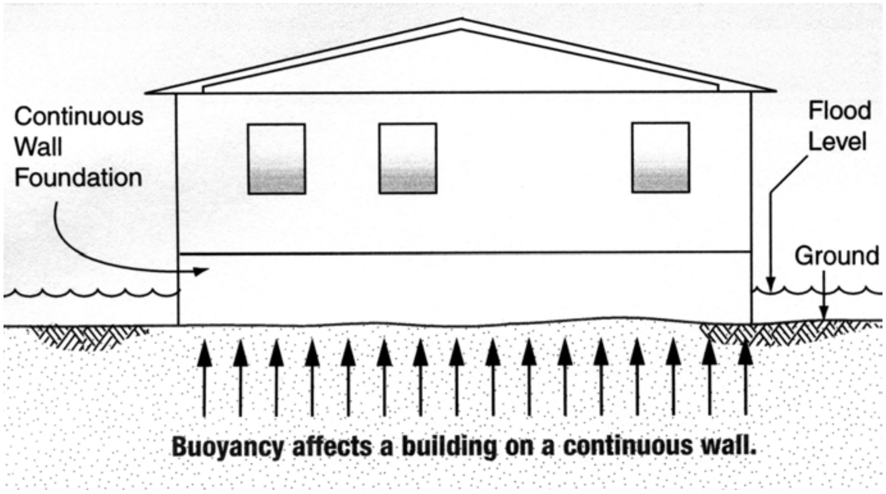

Figure 3. Vertical (buoyant) force generated by saturated soil. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

High-velocity floodwaters

When floodwaters exceed a velocity of 10 ft/sec tremendous force is applied to structures in its path. This added *hydrodynamic force* is related to the flood flow velocity and the shape of the structure. Fluid flowing around an object creates lift and drag similar to airflow around an airplane. If the resisting foundation forces are less than the net force against the structure, it will move in the direction of the flow (Figure 4). High-velocity flows can be created by storm surge and wave run-up flowing landward through breaks in dunes and/or across low-lying areas, by outflow of floodwaters as a storm surge relaxes and by wave generated currents flowing parallel to the shoreline.

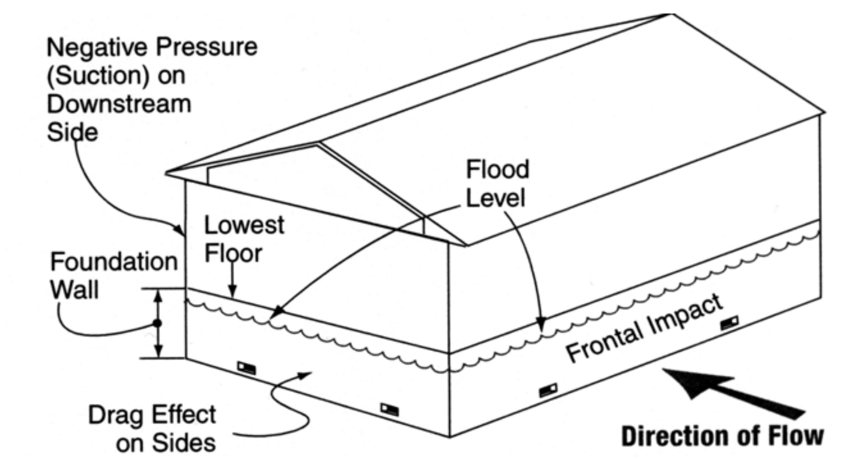

Figure 4. Hydrodynamic load applied to a foundation wall due to the flow of water around the structure. High pressure on the upstream side and a low pressure on the downstream (lee) side, combine to produce a net force in the direction of flow. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Waterborne Debris

Debris carried by floodwater generates short duration impacts when they strike stationary or slower moving objects. Waterborne debris typically include any floating object that that is not secure: decking, stairs, breakaway wall panels, pilings, fences, propane and oil tanks, boats, portions of buildings, and entire houses (Figure 5). Such objects are capable of destroying wood frame structures, masonry walls, and pile supported structures on impact. Debris trapped by cross bracing, closely spaced pilings, grade beams or other low elevation building components are capable of increasing the flood load on a structure. Storm generated debris is also one of the leading causes of fatalities during a coastal storm event.

Figure 5. Raft of debris left on Beach Ave. (Ocean Blvd.) just landward of the seawall in Cape May as a result of the March 1962 “Great Atlantic Storm.” Note segments of destroyed boardwalk with attached benches still bolted on in center (Photo courtesy of Dr. Susan D. Halsey).

Wave Hazards

The size and intensity of storm-generated waves depend on the magnitude of the storm, its sustained wind speeds and the duration of the storm. In general, the maximum breaking wave height at any point along the coast is a function of the water depth at that particular location. When a wave reaches a height equal to three-quarters of the water depth, the wave will break (Figure 6). During calm weather, large waves typically reach breaking depths a few thousand feet from the shoreline. During storm conditions, however, the elevated water levels generated by storm surge allow waves to penetrate much closer to the shoreline, exposing coastal structures to direct wave attack, wave run-up and wave-induced scour and erosion (Figure 7).

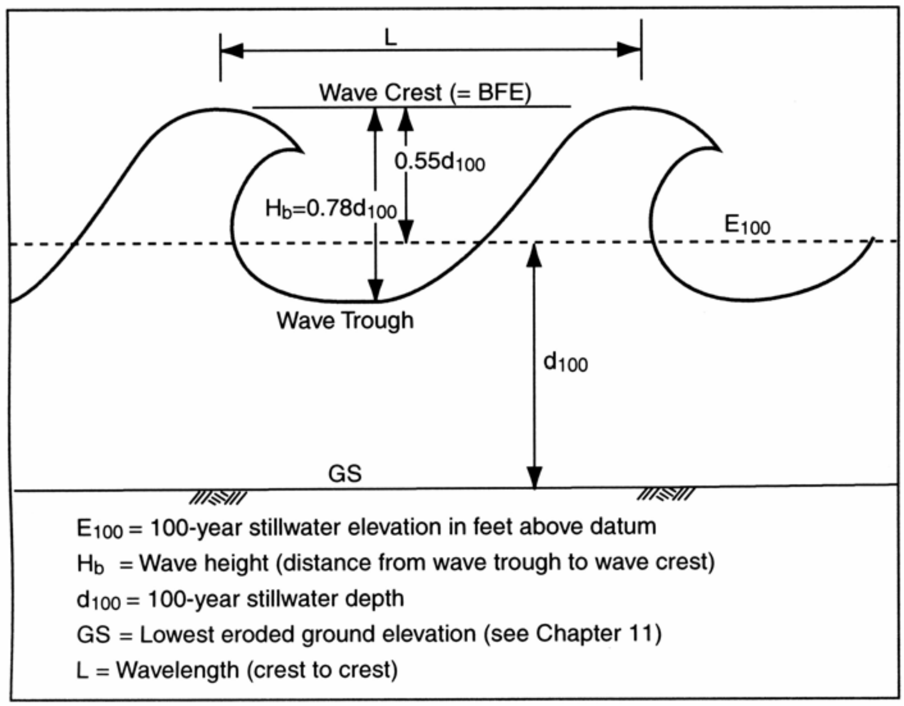

Figure 6. Determination of the Base Flood Elevation (BFE) for regions exposed to wave attack. A wave breaks when it reaches a height equal to 78% of the water depth. At breaking 75% of the wave height is above the still water level and must be added to the flood level. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Figure 7. Extensively damaged home south of Litchfield Camp, South Carolina as a result of Hurricane Hugo. In addition to the heavy damage to the structure of the building itself from wind and wave damage, note evidence of wave-induced erosion and scour under the house and around pilings and creation of channels toward the viewer (Photo courtesy of Dr. MaryJo Hall).

Non-breaking Waves

A wave can impact a structure prior to breaking, during breaking, and after breaking. If a wave strikes a solid structure prior to breaking, the wave energy is reflected back toward the ocean. If the incoming wave approaches the structure at an angle, the reflected wave will travel away from the wall at the same angle. Reflected waves apply two times the amount of wave-induced stress on the seabed as a single shoreward propagating wave. The increased bottom stress generates increased erosion and scour at the base of the structure, potentially leading to undermining and collapse (Figure 8).

Figure 8. Brant Beach section of Long Beach Island, New Jersey after the March, 1962 storm. Houses with regular foundations undermined by wave scour on the oceanfront, cinder blocks failed and houses tipped down the scarp (cliff) toward the ocean. The number of damaged homes from this storm led to FEMA subsequently requiring houses in specific zones to be built on pilings (Photo by Al Chance, courtesy of Dr. Susan D. Halsey).

Breaking Waves

The most extreme wave hazard to the built environment occurs when a wave breaks on a structure. As the crest of a breaking wave strikes a solid structure, wave forces 4 to 5 times greater than that from a non-breaking wave are measured. An air pocket formed between the wave crest and trough at impact, compresses during breaking (Figure 9). As the air pocket collapses, the structure is exposed to an exceedingly high-pressure burst of energy. Peak pressures from a 5-foot high breaking wave can exceed 2,000 pounds per square foot (FEMA, 1999). Post storm damage inspections have shown that breaking waves are capable of destroying all wood-frame or unreinforced masonry walls (FEMA, 2000).

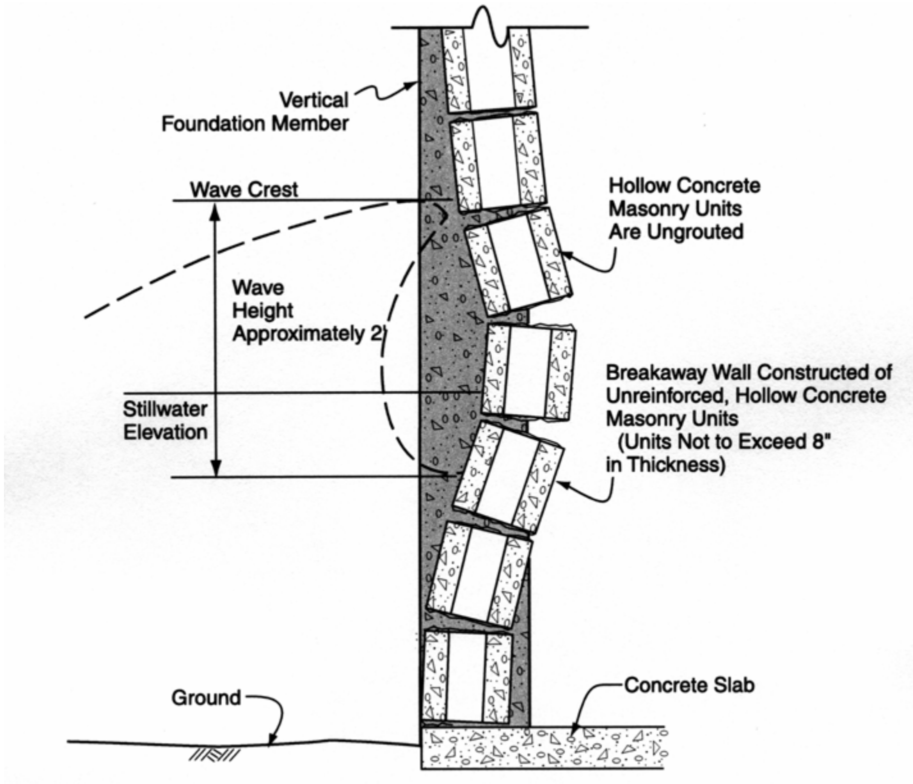

Figure 9. Compressed air trapped between a breaking wave and a vertical wall generates extreme horizontal pressure, often leading to structural failure. Reprinted with permission from the FEMA Technical Bulletin 9-99 (FEMA, 1999).

As a breaking or non-breaking wave passes under an open foundation, such as the pilings below a fishing pier, the structure experiences an oscillating, high-velocity horizontal flow that peaks under the crest and trough of the wave. Because there is ample open space below pile supported structures the wave energy is allowed to pass through the structure, eliminating any severe loading on the foundation (Figure 10). Maximum vertical velocities occur at the still water level, midway between the wave crest and trough. If the distance between the water level and the bottom of the structure is about ½ the wave height, the horizontal members of the structure, floor or decking, can experience significant uplift forces. Uplift damage frequently occurs to piers (Figure 11) and boardwalks (Figure 12) as waves lift the decking from the pilings and beams.

Figure 10. Large waves passing under a piling supported pier in Ocean Grove, New Jersey (Photograph by Dr. Thomas O. Herrington).

Figure 11. Damage to Atlantic City's Steel Pier from the March, 1962 storm. Note missing center portion removed by wave uplift during the height of the storm (Photo courtesy of Dr. Susan D. Halsey).

Figure 12. Damage to the Ocean City, NJ boardwalk from Hurricane Gloria, September 1985. This damage was caused by waves reflecting off the adjacent bulkhead, lifting up sections of the boardwalk and moving the loosened section landward (Photo courtesy of Dr. Susan D. Halsey).

Wave Runup

Wave run-up refers to the distance a non-breaking or broken wave will travel up a sloped surface or vertical wall. Wave run-up can drive large volumes of water and debris against coastal structures. Strong currents associated with run-up can cause localized erosion and scour (Figure 13). Wave run-up can extend up to the top of bulkheads, seawalls and revetments, allowing a significant volume of water to overtop the structure, causing localized flooding even in protected areas. Uplift forces generated by wave run-up are capable of destroying overhanging decks and porches, as well as flooring under pile-supported buildings (Figure 14).

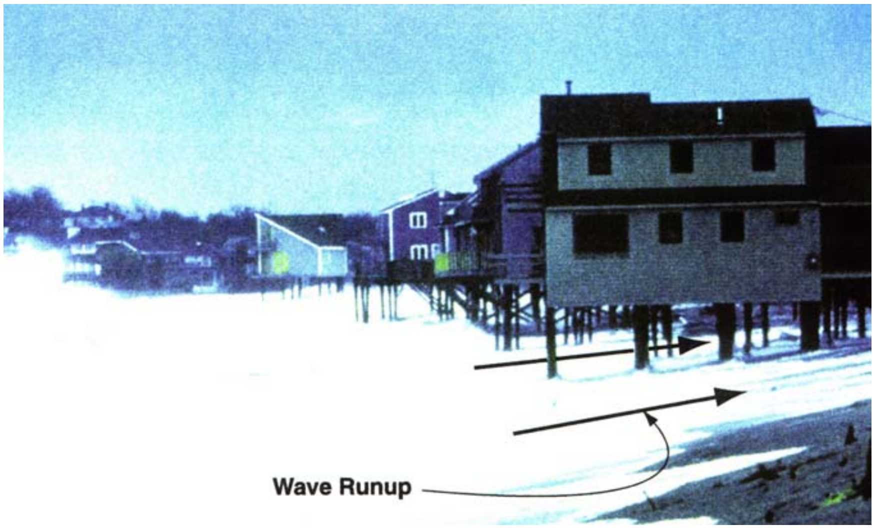

Figure 13. Erosion due to wave runup under elevated buildings in Scituate, Massachusetts (Photograph by Jim O'Connell).

Figure 14a. Brighton Beach Condominiums with decks overhanging primary bulkhead, 5th Street, Ocean City, New Jersey prior to March 28-29, 1984 northeaster. Storm waves lifted up the decks that had been tied into the interior of the house damaging the entire living rooms. The City condemned the buildings until the structure of the units were repaired, and passed an ordinance that prohibited decks to be tied into the main part of the house. Decks now have to be freestanding (Photo courtesy of Dr. Susan D. Halsey).

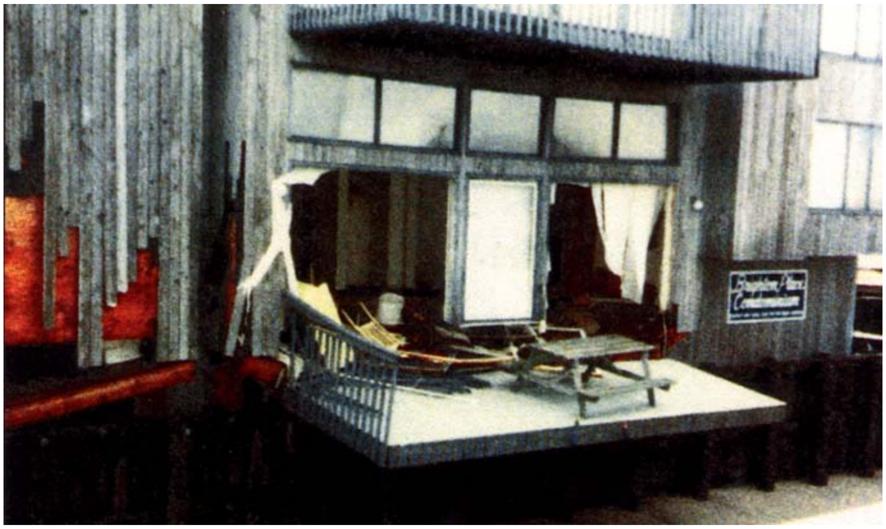

Figure 14b. Damage to an oceanfront residence in Ocean City, New Jersey due to wave run-up on a timber bulkhead (Photograph by Mark Mauriello).

Wind Hazards

The most significant coastal wind hazards originate from tropical storms, hurricanes, northeasters, and storm spawned tornadoes. Hurricanes can generate sustained winds ranging from 74 mph (Category 1) to greater than 155 mph (Category 5) over durations of 12 to 24 hours (Table 1).

SAFFIR-SIMPSON HURRICANE SCALE

Class	Pressure (millibars)	Velocity (mph)	Storm Surge (feet)	Classification
1	980	74-95	4-5	Minimal
2	965-979	96-110	6-8	Moderate
3	945-964	111-130	9-12	Extensive
4	920-944	131-155	13-18	Extreme
5	< 920	>155	>18	Catastrophic

Table 1. The Saffir-Simpson Hurricane Scale was developed by employees of the NOAA's National Weather Service to rank different hurricane magnitudes and their potential extent of damage. The storm's barometric pressure and wind speed will determine its storm surge, and all these factors will determine the storm's capacity for damage (NOAA-NWS Technical Report 2).

Mid-latitude northeasters typically generate much lower sustained winds of between 35 and 45 mph but can last for 2 to 3 days. Tropical storms and hurricanes are characterized by strong onshore winds as the cyclone approaches the coast, followed by strong offshore winds after the center passes or makes landfall. Northeasters are large (synoptic-scale) coastal low-pressure systems that intensify offshore of the coast. As the extratropical storm develops, the winds gradually build out of the northeast, peaking as the storm reaches maximum intensity, and then gradually decrease as the storm moves northeast, out to sea.

Because there is no topographical relief over the ocean, high winds are unimpeded by friction and can impose large lateral (horizontal) and uplift (vertical) forces on coastal structures. Coastal buildings can suffer extensive structural damage when they are improperly designed and constructed, or when wind speeds exceed design levels (FEMA, 2000). Buildings elevated well above sea level, containing large areas of window space, or with low-pitched gabled roofs and overhangs are particularly susceptible to wind damage. Any structural failure that compromises the building envelope (outer walls and roof of the structure) will result in severe structural damage (Figure 15).

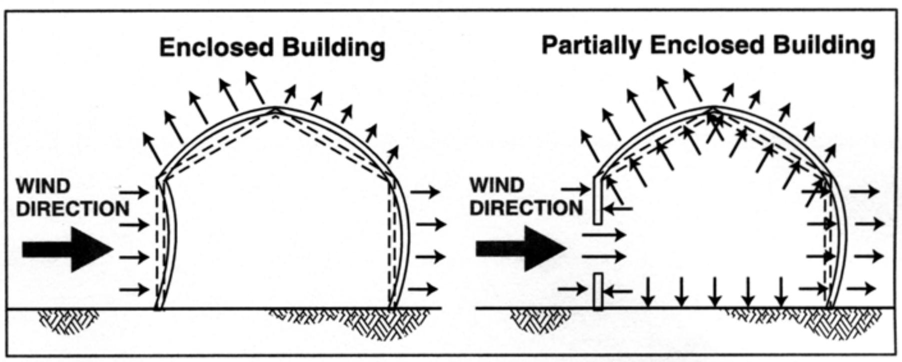

Figure 15. Enclosed buildings experience wind-induced pressure on the upwind walls and suction forces on the roof and lee walls. A partially enclosed building experiences increased loads due to the pressurization of the interior of the building. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Wind loads and windborne debris are both capable of damaging the building envelope (Figure 16). When a building envelope is breached, interior damage by rainfall and wind is certain, and interior pressurization, roof loss and structural failure a possibility (FEMA, 2000). In forested areas, high-winds can topple trees and break large branches creating the risk of injury and property damage from falling debris. In many communities, storm related power outages are caused by trees falling on elevated power lines.

Figure 16. Extensive wind damage to house near Myrtle Beach, South Carolina as a result of Hurricane Hugo. Note loss of not only front plate glass windows, but also loss of side windows (Photo courtesy of Dr. MaryJo Hall).

Erosion Hazard

Erosion hazards to buildings, infrastructure and personal property due to coastal erosion are often the most difficult to recognize. Coastal sediments are constantly in motion, moving along the shore, offshore and onshore at numerous time scales. The long-term evolution of the shoreline, in response to decades and centuries of storm events, changes in sediment supply, fluctuations in sea level, land subsidence or rise, and the migration, formation, and closing of tidal inlets may not be evident on a day-to-day or even year-to-year basis. The cumulative changes imposed on the beach by these forces, however, can have a dramatic effect on the coast over the 50 to 100 year lifetime of most coastal structures. In contrast, the changes to the coast generated by short-term storm events are immediately recognizable. Storm surge and waves can rapidly transform the coast by moving a large volume of sand over a relatively short duration.

Because of these different periodicities, long-term and short-term erosion hazards are usually evaluated independently. *Long-term erosion* is defined as the gradual recession of the coast over a period of decades. *Short-term erosion* is defined as a rapid recession of the shoreline in response to coastal storms and flood events. It should be noted that along some coasts the trend is for long-term accretion – an expansion of the coast seaward and sometimes vertically, so it is more accurate to speak of long-term and short-term shoreline change rather than erosion. Since hazards associated with accretion are relatively minor compared to those of erosion, we will use the term erosion as defined above.

Short-term Erosion

Storm generated erosion ranges over periods of hours (tropical cyclones) to several days (northeasters). Although the storm events are short-lived, the resulting erosion can be equivalent to *decades* of long-term erosion. The actual quantity of sediment eroded from the coast is a function of storm tide elevation relative to land elevation, the duration of the storm and the characteristics of the storm waves. During severe coastal storms, it is not uncommon for the entire *berm* (dry beach above the normal high water line) and part of the dune to be removed from the beach (Figures 17a & 17b). The amount of erosion is also dependent on the pre-storm width and elevation of the beach. If the beach has been left vulnerable to erosion due to the effects of recent storms, increased erosion is likely (Figure 18). In fact, the cumulative effects of two closely spaced minor storms can often exceed the impact of one severe storm (Halsey, 1986).

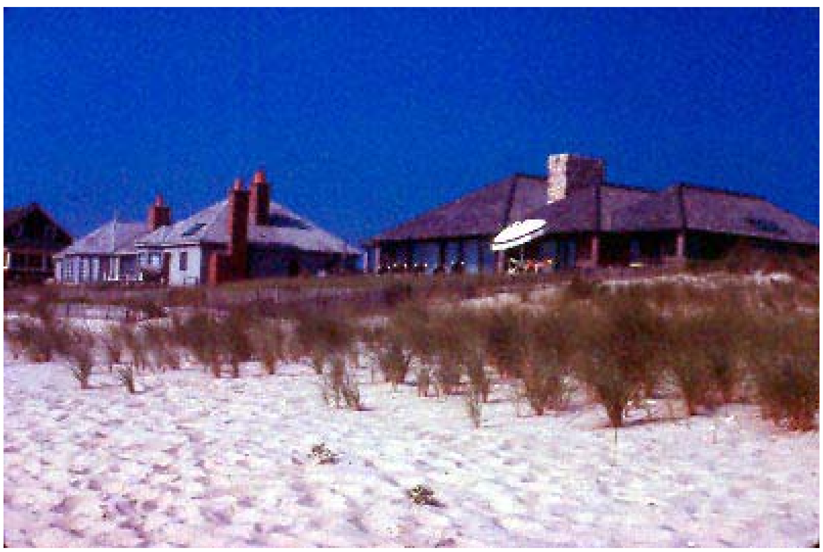

Figure 17a. Extensive dunes at Mantoloking, New Jersey shown prior to a northeaster in March 1984. This oceanfront municipality has one of the most comprehensive dune ordinances in New Jersey requiring homeowner’s to plant and apply other techniques for dune building (Photo courtesy of Dr. Susan D. Halsey).

Figure 17b. Similar view of the dune field in Mantoloking, New Jersey after the March 1984 northeaster. Despite horizontal erosion of up to forty feet (40 feet) back into the dune, as well as vertical beach erosion, there were few breaches in this dune field throughout the municipality (Photo courtesy of Dr. Susan D. Halsey).

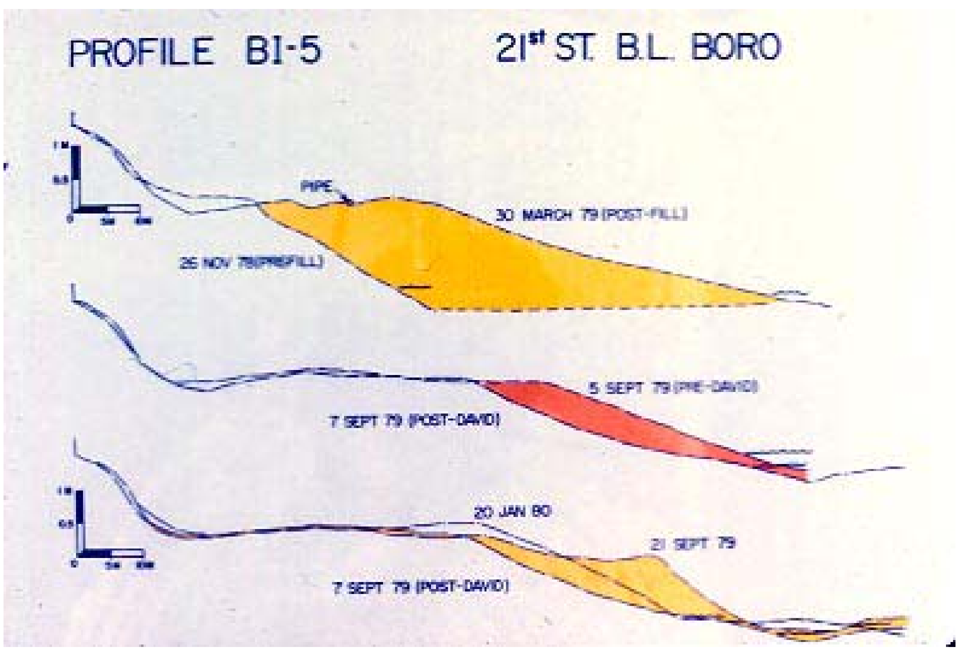

Figure 18. Beach profiles at 21st Street, Barnegat Light, New Jersey, plotted at a 5:1 vertical to improve visualization of sediment dynamics. The top profile depicts the volume of fill placed at the site by the 1979 Army Corps of Engineers beach nourishment project. The middle profile contrasts the post-fill profile on 5 September 1979 with the loss of berm from the offshore passage of Hurricane David. Note also small loss of both back beach and dune. The lower profile contrasts the post-David profile with a post-

storm berm recovery profile of 21 September 1979 after a period of only 14 days. The 20 January 1980 profile shows the loss of about half of this volume as well as a change of shape as a result of a small northeaster in late December 1979, and subsequent recovery (Figure courtesy of Dr. Susan D. Halsey).

The impact of short-term erosion to private and public property can be severe. Dunes and other natural protective features of the coast can be breached and destroyed. The erosion and/or destruction of dunes expose the structures behind them to further damage from subsequent storms. The removal of sand from the beach will lower ground elevations, possibly leading to the undermining of shallow foundations, exposure of underground utilities and infrastructure, and reducing the penetration depth (or carrying capacity) of piles. Low-lying inland structures, such as roads, driveways and storm drains, can be buried by *washover fans* - sand pushed landward by waves and surge (Figures 19 and 20). The base of coastal bluffs can be undermined by erosion leading to bluff failure and the potential loss of structures at the top of the bluff. Storms that generate significant surge can generate breaches in barrier islands as the build up of water behind the island seeks the path of least resistance to return to the sea. Breaches are one of the most destructive short-term erosion hazards as swift currents create deep channels across the island, undermining everything in its way (Figure 21).

Figure 19. Newly created washover fans along Island Beach State Park, New Jersey, as a result of a severe northeaster. The white fingers of sand with bulbous ends reach westward into the vegetated back dune are washover fans resulting from storm surge (Photography courtesy of Dr. Susan D. Halsey).

Figure 20. Front end loaders removing extensive storm washover from Long Beach Boulevard, New Jersey, in the Loveladies section of Long Beach Island. At some locations, washover was over four feet deep (Photo courtesy of Lawrence Wagner).

Figure 21. Aerial photograph of a former barrier island breach on the south shore of Long Island, NY (Photograph by Dr. Michael S. Bruno).

Erosion hazards during storms can occur despite the presence of shore protection structures. Significant storms can overtop or damage poorly sited, designed, constructed or maintained erosion control devices such as revetments, seawalls and bulkheads (Figure

22). When a coastal protection structure fails, the buildings and infrastructure behind them are very vulnerable to damage (Figure 23). Protective dunes, if not correctly maintained with vegetation and proper pedestrian walkovers, can be breached, exposing landward structures to increased wave attack and flood loading.

Figure 22. Hurricane Hugo induced failure of an ocean front bulkhead in Myrtle Beach, South Carolina that resulted in substantial damage to a condominium building (Photo courtesy of Dr. MaryJo Hall).

Figure 23. Catastrophic building damage caused by the failure of a protective timber bulkhead in Westhampton, NY (Photograph by Dr. Michael S. Bruno).

Short-term erosion unrelated to coast storms can also occur along coastlines stabilized by shore protection structures. Groins, breakwaters and jetties are designed to slow the movement of sand along the beach, but when a reversal in the usual direction of sand transport occurs (due to hydrodynamic events), it can lead to short duration erosion adjacent to the protective structure. Such effects are usually short-lived, however, prolonged reversals on eroded shorelines can generate a significant erosion hazard (Figure 24).

Figure 24. Localized erosion on the downdrift side of a timber groin in Manasquan, NJ, caused by prolonged unidirectional sediment transport (Photograph by Dr. Michael S. Bruno).

Scour

Scour refers to localized erosion in addition to that caused by flooding or wave action. This effect is generated by the acceleration of water flow around an object. As water moves past a fixed structure such as a pile, it accelerates, creating turbulence above the bottom. Erodible materials will be re-suspended by turbulence and transported away from the pile, resulting in localized erosion (Figure 25).

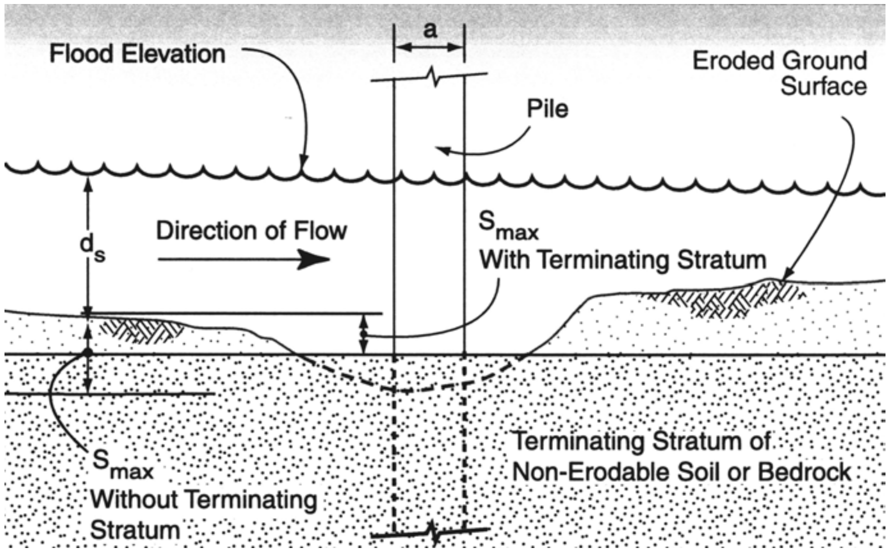

Figure 25. Scour generated by accelerated water flows around a piling. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Post-storm surveys have indicated that scour around piles and similar objects is generally limited to cone-shaped depressions less than 2 feet deep (FEMA, 2000). However, the maximum depth of scour that can occur during the storm events is unknown. Horizontal beams and on-grade slabs can be undermined by scour, leading to structural failure (Figure 26).

Figure 26. Scour around pilings and under on-grade slab. Notice that the slab broke free of the pilings and flipped up vertically. Poured concrete under a pile supported structure can generate unexpected loads on the structure, if undermined like above. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Long-term Erosion

Long-term shoreline recession along a coastal reach is a manifestation of the cumulative impacts of storms, sea level rise, land subsidence, manmade impacts, and sediment supply, among other factors. As storms rework the coastal landscape, a portion of the beach is deposited offshore in water depths deep enough that sand is permanently lost from the system. Over decades, the net loss of sand due to storms results in a recession of the shoreline. Sea level rise and land subsidence combine to produce a more gradual shoreline recession (National Research Council, 1987). Due to global climate change, the average level of the oceans has been rising by approximately 2 mm/yr (0.078 in/yr). Although variable, the general subsidence of land along the East and Gulf coasts of the United States has lead to localized increases in the rate of sea level rise along the coast (Figures 27 and 28).

New Jersey has the highest measured relative sea level rise on the Atlantic coast of the U.S, about 4 mm/yr (0.16 in/yr), while Boston has the lowest, 0.9 mm/yr (0.035 in/yr). For an average beach slope of 1 foot vertical rise for every 30 horizontal feet of beach, a 4 mm/yr (0.013 ft/yr) rise in sea level translates into a horizontal beach recession of 0.39 ft/yr, or 1 ft every 2.5 years. One may wonder why there is any beach left at all given the rapid rate of horizontal beach recession. The reason the coast of New Jersey has not retreated 250 ft over the last 100 years is because a much larger volume of sand is redistributed along the coast due to the day-to-day wave and current action than due to the rate of sea level rise. The coast evolves by redistributing large volumes of sand from regions of high wave and current energy to areas of low energy, masking the long-term recession due to sea level rise.

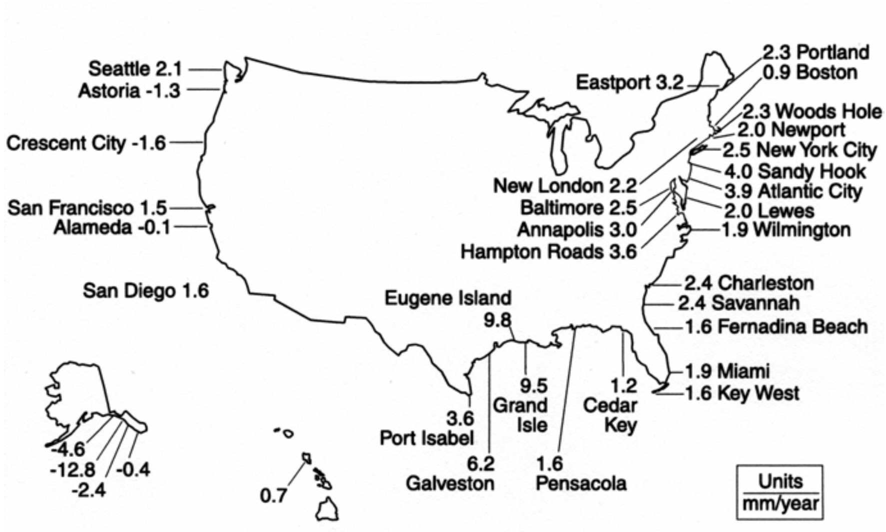

Figure 27. Estimates of relative sea level rise along the continental United States in millimeters per year. Negative values indicate falling sea levels (from National Research Council, 1987). Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

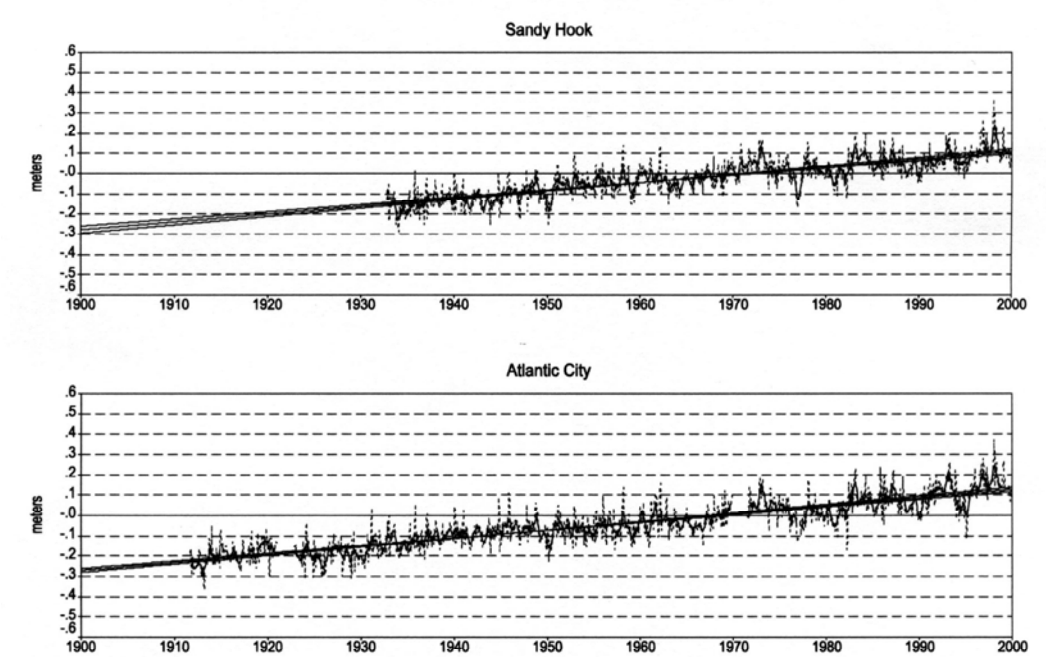

Figure 28. Sea level rise graphs for the last 100 years from tide gauges in New Jersey. Although the rates vary, all show an upward trend (Reprinted from NOAA, 2001).

Tidal inlet migration can also significantly impact long-term shoreline erosion rates. Many natural tidal inlets slowly migrate in response to the prevailing wave climate. If waves primarily transport sediment in one direction along the coast, the updrift side of the inlet channel will fill in, shifting the inlet toward the downdrift beach. Inlet migration rates as great as 300 ft/yr have been measured in North Carolina, prompting the state to map Inlet High Hazard Zones along the coast (Cleary and Marden, 1999). In New Jersey, significant inlet migrations have been observed at all inlets unconstrained by jetties; Hereford, Corsons, Townsends, Great Egg, Little Egg, and Beach Haven Inlets.

Shorelines adjacent to inlets also undergo much more rapid and variable erosion and accretion cycles as the evolution and migration of inlet shoals alter the local wave and current climate (Figure 29). Inlet impacts can be experienced as far away as a few miles updrift and downdrift from the actual inlet channel. In many cases, the stabilization of an inlet by *jetties* – impermeable shore perpendicular structures designed to keep the inlet from shoaling - will stop the inlet from migrating. The impact of the inlet on the adjacent shoreline, however, will still be present and may be exacerbated by a reduction in the amount of sediment reaching the downdrift shoreline (Figure 30).

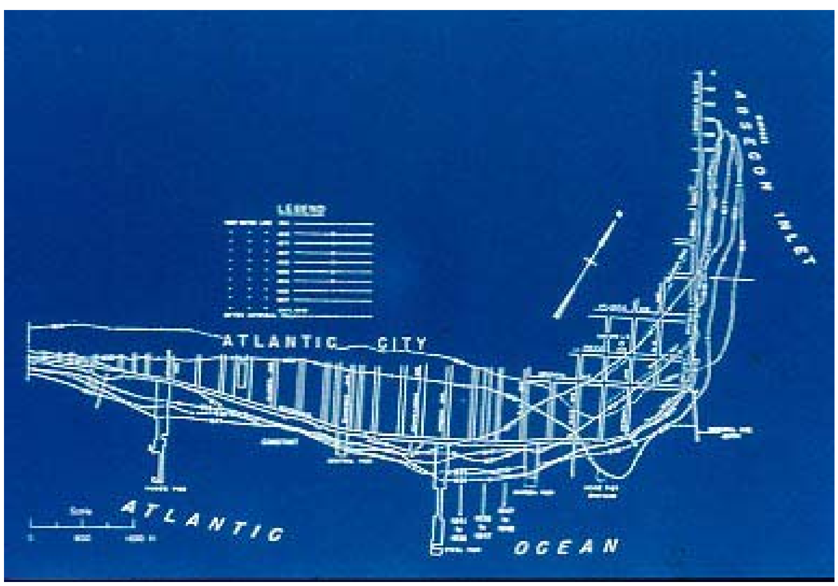

Figure 29. Blueprint showing the variation in the position of the Atlantic City Inlet shoreline.

Figure 30. Sediment offset at Manasquan Inlet, New Jersey. Note sediment build-up on south (updrift) side of the inlet along Point Pleasant Beach, and sediment deficit on the north (downdrift) side of the inlet at Manasquan. Average alongshore current direction in this area is to the north (Photo by Dr. Susan D. Halsey).

Sea level rise and human activities within coastal watersheds can lead to long-term reductions in sediment supply to the coast. The damming of rivers and the bulk-heading of highlands has reduced the amount of erosion and consequently the sediment loads reaching coastal areas. Although it is difficult to quantify, the cumulative reduction in sediment supply from human activities may contribute substantively to the long-term shoreline erosion rate. Along coastlines subject to sediment deficits, the amount of sediment supplied to the coast is less than that lost to storms and coastal sinks (inlet channels, bays, and upland deposits), leading to long-term shoreline recession. Shore protection measures, stabilized inlets and coastal development can also exacerbate long-term erosion. Many shore protection structures slow the movement of sand along the coast. Bulkheads, revetments and seawalls actually remove sediment from the system by encapsulating sand behind the structure (Figure 31). By slowing the transport of sand or removing it from the area, long-term erosion rates increase as one moves farther downstream (downdrift) from the sediment source.

Figure 31. Stone and concrete revetment placed along an eroding bluff in Long Branch, NJ. Although the structure stops erosion, it also reduces the natural sediment supply to the beach (Photograph by Dr. Michael S. Bruno).

Regardless of the ~~causes~~, long-term shoreline erosion increases the vulnerability of coastal structures to damage by exposing them to increased risk over the usable lifespan of the structure. In essence, long-term erosion acts to shift the flood and wave hazard zone landward so that a building once protected from direct wave attack by a wide beach is increasingly susceptible to wave damage (Figure 32). In most instances, the Federal Emergency Management Agency (FEMA) assumes that the usable life span of a private structure is 30 years, the length of most homeowner mortgages. Any coastal structure should therefore be built to withstand the maximum coastal hazard expected over the 30-year life of the structure. Of course, this cannot be applied universally as many New Jersey communities contain structures more than a hundred years old. In many cases, alternative mitigation strategies such as extensive beach fill must be implemented to insure that the maximum coastal hazard level experienced by a structure does not change (Figure 33).

Figure 32. Concrete retaining wall, originally constructed to prevent wind blown sand from depositing on Ocean Avenue, in Belmar, New Jersey, under direct wave attack during the October 31, 1999 northeaster (Photograph by Dr. Michael S. Bruno).

Figure 33. Belmar, NJ retaining wall shown in 1999 after the completion of a beach fill project designed to protect the coast from a 1 in 100 year storm event (Photograph by Dr. Thomas O. Herrington).

Additional Hazards

Coastal communities are exposed to a number of minor hazards that may occur less frequently than flooding or wave attack but that can still cause localized property damage and personal injury.

Burial

Sediment eroded from the beach during a storm or blown inland by onshore winds can be deposited around structures and in roadways. Washover fans are generated by large volumes of sand transported landward through breaches in the dunes. Depths as great as 4-5 feet have been measured on coastal roadways following hurricanes (FEMA, 2000). High onshore winds can create large sand drifts similar in character to drifting snow. This is especially problematic in areas that have unvegetated sand dunes, as there is little or no resistance to the movement of sand. In such cases, migrating sand can potentially bury shorefront structures (Figures 34 and 35).

Figure 34. Ortley Beach, New Jersey after a severe storm. Significant erosion of sand from the beach overwashed the boardwalk and was deposited onto local streets. The piles of sand just landward of the boardwalk resulted from post-storm bulldozing of the streets (Photograph by Dr. Susan D. Halsey).

Figure 35. Underground parking garage with partially buried vehicle in Point Pleasant Beach, New Jersey in the aftermath of the December1992 northeaster. The ripple marks on the top of the sand indicate active water flow (Photograph by Dr. Susan D. Halsey).

Rain and Snow

Coastal storms often produce large amounts of precipitation. Rainfall from tropical storms and hurricanes can exceed an inch or more per hour as the system moves inland or along the coast. Extratropical storms can spread heavy precipitation over regions as large as the entire east coast. Snow and ice from winter storms can paralyze large areas under blizzard conditions. Power outages, river and stream flooding, and the interruption of public services are all hazards associated with heavy snow and icefall. Wind driven rain and snow can also penetrate into buildings through damaged siding, windows and roofing posing additional hazards to private property. Heavy rain, prior to the onset of high winds will soften the ground and make large trees more susceptible to toppling.

Ice

As the surface of bays and coastal waterways freeze, ice formed on the surface will rise and fall with the tide. Significant forces can be generated as the ice pushes up along pilings and under buildings and other structures suspended over the water. During flood events, ice flows can also pose a debris and impact hazard to coastal structures. Ice damning can lead to localized elevated flood water levels. Ice storms can produce heavy damage to trees, power lines and other infrastructure sometimes paralyzing communities for days.

Salt Spray

During a storm, high winds will transport a significant amount of saltwater spray inland. Salt residue accumulates on building surfaces, utilities, roadways, trees and landscaping, or on just about everything else that is exposed to the elements. The accumulation of salt spray on metal surfaces leads to accelerated corrosion, shortening the useful life of metal connectors, wiring and utilities. Salt spray can also be damaging to non-native ornamental plants.

COASTAL HAZARD MITIGATION TOOLS AND TECHNIQUES

Beach Nourishment

Responsible Agency/Party:	Federal and/or State sponsored projects
Mitigation for:	Long- and short-term erosion Flood hazards Wave hazards
Management Effort:	High

Although the management an funding levels of a beach nourishment projects are extremely high, on chronically eroding coastlines like in New Jersey, it is the only alternative that directly mitigates the lack of sand along the coast. In New Jersey, beach nourishment is the fundamental component of the state's shore protection plan. Since 1962, almost every segment of the New Jersey coast has been maintained or protected by a local or state funded beach nourishment project. As of 2002, over half of the 127 miles of Atlantic Ocean coastline in New Jersey was, or about to be, protected by a federal shore protection project designed to create and maintain a 100+ foot wide beach within the limits of each project. Beach nourishment is extremely important to all aspects of coastal maintenance and will become the fundamental component of future coastal management and habitat restoration efforts.

Beach nourishment is the process of extending a beach seaward along designed contours both above and below the tideline. Newly placed sand protects property and infrastructure from wave attack, inundation, undermining, and increased vulnerability due to long-term shoreline erosion/recession (Figure 36). Beach nourishment is often referred to as beach fill as these projects are designed to mitigate long-term shoreline erosion through "filling" large quantities of sand into the coastal zone. However, beach nourishment does not directly address the underlying *causes* of erosion, rather it simply reduces the *sand deficit* by adding sand to the coast from sources outside of the eroding system. Beach nourishment, therefore, serves as a "sacrificial" protection measure rather than a fixed barrier solution to the problem (National Research Council, 1995).

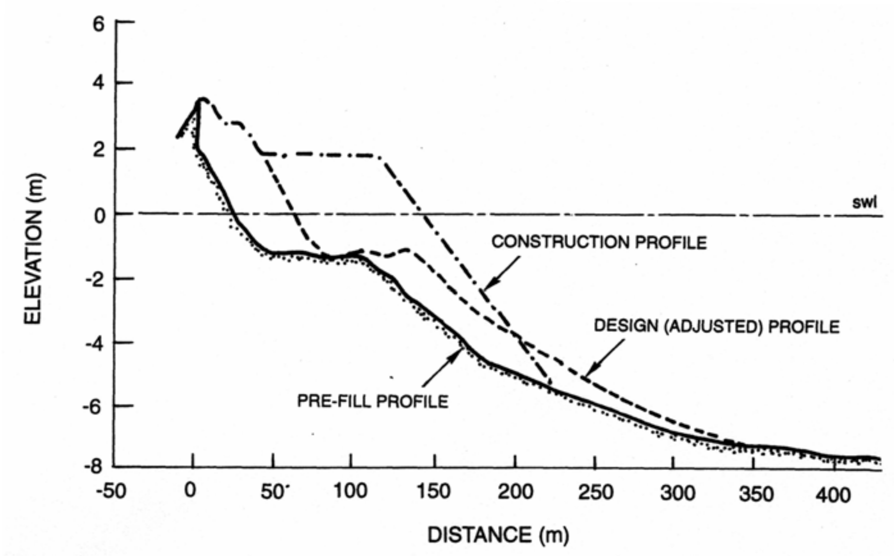

Figure 36. Beach fills are designed to shift the entire beach profile seaward by a sufficient horizontal and vertical distance to account for both long-term and short-term erosion during the project's anticipated lifetime. Due to construction limitations, the constructed beach profile is often much wider and steeper than the final projected form design. Wave action will naturally redistribute the sand into the preferred design template (Reprinted from National Research Council, 1995).

Beach nourishment is an accepted hazard mitigation technique but its application is not suitable for all locations. Prior to undertaking a project, detailed cost-benefit analysis is usually performed to determine if the benefits of incremental protection outweigh the cost of constructing and maintaining the new beach (Figure 37). Moreover, the protection provided by a newly constructed project will vary significantly over the anticipated lifetime of the project; i.e., the longevity of the protection provided will be dependent on volume of sand added, characteristics of the fill used, background erosion rates, and the frequency, duration and severity of coastal storms after the completion of the project.

Figure 37. Emergency beach nourishment project underway on Long Beach Island, NJ, March 1979. Sand from Barnegat Inlet was pumped through pipes at two locations; one further up the beach profile and one near the proposed low tide line. Note pipes on upper beach waiting for placement near the dune scarp created by a trio of northeasters in the winter of 1978-1979. After the nourishment project, groins seen in this photograph were not visible. (Photograph by Dr. Susan D. Halsey)

Most beach nourishment projects are designed to include periodic re-nourishment to assure that an appropriate level of protection is maintained. The process of designing and constructing an effective beach nourishment project is complex and costly, to the degree that effective mitigation is often cost prohibitive for property owners and communities. Consequently, the federal government in cooperation with state and local governments (as in New Jersey) usually undertakes most large-scale shore protection projects including beach nourishment.

In general, beach nourishment projects are designed to provide protection against the occurrence of a storm that has a 1-percent probability of being exceeded in any given year for a period of 50 years. Consideration is usually given to constructing a beach that will protect coastal structures over their useful lifespan, including a buffer to build protective dunes. Ultimately, protection is also a function of the sponsors' (federal, state and local) willingness to maintain (renourish the beach) over the lifespan of the project (FEMA, 2000). The cost of *maintaining* adequate protection over say 50 years added to the *initial* cost of the fill can be on the order of millions to billions of dollars depending upon the length of the project and volume of sand required. Given the cost of nourishment projects, their use is generally restricted to densely populated coastal regions, where significant secondary benefits can be achieved including, maintenance of federal navigation channels and the restoration of recreation beaches that are significant contributors to the local and regional economy.

For more information regarding beach nourishment projects in New Jersey contact:

New Jersey Department of Environmental Protection
Natural and Historic Resources
Division of Engineering and Construction
1510 Hooper Avenue
Toms River, New Jersey 08753
Phone: (732) 255-0770
Fax: (732) 255-0774

New Jersey Department of Environmental Protection
Office of Coastal Planning
P.O. Box 418
401 East State Street
Trenton, New Jersey 08625
Phone: (609) 292-2662
Fax: (609) 292-4608
Web: http://www.state.nj.us/dep/cmp/

New Jersey Coastal Protection Technical Assistance Service
Davidson Laboratory
Stevens Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030
Phone: (201) 216-5290
Fax: (201) 216-8214
Web: http://www.dl.stevens-tech.edu

U.S. Army Corps of Engineers
Philadelphia District Office
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3390
Phone: (215) 656-6516
Fax: (215) 656-6820
Web: http://www.nap.usace.army.mil/

U.S. Army Corps of Engineers
New York District Office
26 Federal Plaza
New York, NY 10278
Phone: (212) 264-0100
Web: http://www.nan.usace.army.mil/

Regulation

Responsible Agency/Party:	Federal and State Regulations Local Ordinances
Mitigation for:	Long- and short-term erosion Flood hazards Wave hazards Wind hazards
Management Effort:	Moderate to High

An effective means of achieving hazard mitigation goals is through regulatory oversight of land use practices, and the siting, design and construction of structures in hazardous areas. These requirements including building codes and standards, and locally adopted floodplain management and land use ordinances and laws. Regulatory requirements are established with the intent of reducing the loss of life and damage caused by natural disasters as well as protecting the natural environment. Requirements vary from state to state and among individual localities and can have a substantial impact on the allowable location and design of structures in specific areas. Designers, property owners and builders should be cognizant of these regulations and fully investigate the restrictions that may apply to individual properties.

<u>Land Use Regulations</u>

State and local governments establish regulations for governing the development and use of land within their jurisdictions to promote sound physical, social and economic development. New Jersey statutes that govern land use[3] include the Freshwater Wetlands Protection Act, Flood Hazard Area Control Act, Coastal Area Facility Review Act (CAFRA) (Figure 38), Waterfront Development Act, Wetlands Act of 1970 and the Tidelands Act. In addition, New Jersey has adopted Coastal Zone Management (CZM) regulations in partnership with the Federal Government to protect coastal resources, manage development in high hazard areas, provide public access to the coast and coordinated state and Federal actions, among other initiatives. Coastal states adopt their own CZM plans and review the plan every three years for consistency with State and Federal goals and regulations. Taken together, the land use regulations oversee all aspects

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[3] For more information about New Jersey Land Use Regulations see http://www.state.nj.us/dep/landuse/about/about.html

of land development and building in the coastal zone including prohibiting or restricting development in specified areas, establishing minimum site requirements, floodplain management, natural resource management, utility easements and planting requirements.

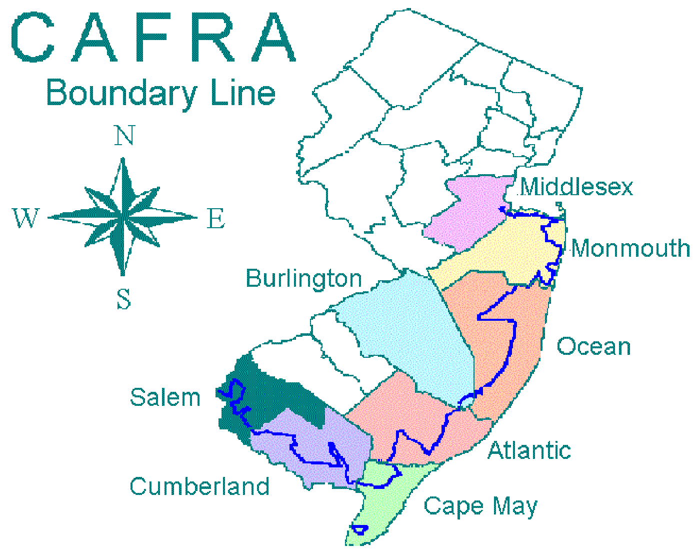

Figure 38. The New Jersey Coastal Area Facilities Review Act boundary indicated in blue. Structures built seaward of the boundary must meet CAFRA standards. Reprinted from the New Jersey Department of Environmental Protection, Land Use Regulations web page.

Building Codes and Standards

Building codes set forth the requirements for protecting public health, safety and the welfare of the built environment. There are literally hundreds of standards related to design and construction practices and even more standards related to construction materials. Although too numerous to cite most state and local building codes are based on model building codes established in the early 20th century. Some states simply adopt one of the model codes, while others add local amendments or adopt their own codes to address specific hazards and needs in their communities. In 2000, The International Code Council (ICC) unified 3 model-building codes together under the International Building Code 2000 (International Code Council, 2000a) and the International Residential Code for One- and Two- Family Dwellings 2000 (International Code Council, 2000b) in order to simplify minimum building standards[4]. It must be stressed that these codes provide minimum standards that *may or may not* provide for safe construction in all hazard areas, especially if a state or local jurisdictions have only adopted one of the minimum codes verbatim.

[4] Detailed information about ICC codes can be found at http://www.intlcode.org/

Due to the variation in building codes, property owners should investigate the minimum requirements for their location[5]. New Jersey, for instance, does not implement a national code but instead uses a State Uniform Construction Code based on the 1995 One and Two Family Dwelling Code (1995 CABO). This code is applied to all 1 and 2 family dwellings in the state and local jurisdictions cannot amend the code. The construction of commercial structures in New Jersey is regulated under the 1996 National Building Code (1996 NBC) with some state modifications. The code applied to all commercial structures and cannot be amended by local jurisdictions.

National Flood Insurance Program (NFIP)

Perhaps the single most important regulatory statue governing the construction of buildings in New Jersey flood prone areas was set forth by the Federal Government through the National Flood Insurance Program (NFIP). Established by Congress in 1968, the NFIP is a voluntary program designed to reduce the loss of life and damage caused by flooding, to help victims recover from floods and to promote an equitable distribution of costs among those who are protected by flood insurance and the general public (FEMA, 2000). The NFIP operates through a voluntary partnership between the Federal Government, the states, and local communities.

The New Jersey Department of Environmental Protection (NJDEP) is authorized under N.J.S.A. 58:16A-50, the Flood Hazard Area Control Act, to delineate and mark flood hazard areas, adopt land use regulations for flood hazard areas, authorize the delegation of certain administrative and enforcement functions to county governing bodies and integrate the flood control activities of the municipal, county, State and Federal Governments. Based on flood hazard studies, the state adopts rules and regulations that delineate flood hazard areas that, in the judgment of the NJDEP, the improper development and use of which would constitute a threat to the safety, health, and general welfare of the public. Such delineations identify the various subportions of the flood hazard area for reasonable and proper use according to relative risk levels. Wherever practicable, floodway delineations identical to the delineations approved by the NFIP are made by the NJDEP.

The Federal Emergency Management Agency (FEMA) administers the NFIP conducting flood hazard studies, Flood Insurance Studies (FIS) and by developing Flood Insurance Rate Maps (FIRMs) for individual communities. A FIRM consists of one or more maps delineating the flood hazard by ground elevation as shown in Figure 39 (FEMA, 1995). Each FIRM outlines the areas of a community that will be impacted by a 100- and 500-year flood event. FEMA also provides funding to New Jersey communities for flood hazard mitigation and affordable, federally backed flood insurance to property owners and residents living in flood hazard areas. In return, participating communities adopt and enforce floodplain management ordinances that control development and the construction

[5] Additional information pertaining to regional building codes can be found on the Institute for Building and Home Safety web page at http://www.ibhs.org/building_codes/

of new buildings, substantial improvements to existing buildings and the reconstruction of substantially damaged buildings.

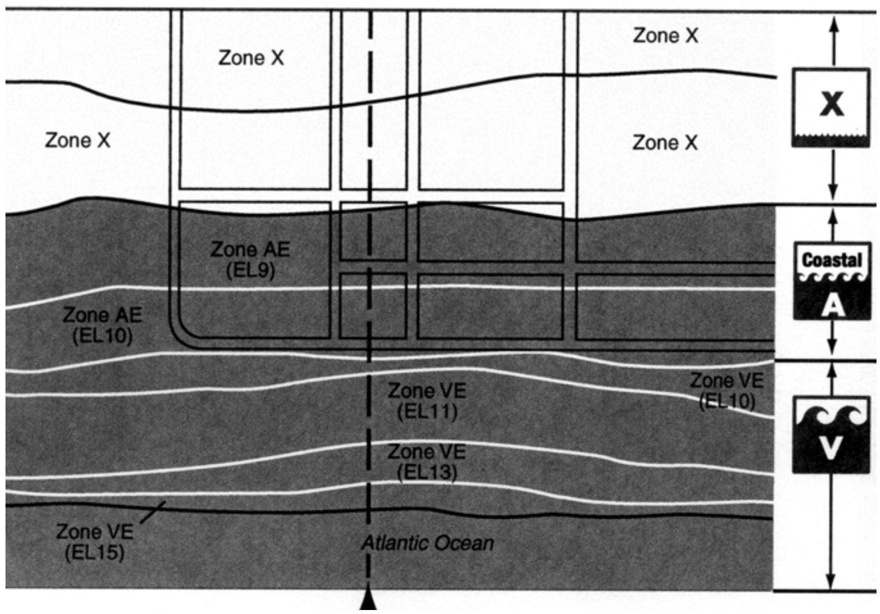

Figure 39. Idealized Flood Insurance Rate Map showing the delineation of flood hazard zones. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

A participating community's floodplain management ordinance must, at a minimum, meet the requirements of the NFIP regulations, but FEMA encourages communities to establish additional or more stringent requirements (FEMA, 2000). To provide incentives for communities to adopt more stringent regulations, FEMA established the NFIP Community Rating System (CRS) in 1990. The CRS awards points to communities for activities that will reduce flood losses, facilitate accurate insurance ratings and promote the awareness of flood insurance. Through the CRS, FEMA recognizes a community's floodplain activities in excess of the minimum standards by reducing flood insurance premium rates.

For more information regarding coastal regulations in New Jersey contact:

New Jersey Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439
501 East State Street
Trenton, New Jersey 08625-0439
Phone: (609) 292-1235
Fax: (609) 777-3656
Web: http://www.state.nj.us/dep/landuse/

New Jersey Coastal Protection Technical Assistance Service
Davidson Laboratory
Stevens Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030
Phone: (201) 216-5290
Fax: (201) 216-8214
Web: http://www.dl.stevens-tech.edu

New Jersey Department of Community Affairs
Division of Codes and Standards
Bureau of Code Services
P.O. Box 816
Trenton, New Jersey 08625-0816
Phone: (609) 984-7609
Web: http://www.state.nj.us/dca/programsbook/dcs.htm

Federal Emergency Management Agency
Region II
26 Federal Plaza, Room 1337
New York, NY 10278
Phone: (212) 225-7200
Web: http://www.fema.gov/regions/ii/

Federal Emergency Management Agency
Federal Insurance Administration
500 C Street, S.W.
Washington, D.C. 20472
Phone: (202) 566-1600
Web: http://fema.gov/

Elevation

Responsible Agency/Party: Homeowner or builder initiated to new or established structures

Mitigation for: Flood hazards
Wave hazards

Management Effort: Low

In coastal flood zones, elevating structures is an effective way to mitigate potential damage from flooding, wave action and debris. In New Jersey communities participating in the National Flood Insurance Program (NFIP), ordinances and laws require buildings to be sited at an elevation above the Base Flood Elevation (BFE); i.e., the flood elevation that has a 1-percent probability of being equaled or exceeded in any given year (determined on an individual community basis). The 100-year storm event is chosen as the standard of protection or target state since such events generally are capable of permanently altering coastal landforms. The type of structural elevation required, open or closed foundation, is determined by the flood hazard potential at the location of the structure (Figure 40). The NFIP designates flood hazards into three broad categories:

V-Zone: Coastal High Hazard Area extending from the ocean to the inland limit of the primary dune and/or any area subject to high-velocity wave heights (3 feet or greater), and wave runup depths greater than 3 feet.

A-Zone: Areas outside of the Coastal High Hazard Area but still exposed to high velocity flood flows (greater than 10 ft/s) and breaking waves heights less than 3 feet in height.

Coastal A-Zone: Presently, the NFIP makes no distinction between the A-zones of inland and coastal areas. Because structures in an A-zone along the *coast* are still subject to wave action (less than 3 ft in height), FEMA is recommending that structures in the Coastal A-zone be built to meet V-zone requirements (FEMA, 2000).

X-Zones: Areas of moderate flood hazard outside of the 100-year base flood elevation but inside the 500-year flood limits

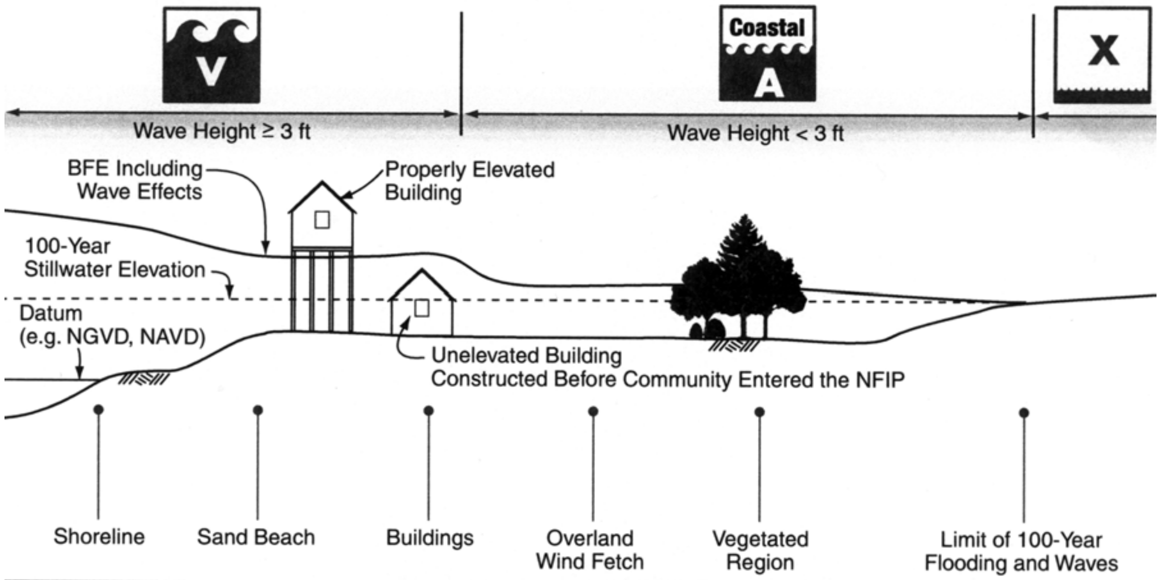

Figure 40. Cross-section of a typical shoreline showing the variation in flood hazard from the shore to the upland limit of flooding. Note the proposed delineation of a Coastal A-zone as an indicator of the higher flood velocities associated with waves less than 3 ft in height and storm surge flooding. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Structures built in V- or Coastal A-Zones in New Jersey should be elevated on pilings to a height where the lowest horizontal member of the structure is at or above the BFE (Figure 41). In addition, any enclosures, - carports, storage areas, showers, etc - built below the BFE must include structural elements that will “breakaway” when impacted by waves. The latter is extremely important because wave loads can exceed typical wind pressures that are generated by hurricanes and typhoons (FEMA, 2000). FEMA NFIP Technical Bulletin 9-99 discusses the design of breakaway walls in detail (FEMA, 1999). In addition to the use of breakaway elements, all concrete slabs and grade beams should be poured so that the concrete is not attached to the supporting piles. Many elevated structures that would have otherwise survived direct wave attack, have failed due to concrete slabs damaging the support piles (see Figure 26).

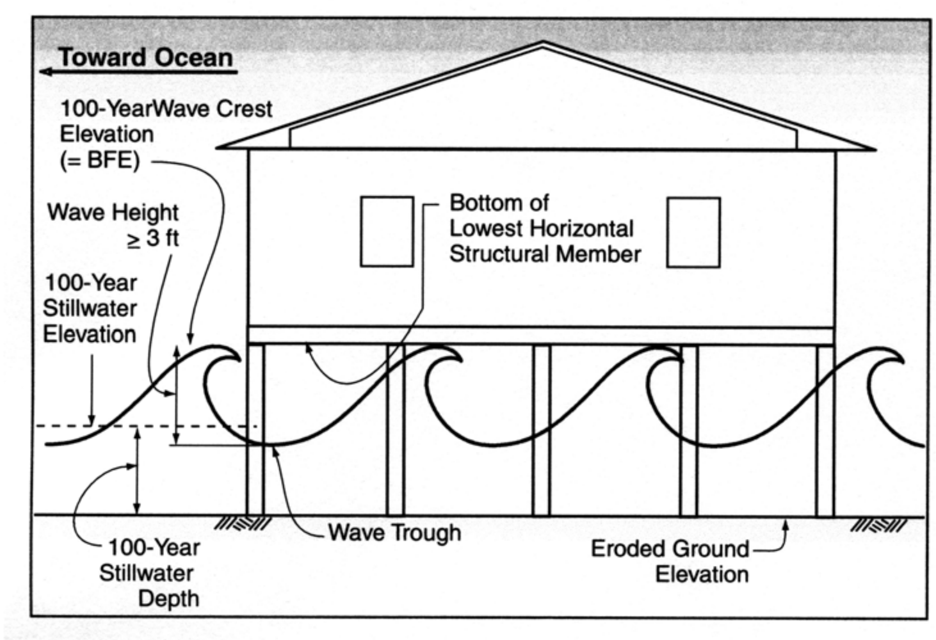

Figure 41. Minimum NFIP standards applied to New Jersey coastal dwellings in the V-zone require that buildings be elevated on an open foundation so that the lowest horizontal structural member is above the Base Flood Elevation. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Structures built in A-zones should be elevated to a level where the lowest floor of the structure is at or above the BFE (Figure 42). They can be built on pilings or on solid foundation walls as long as openings are included in the wall to allow floodwaters to enter Proper openings in a solid foundation are critical to insure that internal and external hydrostatic pressures are equalized, otherwise the foundation has the potential to collapse inward.

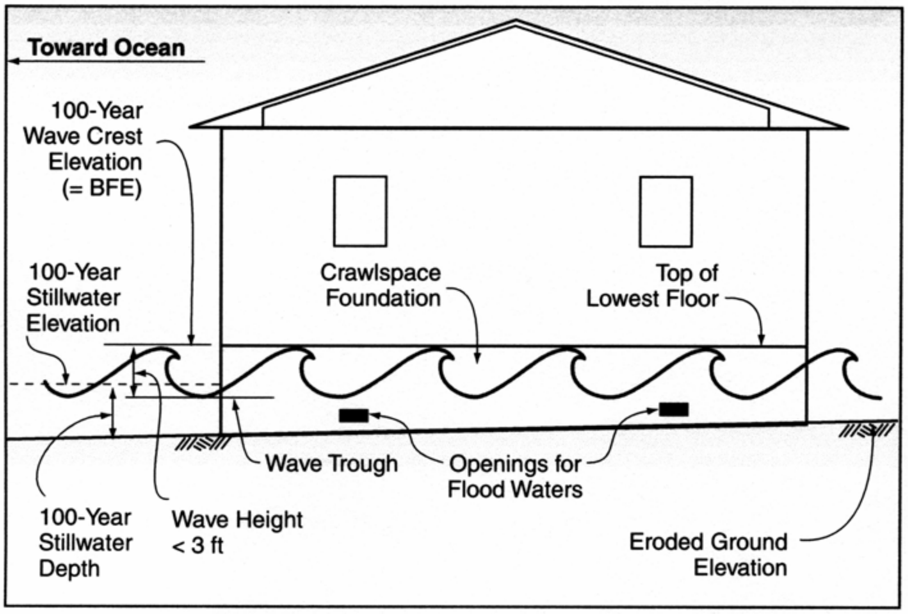

Figure 42. Minimum NFIP A-zone standards require that the lowest floor be at or above the Base Flood Elevation (BFE). Foundation walls below the BFE must be equipped with openings to allow equal interior and exterior hydrostatic pressures. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Structures built in either flood zone should also be designed to resist impacts from waterborne debris. Consideration should be given to elevating the structure an *additional* increment above the BFE to provide added protection against floods (Figure 43). This is especially prudent in regions where sea-level rise and shoreline recession and deflation may act to lower the ground elevation relative to mean sea level over the lifespan of the structure (Figure 44).

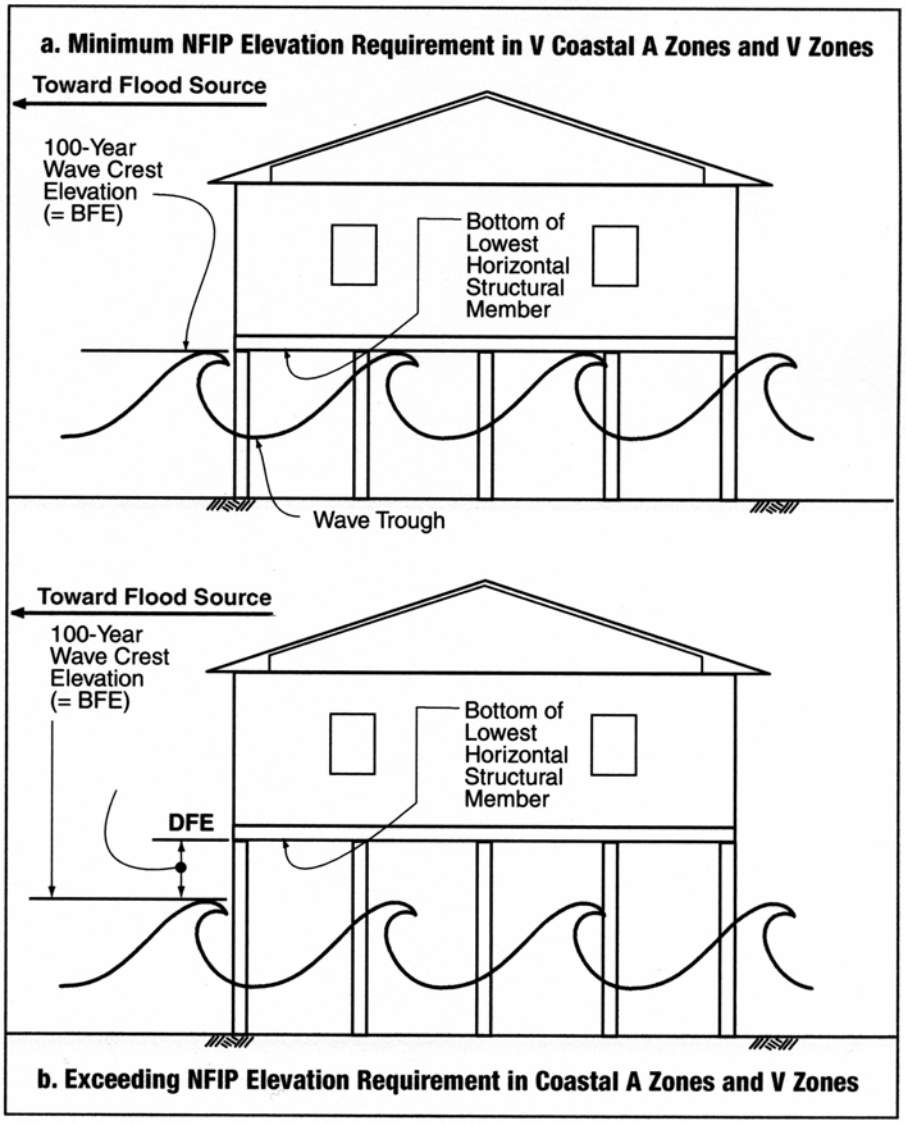

Figure 43. Since the NFIP provides *minimum* standards, consideration should be given to elevating structures above the Base Flood Elevation to provide an added level of protection. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

Figure 44. House on pilings left standing after March 1962 northeaster in Holgate, New Jersey. Almost all oceanfront houses not on pilings were either destroyed or heavily damaged as a result of this storm. The pilings to the right of the houses had just been driven in anticipation of building. The comparison between those houses left standing and those destroyed led to changes in FEMA's construction code (Photograph by Lawrence Wagner; courtesy of Dr. Susan D. Halsey)

In all instances, outside utilities (including air conditioning units) should be elevated along with the structure to or above the BFE. Designers and builders should be careful not to elevate the structure too high in regions exposed to exceptionally high winds as the benefit of reducing the flood hazard may increase the risk associated with the other hazards. Structures or infrastructure build below the BFE may encounter significant uplift forces due to buoyancy. Such structures should be sufficiently heavy or be anchored to withstand the uplift force.

For more information pertaining to construction in New Jersey flood hazard areas contact:

New Jersey Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439
501 East State Street
Trenton, New Jersey 08625-0439
Phone: (609) 292-1235
Fax: (609) 777-3656
Web: http://www.state.nj.us/dep/landuse/

New Jersey Coastal Protection Technical Assistance Service
Davidson Laboratory
Stevens Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030
Phone: (201) 216-5290
Fax: (201) 216-8214
Web: http://www.dl.stevens-tech.edu

New Jersey Department of Community Affairs
Division of Codes and Standards
Bureau of Code Services
P.O. Box 816
Trenton, New Jersey 08625-0816
Phone: (609) 984-7609
Web: http://www.state.nj.us/dca/programsbook/dcs.htm

Federal Emergency Management Agency
Preparedness and Prevention Library
500 C Street, S.W.
Washington, D.C. 20472
Phone: (202) 566-1600
Web: http://fema.org/library/prepandprev.shtm

Institute for Business & Home Safety
4557 E. Fowler Avenue
Tampa, FL 33617
Phone: (813) 286-3400
Fax: (813) 286-9960
Web: http://www.ibhs.org

Siting

Responsible Agency/Party:	State regulations, local ordinances and homeowner/builders
Mitigation for:	Long- and short-term erosion Flood hazards Wave hazards
Management Effort:	Low to Moderate

The proper siting of buildings and infrastructure is one of the most effective methods of coastal hazard mitigation (Figure 45). Unfortunately, prudent siting has often been overlooked or ignored by property owners, builders and local building and zoning codes. Poorly sited construction exposes coastal structures to increased vulnerability to erosion hazards, flooding, wave attack and wind loads.

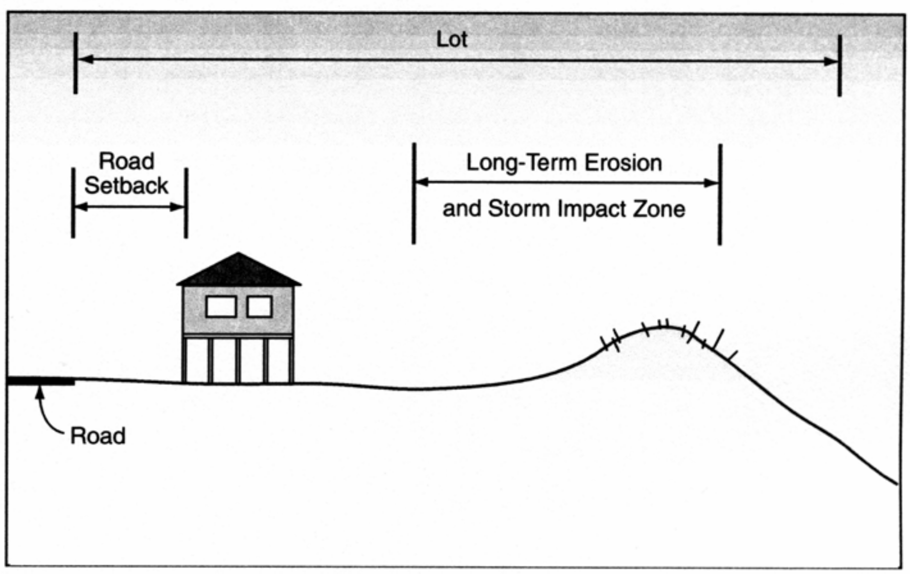

Figure 45. Oceanfront lots should be sufficiently wide to allow for ample space between the present shoreline and the anticipated location of the shoreline due to long-term erosion trends. Reprinted from the FEMA Coastal Construction Manual (FEMA, 2000).

The suitability of a coastal development site should be carefully investigated prior to its purchase, otherwise the new owner may be subjected to unwanted constraints in location, design, and construction techniques, all of which determine the sites long-term vulnerability to hazards. In addition to conducting an in-depth hazard analysis, the prospective buyer should also investigate the regulatory requirements for the location, including land use regulations, zoning ordinances, setback requirements, floodplain management requirements, building codes, coastal zone management regulations and allowable responses to erosion and flood hazards. It must be emphasized, however, that compliance with all of the regulatory requirements does not *ensure* the future safety of a building or development (FEMA, 2000).

Even with proper siting, the vulnerability of a coastal structure may increase over time. The presence of existing erosion control structures or constrained navigation inlets is an indication of prior (and most likely future) changes in the location of the shoreline (Figure 46).

Figure 46. Long Branch, New Jersey in May 1983 showing the location of old shore protection structures exhumed by storm action. (Photograph by Ed Schwartz, Toms River, New Jersey)

In addition, future coastal development and shore protection projects may have impacts on the vulnerability of the existing built environment. For example, the California Coastal Commission (1994) developed a set of comprehensive guidelines for coastal site planning, development and redevelopment that are relevant for all coastal residents:

- Ensure that the proposed land use is consistent with local, regional, and state planning and zoning requirements;
- Account for all types of erosion and governing erosion control policies;
- Avoid areas that require extensive drainage;
- Identify all potential hazards, including multi-hazard impacts;
- Consider existing public access and resource areas;
- Incorporate setbacks from identified high-hazard areas;
- Do not rely on engineering solutions to correct poor planning decisions;
- Do not rely on relocation or restoration efforts to replace resources impacted by poor planning;
- Do not overlook the effects of infrastructure location on the hazard vulnerability of building sites;
- Do not plan development on beaches or dunes;
- Do not forget to consider future site and hazard conditions; and
- Do not assume that engineering and architectural practices can mitigate all hazards.

The 3rd edition of FEMA's Coastal Construction Manual (FEMA, 2000) recommends additional siting practices based on prior experience with coastal development patterns and ensuing damages from poor planning:

1. Establish sufficient setbacks and building relocation plans for oceanfront lots (Figure 47). At a minimum, the structure should be landward, or capable of being moved landward, of the projected shoreline location at the end of the useful life of the structure. In some instances, the commitment to a long-term beach nourishment project can provide the appropriate setback over the useful life of the structure.

2. The placement of utilities near and parallel to the shoreline should be avoided. Potential damage to infrastructure can be reduced by configuring the oceanfront lots so they have access and utility feeds from shore perpendicular roads.

3. The creation of building lots or the redevelopment of existing lots on low-lying, narrow landforms should be avoided.

4. Development that places structures in line with environmental features that can concentrate floodwaters should be avoided (Figure 48). Such features may include areas of historic breaching, roads or paths across dunes, drainage features or canals. Lots should not be developed in such a way that floodwater and waves are potentially channeled through gaps.

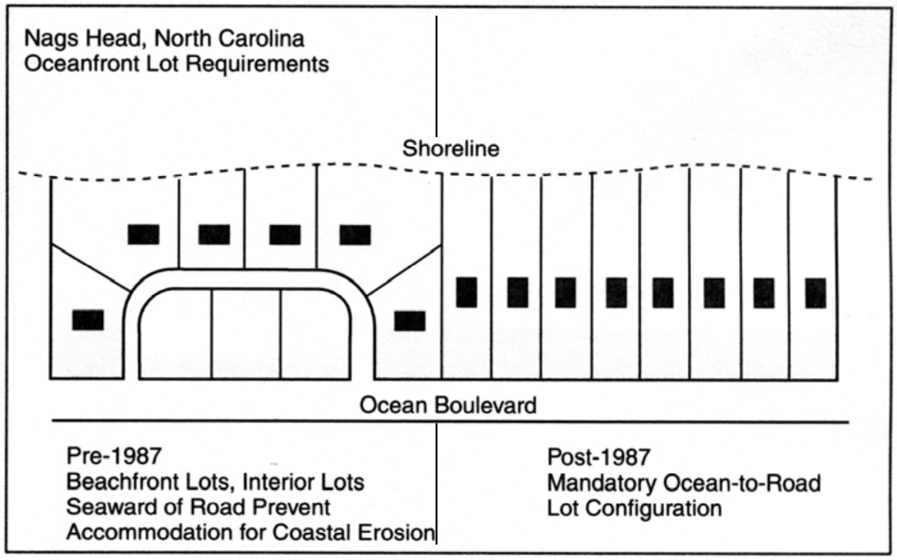

Figure 47. Example of improved lot requirements allowing for sufficient oceanfront setbacks. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

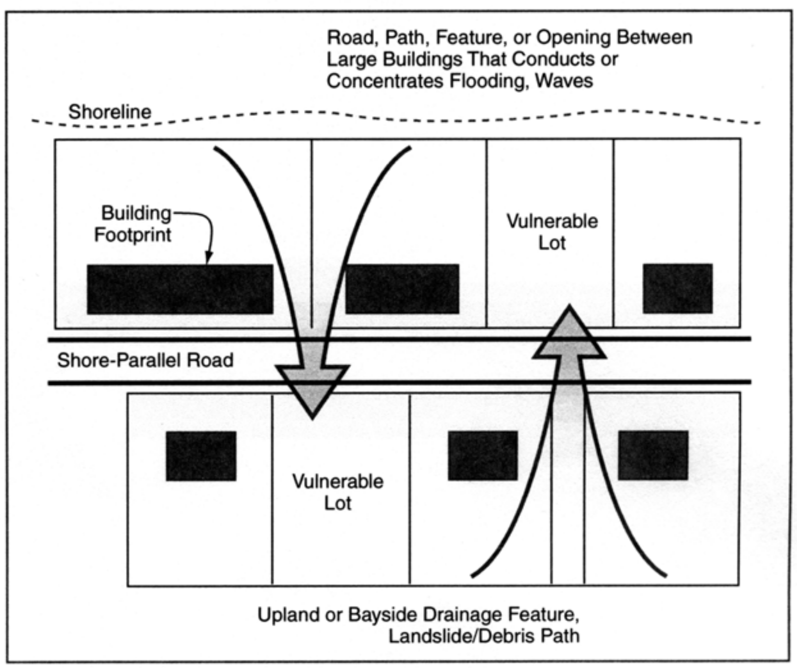

Figure 48. Lots sited landward of breaks in the dune line or openings between structures are vulnerable to channalized flow. Lots should not be developed in a way that places landward lots in gaps between seaward lots. Reprinted with permission from the FEMA Coastal Construction Manual (FEMA, 2000).

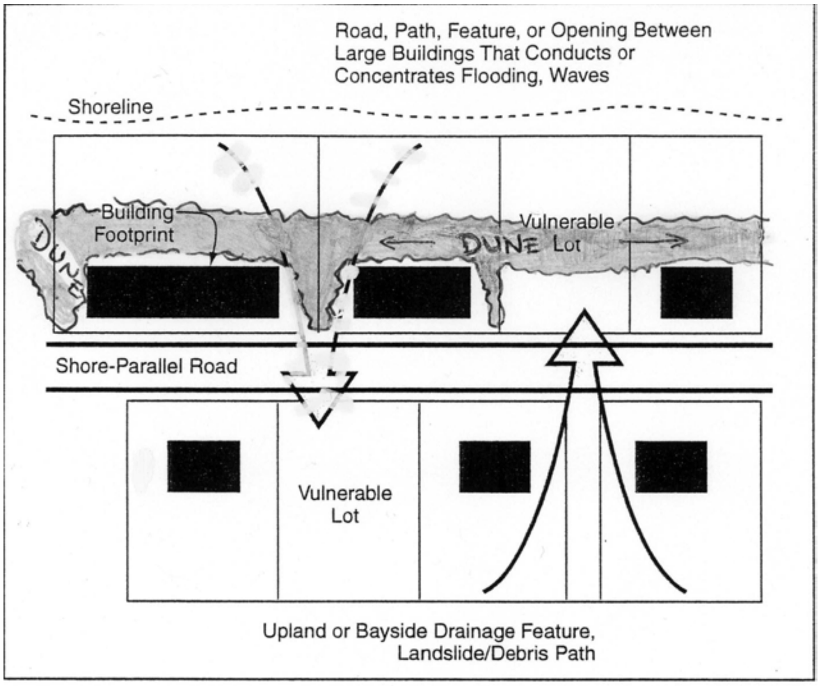

Figure 48b. Careful construction of dunes seaward and/or between structures can create a natural barrier around coastal structures that can mitigate channelized flow. Municipalities that construct dunes along their oceanfront (regardless of whether or not there are structures present) will decrease the opportunity for overwash. Vulnerable lots without existing structures may be designated as “sacrificial areas” for bayside drainage to return to the ocean. (Diagram modified by Dr. Susan D. Halsey)

5. Development or redevelopment along reaches of coastline that have historically undergone large variations in erosion and accretion should be avoided. Such areas can include locations close to tidal inlets and on barrier spit formations.

6. The siting of a building as far seaward as allowed under the existing regulations should be avoided as well as siting buildings too close to erosion control structures, dunes, or inlets. Avoid extending the oceanfront side of any building seaward of the existing building line.

A properly sited and designed building will minimize its vulnerability to damage from coastal hazards. Although a structure may be designed to withstand conditions exceeding the design flood, wind, and wave loads, if improperly sited, it may still be rendered a loss, if a storm makes the building inaccessible. The success of a coastal building starts with proper siting.

For more information pertaining to land use planning in New Jersey contact:

New Jersey Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439
501 East State Street
Trenton, New Jersey 08625-0439
Phone: (609) 292-1235
Fax: (609) 777-3656
Web: http://www.state.nj.us/dep/landuse/

New Jersey Coastal Protection Technical Assistance Service
Davidson Laboratory
Stevens Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030
Phone: (201) 216-5290
Fax: (201) 216-8214
Web: http://www.dl.stevens-tech.edu

Institute for Business & Home Safety
4557 E. Fowler Avenue
Tampa, FL 33617
Phone: (813) 286-3400
Fax: (813) 286-9960
Web: http://www.ibhs.org

Federal Emergency Management Agency
Preparedness and Prevention Library
500 C Street, S.W.
Washington, D.C. 20472
Phone: (202) 566-1600
Web: http://fema.org/library/prepandprev.shtm

Shore Protection Structures

Shore protection structures, also referred to as fixed or hard structures are designed to mitigate the effects of shoreline erosion. When appropriately sited, constructed and maintained, fixed structures are capable of providing effective protection for upland property and infrastructure. It should be noted, however, that no structure or device can *create* sand, thus any accumulation of sand in the vicinity of the structure is at the direct expense of an adjacent section of the shore (National Research Council, 1995).

Although shore protection structures have a proven track record (National Research Council, 1995) their deployment without adequate attention given to natural coastal processes will almost always lead to adverse impacts in the vicinity of the structure. It is for this reason that all coastal protection structures should be designed or certified by a professional coastal engineer. In addition, individual shore protection structures should always be constructed as part of a larger shore protection scheme to protect an entire reach or region of the coast. In most instances, shore protection structures are not an option for the individual property owner but rather a coastal management tool for local, state or regional authorities.

Sometimes the use of a fixed structure along the coast is a necessity; e.g., when siting jetties along navigational inlets or when using terminal groins in beach nourishment projects to retain sand. In other instances, shore protection structures can be used to increase the longevity of beach nourishment projects by reducing alongshore sand transport. Shore protection structures can also be used where severe flooding is a distinct possibly and no other options are available (e.g., sand dunes) to protect the backshore. In all cases, the potential for adverse effects of proposed shore protection structures should be analyzed very carefully prior to their construction (National Research Council, 1995). Once a structure is constructed, it should be monitored to determine its performance and impact on adjacent shorelines. Adaptive management plans with thresholds should be developed at the onset of a coastal protection project to mitigate any unanticipated adverse effects, if and when they occur.

Clearly, there is a great deal of responsibility associated with the decision to construct shore protection structures. Because the coast is constantly evolving, a state, municipality or community that decides to use hard structures as part of a shore protection plan must be committed to long-term monitoring, maintenance, and possibly altering or removing the structures. This commitment requires diligence and a stable financial base.

There are generally three broad categories of shore protection structures; shore perpendicular, shore parallel and non-traditional that are summarized below:

<u>Shore Perpendicular Structures</u>

Responsible Agency/Party:	Federal and/or State sponsored projects
Mitigation for:	Long -term erosion Flood hazards Wave hazards
Management Effort:	High

Shore perpendicular protection structures are designed to either reduce the rate of transport of sand along a specific reach of shoreline or to completely block the alongshore movement of sand beyond a certain point. Groins are often constructed in series (called a groin field) forcing the sand to fill in to a specified level on one beach before allowing sand to be transported to the next beach in the field. Down. A groin field is analogous to a series of weirs that will not allow water to flow over a point until a certain level has been reached. Terminal groins and jetties are impervious shore perpendicular structures constructed to keep sand from moving into an undesirable areas including navigational inlets, harbors and submarine canyons.

Groins

Used singularly or in groups, groins are constructed perpendicular to the shore to trap and reduce the alongshore transport of sand (Figure 49). Groins typically extend from the toe of the primary dune, offshore to the seaward limit of the surf zone (Figure 50). Extending the structures beyond the surf zone will usually force sand too far offshore to return to the downdrift beach.

Figure 49. Extensive groin field along the Monmouth County, New Jersey coast. Note the recession of the shoreline from south (bottom of photo) to north as less and less sand is transported around each successive groin (Photograph by Ken Cadmus).

Figure 50. Overhead view of a rock groin showing the underwater extent of the structure (Photograph by Ken Cadmus).

The height of a groin varies depending on the desired amount of sand bypassing. High profile groins will effectively block the transport of sand (Figure 51) while low profile groins will allow the tide and waves to transport sand over the structure. In addition to their length and height, the distance between groins is important to the stability of the shoreline. Groins spaced too far apart lead to excessive erosion between structures and groins spaced to close together generate strong currents that limit the amount of sand deposited in their lee.

Figure 51. Aerial photograph of high profile rock groins along Ocean City, New Jersey after a severe March 1984 storm. Note the little sand left on beaches (shown by the whiter shade of dry sand). (Photography by Dr. Susan D. Halsey)

Groins do not create sand; they only influence its deposition. Groins are only effective when there is a *net* alongshore transport of sand in one direction. The evolution of the shoreline in response to the construction of a groin is dependent on the predominant wave direction. Once constructed, the predominant waves begin to deposit sand along the updrift side of the groin. As the shoreline continues to evolve, the fillet reaches its capacity and sand begins to pass around and over the groin to the downdrift beach. In regions where there is very little net alongshore transport of sand, it takes a very long time to create a sand "surplus" available for migration over and around the seaward extent of the groin. It should be recognized that a groin will negatively impact the downdrift beach by reducing the amount of sand available to it until the fillet has reached capacity.

Groins are constructed with a number of different materials depending on availability, cost, and longevity. In high-energy environments, groins are typically constructed of granite, basalt or pre-cast concrete interlocking units (e.g., dolos) that resist movement. In lower energy environments, groins can be constructed of timber sheeting, poured or pre-cast concrete, metal sheeting, plastic sheeting, pilings, rock filled wire baskets (gabions), and sand filled geotextile tubes. Groins are often constructed of two or more materials to improve performance and cost-effectiveness.

Groins also vary in the shape of the cross-shore profile, depending on the intended function of the structure. Groins can be constructed with low profile sections along the beach berm to allow the wind and storm tides to transport sand across the structure. Groins can be “notched” – lowered down to the mean water level in sections – along the beach foreshore and surf zone to allow breaking waves and wave runup to transport sand across the structure (Figure 52). Groins can also be tapered at the offshore end to allow for unimpeaded sand transport offshore of the structure. The porosity – size of the voids in the structure – can also be altered to allow a certain percentage of sand to move through the structure.

Figure 52. Notched groin – groin with a section removed within the surf zone, in Spring Lake, NJ. Photograph by Thomas O. Herrington.

Jetties

Jetties are shore perpendicular structures constructed to eliminate the alongshore transport of sand around, across, or through the structure, in order to maintain and stabilize the location of an inlet of coastal navigation channel. As such, jetties are high profile, impervious structures stretching between the upland limits of wind-borne sediment transport, offshore into water depths deep enough that no significant wave- or current-induced sediment transport occurs. Because jetties extend through the surf zone and absorb direct wave attack, they are typically constructed of very heavy quarrystone or concrete armor units placed in a trapezoidal cross-section. The individually armor units are placed to limit the size and number of interior voids that will allow sediment to flow through the structure. To limit the amount of wave overtopping, the top elevation of a jetty is commonly above the maximum wave height expected in conjunction with the design storm event (Figure 53).

Figure 53. Jetties constructed to stabilize Barnegat Inlet, NJ interrupt the along shore transport of sand in order to control the location of the inlet channel (Photograph courtesy of the Jersey Shore Partnership).

Jetties, by definition, are designed to interrupt the alongshore transport of sand and stabilize the random transgressions of a coastal inlet. This interruption in sediment transport generates a sand deficit along the shoreline downdrift of the inlet. In order to mitigate the negative impacts of a stabilized inlet, variations in the design or operation of inlet stabilization structures have been implemented, including the use of weir sections – lowered portions of the structure that allow sand to cross the jetty and deposit in a deposition area – and bypassing of sand across the inlet by pumping, trucking or dredging.

Terminal Groins

Terminal groins are impermeable groins designed to stop the transport of sand around, through or over the structure. Terminal groins are very similar to jetties in that they are impervious structures placed in the cross-shore to eliminate the movement of sand beyond a certain point along the coast (Figure 54).

Figure 54. Aerial photograph showing advanced terminal groin effects, Stone Harbor Point, NJ in early March 1984 (before the late March storm). Erosion caused by terminal rock groin in foreground has caused erosion in an arcing pattern behind the structure actually flanking it. Subsequently, the entire Point eroded away (dune field and spit visible in background. (Photograph by Dr. Susan D. Halsey)

Generally not as long or high as jetties, terminal groins are constructed to guard against the permanent loss of sediment from the coastal system. The most common use of a terminal groin is at the downdrift end of a sediment transport system. Some examples include immediately updrift of a submerged canyon, at the edge of an inlet to prevent the movement of sand landward into a bay or estuary and at the limit of a sand spit. Terminal groins can be constructed of many different materials as long as the structure is relatively impervious to sand. The benefits of a terminal groin should be weighed against the potential negative impacts since the structure will permanently interrupt the alongshore transport of sand (Figure 55).

Figure 55. Aerial photograph of the "Cape May Meadows" area, Cape May Point, NJ after the March 1984 storm. Terminal groin effect from Cape May City (in top distance) has eroded the meadows area in the classical arced pattern. Note extensive washover fans with sand reaching into the ponds and salt marsh, and old World War II bunker in surf zone. Originally the bunker was approximately 1000 feet behind the dune line when built. (Photograph by Dr. Susan D. Halsey)

Shore Parallel Structures

Responsible Agency/Party:	Federal and/or state sponsored projects; bulkheads and revetments for private property protection
Mitigation for:	Long -term erosion Flood hazards Wave hazards
Management Effort:	Moderate to High

Shore parallel protection structures are built both onshore and offshore of the coast. Viewed as the last line of defense against coastal storms, onshore structures, (e.g., bulkheads, revetments and seawalls) limit the landward extent of erosion or retain land behind the structure. Offshore structures, or breakwaters, are designed to limit the magnitude of wave energy in their lee. Breakwaters can be built either above or below the water's surface depending on the desired level of wave protection.

Bulkheads

Bulkheads are designed to prevent the loss of sediment landward of the structure (Figure 56).

Figure 56. A sheet metal bulkhead installed to prevent the undermining of a dune and adjacent home. Bulkheads exposed to direct wave attack can result in the loss of sediments fronting the structure (Photograph by Dr. Michael S. Bruno).

Because bulkheads function to retain sediments, they are not necessarily designed to withstand direct wave attack. For this reason, bulkheads are not usually found fronting the ocean, but rather are constructed along bay and harbor shorelines to reduce erosion, and to provide direct access to deeper water. Bulkheads are generally thin structures built of wood, metal or plastic sheeting that are driven deep into the ground to resist deflection of the above ground portion of the structure. In areas where there is poor soil or where high structures are required, a tieback anchoring system may be required. However, where the subsurface soil can support the weight of heavier structures, bulkheads may be constructed of poured or pre-cast concrete, rock, gabions or sand- and cement-filled bags. Care must be taken to insure adequate penetration of the substrate as reflected wave energy can accelerate erosion at the base of the bulkhead (Figure 57). In cases where a bulkhead is needed to withstand moderate wave attack, rock facing is often placed along the seaward side of the structure to dissipate wave energy and provide scour protection (Figure 58).

Figure 57. Timber bulkhead at Bradley Beach, New Jersey under direct wave attack. Note rock placed at the base of the structure to prevent scour (Photograph by Dr. Thomas O. Herrington).

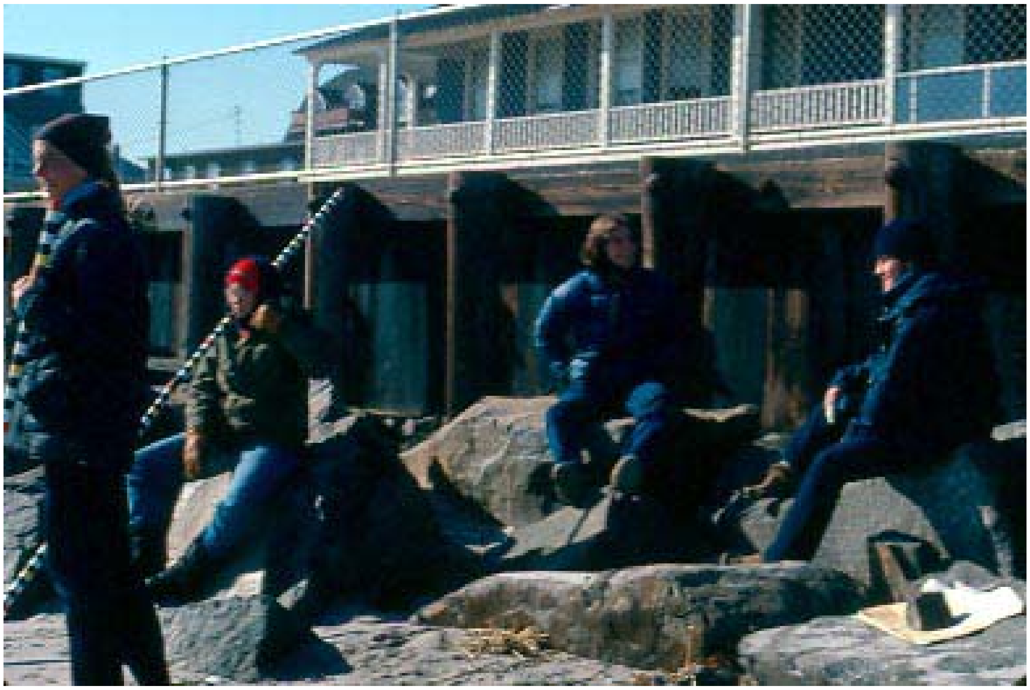

Figure 58. Students on Revetment boulders placed in front of new timber bulkhead, Sea Isle City, New Jersey in January 1979. Subsequent beach nourishment has completely covered these structures up to the level of the promenade above. (Photograph by Dr. Susan D. Halsey)

Revetments

Revetments are sloped structures built of heavy material (armor) to protect the upland from wave- and scour- induced erosion. The structure is designed to absorb direct wave attack and dissipate wave and current energy by inducing wave breaking, reducing wave runup, and by dissipating the water's energy along their slope (Figure 59). Because a revetment is sloped, the structure depends on the subsurface soil for support and should be built on a very stable shore or bank slope. In many instances, the original soil must be removed and replaced with high-quality fill material contoured to an approximately 1:1.5 (1 foot vertical for every 1.5 feet of horizontal distance) slope. Usually, an impervious filter fabric is placed on top of the soil and the structure is built in layers of increasing grain size (sand, pebbles, small rock, and large quarry stone). Any revetment designed to absorb direct wave attack should have a top layer constructed of heavy interlocking quarrystone or pre-cast concrete armor units. These rubble mound structures are flexible in the sense that individual armor units can settle or move without compromising the overall strength of the structure.

Figure 59. Rock revetment fronting a timber bulkhead along the Avalon, New Jersey coastline (Photograph by Dr. Thomas O. Herrington).

Where direct wave attack is of lesser concern, revetments can be constructed of a wide variety of materials. Along riverbanks and embayments, revetments have been constructed of poured concrete, tong-and-groove concrete blocks and slabs, gabions and plastic. Revetments are frequently constructed with smooth slopes for aesthetic reasons. Because revetments dissipate energy along the slope of the structure, smooth structures increase the risk of overtopping and can fail catastrophically, if one of the interlocked units is displaced.

In all cases, revetments should be constructed with adequate toe protection to prevent the undermining and collapse due to wave and current scour. Although wave reflection is of ~~a~~ lesser concern than in the case of bulkheads or seawalls, the action of waves should still be considered in the design of the structure. Because revetments only protect the area immediately behind them, wave overtopping and erosion at the ends of the structure (flanking) can be a problem (Figure 60).

Figure 60. "Flanking" around the end of a gabion revetment in Cape May Point, New Jersey (Photograph by Dr. Thomas O. Herrington).

Seawalls

Seawalls are massive structures designed to protect the land behind them from direct wave attack. They are generally built along reaches of coast that contain some type of critical infrastructure such as an evacuation route, water or sewer main, utility easement or rail line (Figure 61). Because seawalls are designed to withstand direct attack by very large waves (Figure 62), they are usually trapezoidal in cross-section, and constructed of very heavy outer armor units placed on top of smaller rock or a solid core (soil berm or concrete). The top of the structure is typically set at an elevation that will prevent wave overtopping and minimizes the amount of saltwater spray crossing the structure. In some instances, a walkway or emergency access road will be constructed along the crest of the structure.

Figure 61. Sea Bright – Monmouth Beach Seawall in Monmouth County, New Jersey. Originally constructed to protect a rail line, the seawall now protects a main evacuation route and local community (Photograph courtesy of the Jersey Shore Partnership).

Figure 62. Waves breaking over seawall at Sea Bright, New Jersey (Photograph by Dr. Susan D. Halsey).

To minimize the planform ("footprint") required for a seawall, the structure is usually built with steep side slopes (1:1.5). A negative consequence of this design is the generation of reflected waves during storm events that accelerate erosion at the toe of the structure and can lead to instability, undermining and eventual collapse. Research has indicated the seawalls built landward of shorelines with a stable sediment supply are exposed to wave action only during the most severe storm events and allow for the natural recovery of the beach afterwards (Griggs, et. al. 1994). Along eroding shorelines, it may be important to have a protective beach in front of the seawall to ensure its long-term stability, especially if it protects critical infrastructure.

Breakwaters

Breakwaters are shore parallel structures placed offshore to intercept the energy of the incoming waves. Breakwaters are constructed as either emerged (crest above the water level) or submerged structures, and in some instances are designed to float. The type of construction depends on the location and intended use of the structure.

Emerged Breakwaters are constructed to provide maximum shelter from approaching waves. Such devices reduce the incident wave energy through reflection or wave breaking along the seaward side of the structure, creating a low energy environment on the lee side. In bays and harbors, emerged breakwaters are often used to create sheltered areas for marinas and port facilities. Along open coasts, emerged breakwaters are used to stabilize eroding shores as the reduction in wave energy reduces the transport of sand in the lee of the structure, creating areas of localized deposition (Figure 63). The amount of sediment deposited is a function of the length and height of the breakwater. In many instances, a reach of shoreline is protected by a series of breakwaters separated by gaps (Figure 64). Because the structures are effectively trapping sand in their lee, coastal breakwater fields can act very much like a groin field by slowing the movement of sand along the coast and reducing the amount of material available to downdrift beaches.

Figure 63. Engineered beachfront in Malaga, Spain. The Spanish provincial government has created beach reentrants with large T-groins and smaller interior bulbous-ended groins tied together by a wide promenade (right) along extensive sections of the Spanish Mediterranean coast. These designs are created to provide protected beaches and bathing areas for recreation, and shops and restaurants for the burgeoning tourist industry (Photograph by Dr. Susan D. Halsey)

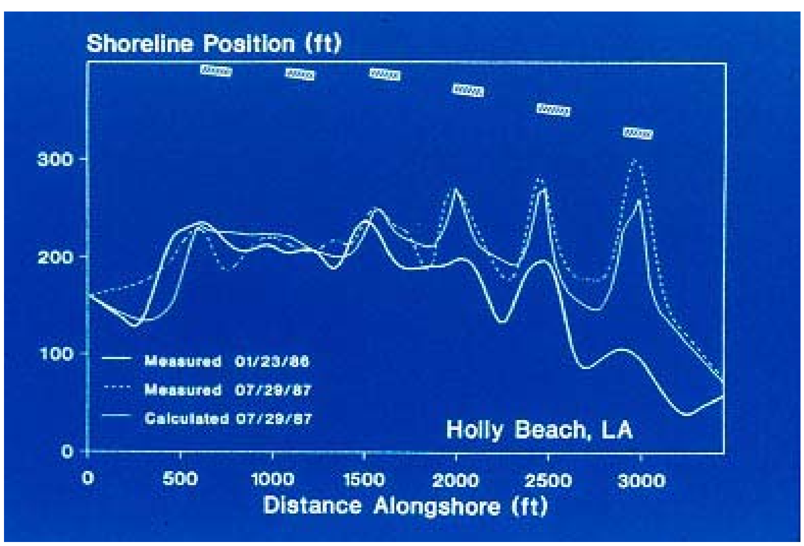

Figure 64. Shore evolution landward of an emerged breakwater field in Holly Beach, LA.

Like seawalls, emerged breakwaters require large “footprints”, are trapezoidal in cross-section, and are almost always constructed of large quarrystone or pre-cast concrete units. When placed in deep water, the structures are often constructed by dumping rock from a barge or ship until a stable slope is achieved. When space is a concern, emerged breakwaters can be constructed by driving sheet metal piling and filling the interior area with rock and rubble. Such “cofferdam” breakwaters are typically constructed in ports and harbors.

Submerged Breakwaters are often used for situations where reduction in wave heights combined with an allowance for sand movement along the beach is desired. The amount of wave energy transmitted across the breakwater is dependent upon the structures length, width, and depth underwater. The wider and higher the structure, the more effective the breakwater is in dissipating wave energy. In high-energy environments, submerged breakwaters must be hundreds of feet wide to effectively dissipate wave energy. Narrow-crested submerged breakwaters (crest width on the order of feet) have been constructed in regions of strong currents to act as barriers between the scouring effect of currents and the shoreline (Figure 65). In addition to sheltering the coast, the structures also act to trip larger storm waves and provide a barrier to offshore transport of sediment. Narrow-crested reefs or sills have been used to create “perched beaches”; i.e., beaches elevated above their normal level and held in place by an~~d~~ offshore sill.

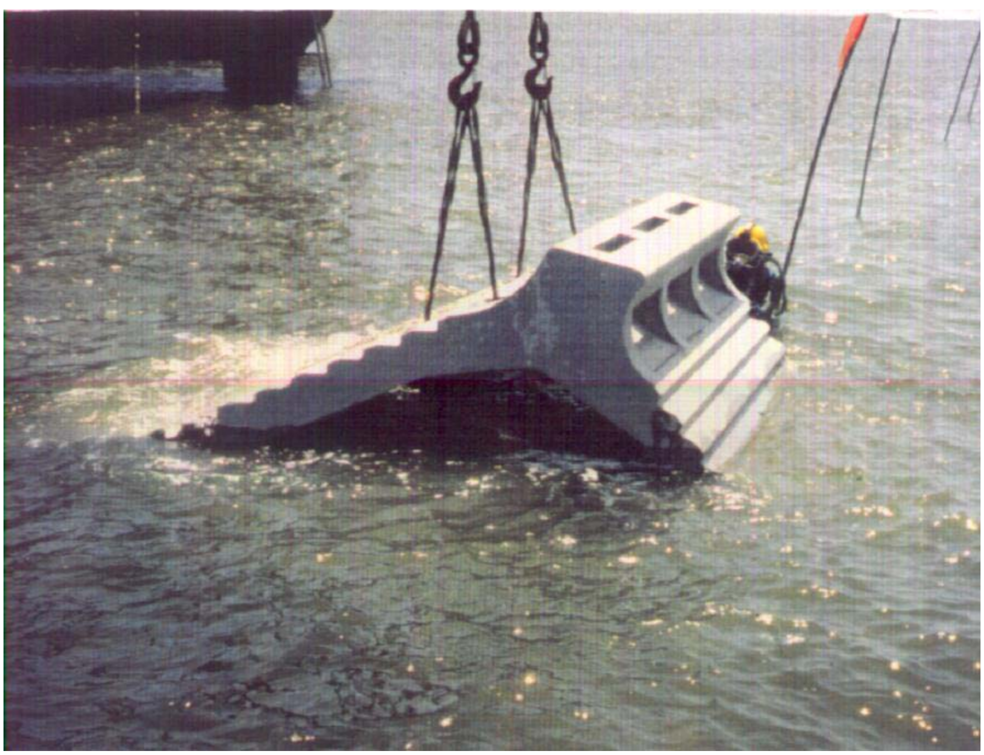

Figure 65. Cross-section of a narrow-crested reef module being installed at Cape May Point, New Jersey (Photograph by Dr. Michael S. Bruno).

Submerged breakwaters may be constructed of rock, pre-cast concrete, or sand-filled geotextile bags and tubing. Wide-crested submerged breakwaters are becoming more prevalent along coast where both coastal protection and habitat and recreational resource creation are desired. In all applications, extreme care is necessary to insure that the components of a submerged breakwater are able to resist movement due to waves, currents and scour.

The term artificial reef is often erroneously used to describe a submerged coastal breakwater designed to reduce the amount of erosion along the coast. It should be noted that all structures built in coastal waters become habitat for marine organisms; however, this is a secondary benefit of the structure. Artificial reefs are structures built for the sole purpose of creating habitat for marine organisms and are often constructed in deeper offshore waters.

Floating Breakwaters are constructed of buoyant material, deployed in the upper portion of the water column. The effectiveness of a floating breakwater is dependent on the structure width, stiffness, porosity, and depth of penetration below the water surface. Floating breakwaters are most effective in reducing wave heights in the lee of the structure when its width is greater than the distance between successive wave crests (wavelength). When the wavelength exceeds the width of the structure, the structure begins to float up and down along the wave surface just like a boat, allowing all of the energy in the wave to propagate under the structure. Because open-ocean wavelengths generally exceed 200 feet, floating breakwaters are generally ineffective in providing cost-effective coastal protection. However, they can be cost effective in ports and harbors where existing water depths are too deep to make the construction of a fixed breakwater practical. Floating breakwaters are often used for marina protection where boat wakes and water quality are of concern.

Floating breakwaters are constructed of a number of materials~~,~~ including timber, plastic, epoxy coated foam, hollow metal cylinders, rubber, pre-cast concrete, among others (Figure 66). In addition to prefabricated materials, many floating breakwaters are constructed with materials of opportunity, such as old boats and floating barges.

Figure 66. Whisprwave© floating breakwater constructed of rotationally modeled high-strength plastic at the Themesport Marina, New London, CT (Photograph by Dr. Thomas O. Herrington).

Non-traditional Shore Protection Structures

Responsible
Agency/Party: Federal and/or state sponsored projects
Municipal or community initiated
Homeowner or industry initiated

Mitigation for: Long– and short-term erosion
Flood hazards
Wave hazards

Management
Effort: Low to High

As research and experimentation continue, new techniques for shoreline stabilization will be proposed and developed (Herrington et al., 1998). In many instances, these approaches "work with nature" rather than simply constructing a barrier as a solution to erosion or wave attack. Increasingly, a shoreline stabilization structure can be hidden in the natural environment and only exposed, if at all, during severe storm events.

Dewatering Systems

Dewatering refers to the drawdown of the water table under the beach foreshore by a system of perforated pipes and pumps. By lowering the natural water table, the porosity of the beach is increased allowing water that would normally run up and down the foreshore slope to percolate down through the sand. Any sediment being carried by the water is deposited on the beach creating a zone of sand deposition (Figure 67). The beach response to a dewatering unit is similar to that of an offshore breakwater system however, in the absence of wave energy reduction, sediment is more easily eroded during storm events. The effectiveness of the system is also dependent on the reliability of the pumps, the maintenance of the pipes and the availability of sand.

Figure 67. STABEACH© dewatering system in Cod Fish Park, Nantucket. Dashed line indicates the location of the buried dewatering pipe. Note the bulge in the shoreline generated by the deposition of sediment in the swash zone over the pipe (Photograph courtesy of Coastal Stabilization, Inc.).

Hardened Dunes

Dune hardening refers to the process of constructing a solid core in the center of a man-made dune system to act as a shore-parallel barrier to wave attack during severe storms. The dune core can be constructed of clay berms, rock revetments or seawalls, pre-cast concrete units or sand filled geotextile tubes. In all cases, the core is designed to promote the development of a natural dune on top of, and around the structure and can include appropriate drainage and soil conditions for the establishment of dune grasses and other plants. Some pre-cast concrete units include hollow interiors to promote sand deposition and plant establishment. Once exposed during a storm, the core of the dune acts as a traditional shore protection structure and must be re-covered with sand after the storm event.

Hardened dunes have been used extensively in New Jersey. Sand filled geotubes have been used in Whale Beach, Avalon, and Atlantic City. Clay berms have been used in Long Beach Township on Long Beach Island. Many relict rubble mound seawalls have also become the core of natural dune systems over time (Figure 68).

Figure 68. Exhumed portion of small rock seawall under dunes in northern section of Bay Head, New Jersey after a severe storm. Many residents were unaware that this seawall existed because it was completely covered by extensive dunes (Photograph by Dr. Susan D. Halsey).

Viscous Drag Mats

Sometimes refereed to as artificial seaweed, viscous drag mats are comprised of buoyant, high-strength plastic fronds woven into a weighted or anchored mat that is placed on the seabed. The fronds create a high-density, vertical lattice that interrupts fluid flow and decreases the velocity of near bottom currents. By interrupting currents, the mat promotes the deposition of sand thereby reducing erosion. Viscous drag mats have worked extremely well in deep water applications, by reducing scour around submerged pipelines and the bottom of drilling rigs. In coastal environments, the mats are only effective in low wave energy environments and are well suited to use in front of bulkheads and revetments where scour is a problem or the re-establishment of a more natural shoreline is desired.

Geotubes

Geotubes are porous textile tubes designed to hold sand but allow water to percolate through. Although geotubes are not in themselves a shore protection device, they are commonly used in shore protection structures. When filled, geotubes are as hard as traditional shore protection structures, but their use is considered by many as a "soft solution" to shore protection as the tubes can be easily removed by cutting the geotextile and pulling the bag out, leaving the sand fill on the beach. Geotubes have been used to create hardened dunes, revetments, groins and submerged sills (Figure 69). However, geotubes have a tendency to degrade over time and are prone to tearing, punctures and settlement. Proper maintenance and foundation preparation is required.

Figure 69. Sand filled geotube used to create the core of a protective dune line (Photograph by Dr. Michael S. Bruno).

Biodegradable structures

In a relatively new approach, biodegradable materials are being used to create biotextile tubes capable of being filled with sand or other soil materials for use in bank stabilization. Natural materials such as hemp and coconut strands are used to create woven tubes that are filled with soil and placed along marsh banks or estuarine riverbanks to reduce wave and current energy. The biotextiles promote the re-establishment of the natural vegetation by offering a protected base for root establishment. Over time the biotextile degrades leaving only the natural vegetation.

For more information about shore protection structures in New Jersey, contact:

New Jersey Department of Environmental Protection
Natural and Historic Resources
Division of Engineering and Construction
1510 Hooper Avenue
Toms River, New Jersey 08753
Phone: (732) 255-0770
Fax: (732) 255-0774

New Jersey Department of Environmental Protection
Office of Coastal Planning
P.O. Box 418
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Trenton, New Jersey 08625
Phone: (609) 292-2662
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New Jersey Coastal Protection Technical Assistance Service
Davidson Laboratory
Stevens Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030
Phone: (201) 216-5290
Fax: (201) 216-8214
Web: http://www.dl.stevens-tech.edu

U.S. Army Corps of Engineers
Philadelphia District Office
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3390
Phone: (215) 656-6516
Fax: (215) 656-6820
Web: http://www.nap.usace.army.mil/

U.S. Army Corps of Engineers
New York District Office
26 Federal Plaza
New York, NY 10278
Phone: (212) 264-0100
Web: http://www.nan.usace.army.mil/

Coastal Resource Management

Responsible Agency/Party: Municipal or community initiated

Mitigation for: Long– and short-term erosion
Flood hazards
Wave hazards

Management Effort: Moderate

Along most coasts, sand is a finite resource that is always in motion in response to waves, currents and wind climate. In regions where the net yearly transport of sand is in one direction along the coast, coastal managers can use techniques to re-circulate the sand in the system, bypass or back-pass obstructions to sediment transport and redistribute sand across the beach profile. In addition, coastal managers can take steps to insure that sediment sources remain unconstrained (not encased behind bulkheads or similar structures) and that sediment sinks, such as inlets and offshore canyons, are avoided. By carefully managing our sand resources, the existing long- and short-term erosion, flood and wave hazard levels can be maintained and perhaps slightly reduced over time.

Regional Sediment Management

Regional sediment management refers to the process of recirculating sediment along specific reaches of coast with similar sediment transport patterns. The process may include the impoundment and mining of sand at the updrift end of the coastal reach and the transport and redistribution of that sediment along the downdrift beaches. Mechanical scraping and movement of sand by pan scrapers or front-end loaders can achieve similar results on smaller scales. By returning the sand to the beginning of the coastal reach, sand is conserved and long-term erosion is reduced. However, the amount of material removed from the updrift limit of a coastal reach should not, of course, exceed the volume of material expected to replenish the area between mining operations.

Sand Bypassing

Where a natural coastal feature or structure completely blocks the transport of sand, several techniques can be used to transfer (bypass) the sediment around the obstruction. *Natural* sand bypassing can be used to divert sand from the updrift shoreline out onto a natural bar or ebb shoal feature that extends around coastal headlands or inlets. This allows natural transport mechanisms to continue the motion of the sand down the coast. *Forced* sand bypassing employs mechanical methods such as mining and hauling to move sand around a barrier or pump sand across it. The volume, rate and frequency of sand bypassing are determined by the natural net sediment transport rate along the coast. At stabilized inlets, it is common to delineate an impoundment area that is mined once a specific volume of sand is deposited within it. In some instances, updrift jetties have been constructed with weir sections that allow sand to cross into the inlet and settle into a deposition basin (Weggel, 1981). At specific intervals the basin is dredged and the sand placed on the downdrift side.

Beach Scraping

Beach scraping is a technique used to move small volumes of sand that have accumulated in the intertidal zone to a beach berm or dune area during accretionary periods (Herrington, 1994). Bulldozers, pan scrapers or front-end loaders remove a veneer (< 6 inches) of sand from the low water line at low tide. The goal is to remove only that quantity of sand that can be replenished during the following tidal cycle. If repeated over a prolonged period of accretionary conditions, the technique can increase the volume of the dry beach, providing some mitigation for short-term erosion.

Beach scraping in New Jersey has often been used to build a protective dune immediately prior to the arrival of a coastal storm. Large volumes of sand are moved from the beach foreshore into the dune. Scraping in this manner actually makes the beach more vulnerable to severe erosion by steepening the slope of the dry beach and allowing the larger storm waves to undermine the lower beach foreshore (Herrington, 1994). To be effective mitigation, beach scraping must be conducted over a prolonged period of calm weather conditions.

For more information pertaining to coastal resource management in New Jersey, contact:

New Jersey Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439
501 East State Street
Trenton, New Jersey 08625-0439
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Fax: (609) 777-3656
Web: http://www.state.nj.us/dep/landuse/

New Jersey Coastal Protection Technical Assistance Service
Davidson Laboratory
Stevens Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030
Phone: (201) 216-5290
Fax: (201) 216-8214
Web: http://www.dl.stevens-tech.edu

New Jersey Department of Environmental Protection
Office of Coastal Planning
P.O. Box 418
401 East State Street
Trenton, New Jersey 08625
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Web: http://www.state.nj.us/dep/cmp/

New Jersey Sea Grant
New Jersey Marine Sciences Consortium
Building 22, Fort Hancock
Highlands, New Jersey 07732
Phone: (732) 872-1300
Fax: (732) 291-4483
Web: http://www.njmsc.org

Natural Resource Restoration

Responsible Agency/Party:	Municipal or community initiated Homeowner or industry initiated
Mitigation for:	Long– and short-term erosion Flood hazards Wave hazards Wind hazards
Management Effort:	Low to Moderate

Most coastal landscapes are composed of two types of geologic features; loose granular soils and eroding headlands. This composition allows the land to rapidly adjust to varying amounts of wave and wind energy and reach equilibrium between the amount of incident energy and the amount of energy dissipated along the coast. In addition to the physical forces in the environment, saltwater flooding and salt spray creates an extremely harsh environment for plants and animals. The rather unique diversity of plant and animal life along our coastal margins is the result of millions of years of adaptation to these harsh conditions. As communities work toward mitigating hazards along the coast, careful consideration should be given to restoring the natural features of the coastal environment. Features such as dunes and coastal marshes naturally mitigate coastal erosion and flood hazards.

Dunes provide a buffer between the ocean and the most seaward buildings and infrastructure along the coast. In addition, dunes store a significant volume of sand that can be released during extreme storm surges and wave events, providing the eroding beach with an additional layer of protection. They can be easily created by placing obstructions along the backshore to trap windborne sand and other particles. Wooden dune fencing or natural vegetation, such as American beach grass, will quickly begin to accrete sand. As the dune grows horizontally and vertically, additional layers of fencing or plantings can be used to incrementally increase the volume of the dune and the level of protection it provides. Although dunes grow and migrate in response to the wind, a properly vegetated dune provides a windbreak for down-wind structures and reduces the amount of sand blown landward of the beach.

Dunes are a unique and valuable coastal resource, providing habitat and protection for a number of endangered and threatened species including shore birds, small mammals (e.g., red fox) and crustaceans. As beach restoration projects continue to recreate lost shoreline many of these species are returning to the New Jersey coast and consideration should be given to enhancing their habitat. Dunes are also a component of the natural landscape adding to the aesthetic beauty and value of the coast. As coastal communities work to restore coastal resources lost to development and natural processes, private and municipal shorefront property owners should consider allowing the establishment or preservation of coastal dunes as a way to enhance the natural environment as well as mitigate the level of flood and wave hazards. If planned correctly, buffer areas can be left on oceanfront lots that will accommodate the growth and potential migration of the dune.

Coastal wetlands provide a buffer between bays or sounds and coastal uplands. Wetlands dissipate wave energy, trap sediments, and via their storage capacity, reduce the velocity of floodwaters during storm events. Coastal wetlands are also extremely productive coastal habitats, providing nutrients, shelter and nurseries to the young of a multitude of species. As the coastal zones were developed, many wetlands were dredged, filled or bordered by bulkheads. An unintended consequence of these construction practices was the erosion and degradation of the surrounding wetlands. Increased wave energy from pleasure boats, or reflected waves (e.g., from bulkheads) and the subsidence of marshlands due to reduced sediment supply has lead to a rapid loss of coastal wetlands and a higher susceptibility of the bay shore to flood and wave damage. As development and redevelopment occurs along the coast, mangers should consider construction techniques that will reduce the rate of surrounding wetland loss. Shore protection measures that dissipate instead of reflect wave energy should be encouraged. Similarly, strong consideration should be given to restoring and conserving wetlands along the coast. Best management practices include planting marsh vegetation, shoreline nourishment and planting, creation of perched sills seaward of wetlands, and the deployment of temporary wave attenuation barriers along eroding wetlands. Although too voluminous to list here, a tremendous amount of useful information for coastal marsh and bay shore restoration and protection practices can be found in the *Soundfront Series*, published by North Carolina (e.g., Rodgers and Skrabal, 2001; Clark, 2001).

Coastal property owners considering landscaping alternatives should give thought to planting native species. Not only are these forms uniquely adapted to the coastal environment, proper landscaping also acts to reduce flood hazards by decreasing runoff and high velocity flood waters. Given the unique environment of the coast, property owners should be encouraged to plant natural vegetation rather than recreate suburban landscapes.

As a community seeks to restore the natural resources of the coastal environment, the dynamic nature of the coastal environment must not be forgotten. Our coastal margins are uniquely adapted to rapid changes in landform and climatic conditions. One significant storm event can radically alter the geography and distribution of native species for years. Restoring, manicuring, and building beaches, dunes and marshes through filling, scraping, grading, staking, planting and fencing can camouflage the mobility of the natural environment and convey a false sense of stability and permanence. Stability is not a natural attribute of the coastal zone and should not be depended upon for long-term mitigation. A truly functional and natural coastal ecosystem is highly variable.

For more information pertaining to natural resource restoration in New Jersey, contact:

New Jersey Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439
501 East State Street
Trenton, New Jersey 08625-0439
Phone: (609) 292-1235
Fax: (609) 777-3656
Web: http://www.state.nj.us/dep/landuse/

New Jersey Coastal Protection Technical Assistance Service
Davidson Laboratory
Stevens Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030
Phone: (201) 216-5290
Fax: (201) 216-8214
Web: http://www.dl.stevens-tech.edu

New Jersey Department of Environmental Protection
Office of Coastal Planning
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401 East State Street
Trenton, New Jersey 08625
Phone: (609) 292-2662
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New Jersey Sea Grant
New Jersey Marine Sciences Consortium
Building 22, Fort Hancock
Highlands, New Jersey 07732
Phone: (732) 872-1300
Fax: (732) 291-4483
Web: http://www.njmsc.org

Building Techniques

Responsible Agency/Party:	*Homeowner or industry initiated*
Mitigation for:	Flood hazards Wave hazards Wind hazards
Management Effort:	Low

Over the latter half of the 20th century, great strides have been made in the design and construction of residential buildings to withstand the extreme forces that occasionally occur in the coastal zone. Many best management practices have been derived from the analysis of structural failures during coastal storms. As a result, homeowners and builders now have a variety of low-cost building materials, building techniques, and design options to mitigate potential storm damage. Architects and engineers should ensure that all loads (wind and water) have a direct path from each structural member to the foundation. In more contemporary structures with large open interiors, the inclusion of appropriate interior shear walls should not be overlooked. Large windows should be surrounded by appropriate framing to reduce side loads. Gable roofs and porch overhangs should be properly designed to resist uplift forces from strong winds. Proper nailing patterns should be applied to sheathing and framing to reduce the chance of uplift. Deck and porch overhangs exposed to wave forces should be properly anchored to prevent uplift. FEMA's coastal construction manual provides design details for those wishing to minimize hazards to their dwellings and businesses (FEMA, 2000).

Inexpensive approaches to reducing hazards to existing buildings include window shutters, hurricane straps placed on roof framing, unbreakable shingles and proper door connections. For flood and wave protection, enclosed areas under the base flood elevation should be constructed with breakaway walls, proper connections between pilings and floor framing should be used and maintained, and proper cross-bracing (perpendicular to the water motion) should employed. All connectors, fixtures and coatings should be constructed of anticorrosive materials and the regularly inspected and maintained over the life of the structure.

Homeowners should be aware of external utilities, tanks and furniture that are not part of the existing structure, or affixed to it. Propane, oil, gas and water tanks that can be lifted by floodwaters should be anchored to concrete pads or held in place with anchoring straps and earth anchors. Outside utilities, including air-conditioning units and electrical boxes should be elevated above the base flood elevation. Carports or storage areas under buildings should not have poured concrete pads or grade beams attached to support pilings. Also, outdoor furniture, decoration or anything that can be lifted by wind or water should be properly stored prior to a storm to eliminate the potential of those items becoming wind or water borne debris.

For more information on building techniques, contact:

New Jersey Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439
501 East State Street
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New Jersey Coastal Protection Technical Assistance Service
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Castle Point on Hudson
Hoboken, NJ 07030
Phone: (201) 216-5290
Fax: (201) 216-8214
Web: http://www.dl.stevens-tech.edu

New Jersey Department of Community Affairs
Division of Codes and Standards
Bureau of Code Services
P.O. Box 816
Trenton, New Jersey 08625-0816
Phone: (609) 984-7609
Web: http://www.state.nj.us/dca/programsbook/dcs.htm

Federal Emergency Management Agency
Preparedness and Prevention Library
500 C Street, S.W.
Washington, D.C. 20472
Phone: (202) 566-1600
Web: http://fema.org/library/prepandprev.shtm

Institute for Business & Home Safety
4557 E. Fowler Avenue
Tampa, FL 33617
Phone: (813) 286-3400
Fax: (813) 286-9960
Web: http://www.ibhs.org

Community Maintenance and Preparedness

Responsible Agency/Party:	Municipal, community or individual initiated
Mitigation for:	Flood hazards Wave hazards Wind hazards
Level of Effort:	Moderate

The proper construction and maintenance of community infrastructure and private property is important to mitigating potential storm damage. There are many ways community and individuals can plan and prepare against coastal hazards:

1. Coastal communities should be diligent in maintaining clear storm drains. In addition, to prevent minor flooding from entering the streets through the storm drain system, flap valves should be placed on the end of all outfall pipes.

2. Utility companies serving the community should take preventive measures to reduce the potential for power and service interruption by maintaining utility easements, removing tree limbs around power lines and properly elevating substations, transformers and pump houses in the coastal zone.

3. If possible, evacuation routes should be sited and maintained along roads above the base flood elevation or along the highest road in the community.

4. Plans should be prepared in advance to insure a quick and orderly evacuation of the coastal community.

5. Bulkheads should be constructed and maintained at an elevation above the base flood event.

6. Elevated walkovers should be constructed across dunes to prevent breaks in the dune line. If unavoidable, breaks in the dune line should be oriented perpendicular to the predominant storm winds.

7. Dunes should be properly vegetated and maintained to ensure a continuous unbroken line of protection. Fencing should be installed to discourage people from walking across dunes and enhance their growth.

8. Coastal protection structures should be inspected and maintained on a regular basis.

9. Prior to the construction of a coastal protection structure, the potential benefits and negative impacts should be analyzed and the function of the structure should be clearly understood and accepted (i.e., groins trap sediment but do not stop erosion).

10. An approved coastal management plan should be developed and followed to reduce the probability of long-term degradation of coastal protection levels. A beach monitoring program should be established in order to establish a database of coastal change information with which informed coastal protection decision can be made by a community.

11. All coastal management plans should include an understanding of the regional coastal processes and limit the impacts to the larger coastal system.

12. If a coastal structure(s) that interrupts the flow of sediment along the coast (i.e., jetties at an inlet) is needed, a mitigation plan should be developed to limit the impact of the structure of the local and regional coastal processes.

13. All coastal structures should be designed and constructed by qualified engineers and contractors with experience in wind, wave, and flood loading.

14. Large signs, old trees and any light structure upwind of critical infrastructure and buildings should be removed or strengthened to eliminate the potential for damage from wind borne debris.

15. All objects that can be moved by high winds and flood waters should be placed in storage or anchored to ensure they don’t become moving debris.

16. Property owners should abide by all regulations and codes governing the siting and construction of structures in the coastal zone. Variances that increase the vulnerability of private property should not be sought.

17. Communities with property in the floodplain should participate in the National Flood Insurance Program.

18. Structures in the floodplain should, at a minimum, be elevated above the base flood elevation and consideration should be given to elevating the structure an additional amount to provide freeboard for less frequent floods.

19. If possible, structures should be sited to account for future variations in shoreline position and long-term erosion trends.

20. Window area should be limited to a practical amount in the coastal zone or shutters/hurricane blinds installed to protect against the possible breaching of the building envelope due to debris impact.

21. Proper connections should be maintained between the building foundation, sill plates, floor beams and roof to reduce the risk of wind damage. Proper corrosion protection and periodic inspection of connections should be performed.

22. In the design of beach nourishment projects consideration should be given to the restoration of the natural environment, including vegetation and geologic features.

23. Coastal residents, property owners and communities should strive to be knowledgeable and aware of the dynamic nature of their environment and the hazards present.

24. Communities should consider instituting grassroots coastal stewardship programs to highlight and build awareness of their coastal resources and the value of their preservation.

25. For more information on community preparedness in New Jersey, contact:

New Jersey Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439
501 East State Street
Trenton, New Jersey 08625-0439
Phone: (609) 292-1235
Fax: (609) 777-3656
Web: http://www.state.nj.us/dep/landuse/

New Jersey State Police
Office of Emergency Management
Hazard Mitigation Officer
P.O. Box 7068 River Road
West Trenton, NJ 08628-0068

New Jersey Coastal Protection Technical Assistance Service
Davidson Laboratory
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Federal Emergency Management Agency
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Web: http://fema.org/library/prepandprev.shtm

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Fax: (813) 286-9960
Web: http://www.ibhs.org

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ADDITIONAL INFORMATION RESOURCES

Federal Organizations

Federal Emergency Management Agency (FEMA). http://www.fema.gov

National Oceanic and Atmospheric Administration (NOAA). http://www.noaa.gov/

National Sea Grant College Program. http://www.nsgo.seagrant.org/

Natural Resource Conservation Service. http://www.nrcs.usda.gov/

NOAA Coastal Service Center. http://www.csc.noaa.gov/

US Army Corps of Engineers (ACOE). http://www.usace.army.mil/

US Fish & Wildlife Service. http://www.fws.gov/

US Geological Service. http://www.usgs.gov/

NJ State and Regional Organizations

FEMA Region II. http://www.fema.gov/regions/ii/index.shtm

New Jersey Sea Grant College Program. http://www.njmsc.org/Sea_Grant/Main_Page.htm

New Jersey Marine Sciences Consortium. http://www.njmsc.org/

New Jersey Department of Environmental Protection (NJDEP). http://www.state.nj.us/dep/

NJDEP Land Use Regulation Program. http://www.state.nj.us/dep/landuse/index.html

NJDEP Coastal Management Program. http://www.state.nj.us/dep/cmp/

New Jersey State Information. http://www.state.nj.us/

US Army Corps of Engineers, Philadelphia District Office. http://www.nap.usace.army.mil/

US Army Corps of Engineers, New York District Office. http://www.nan.usace.army.mil/

New Jersey Home Builders Association. http://www.njba.org/index.html

New Jersey County and Municipal Web Sites. http://www.state.nj.us/localgov.htm

The Jersey Shore Partnership. http://www.thejerseyshorepartnership.com/

Professional Organizations

American Institute of Architects. http://www.e-architect.com/

American Shore & Beach Preservation Association. http://www.asbpa.org/

American Society of Civil Engineers (ASCE). http://www.asce.org/

Association of Coastal Engineers (ACE). http://www.coastalengineers.org/

Association of State Flood Plain Managers (ASFPM). http://www.floods.org/

The Geology Society of America. http://www.geosociety.org/

National Association of Home Builders (NAHB). http://www.nahb.com/

National Society of Professional Engineers. http://www.nspe.org/

Northeast Shore & Beach Preservation Association. http://attila.stevens-tech.edu/~therring/nsbpa.html

Trade Organizations

Institute for Business and Home Safety (IBHS). http://www.ibhs.org/

National Association of Home Builders Research Center. http://www.nahbrc.org/

National Pile Driving Contractors Association. http://www.piledrivers.org/pdca/index.cfm

Codes and Standards Organizations

American National Standards Institute (ANSI). http://web.ansi.org/

Building Officials Code Administrators (BOCA). http://www.bocai.org/

International Code Council (ICC). http://www.intlcode.org/

International Conference of Building Officials (ICBO). http://www.icbo.org/

Research and Guidance

Natural Hazards Center. http://www.colorado.edu/IBS/hazards/index.html

The H. John Heinz III Center for Science, Economics and the Environment. http://www.heinzctr.org/

US Army Corps of Engineers Coastal and Hydraulics Laboratory (CHL). http://hlnet.wes.army.mil/

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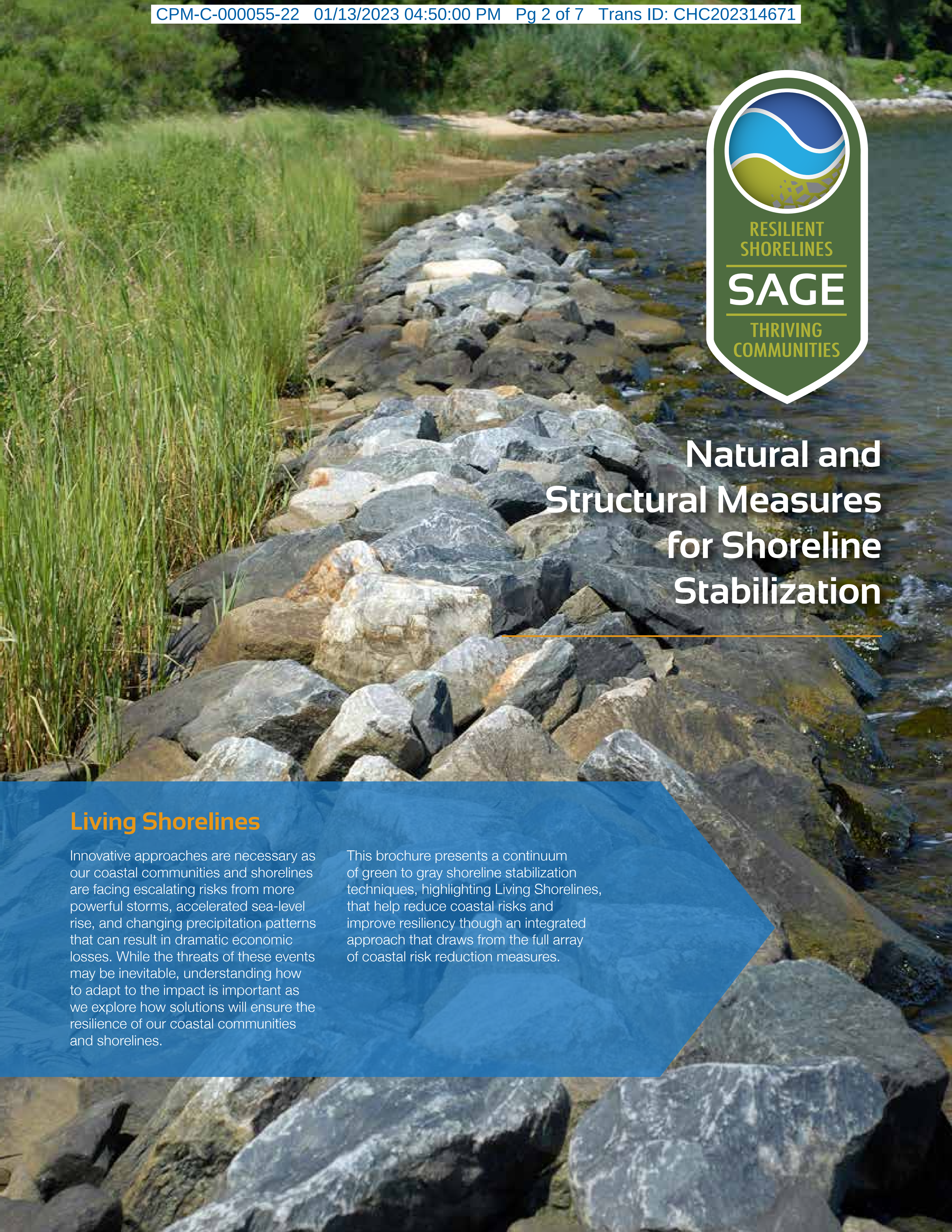


RESILIENT SHORELINES
SAGE
THRIVING COMMUNITIES

Natural and Structural Measures for Shoreline Stabilization

Living Shorelines

Innovative approaches are necessary as our coastal communities and shorelines are facing escalating risks from more powerful storms, accelerated sea-level rise, and changing precipitation patterns that can result in dramatic economic losses. While the threats of these events may be inevitable, understanding how to adapt to the impact is important as we explore how solutions will ensure the resilience of our coastal communities and shorelines.

This brochure presents a continuum of green to gray shoreline stabilization techniques, highlighting Living Shorelines, that help reduce coastal risks and improve resiliency though an integrated approach that draws from the full array of coastal risk reduction measures.

Coastal Risk Reduction and Living Shorelines

Coastal Risk Reduction

Coastal systems typically include both natural habitats and man-made structural features. The relationships and interactions among these features are important variables in determining coastal vulnerability, reliability, risk and resilience.

Coastal risk reduction can be achieved through several approaches, which may be used in combination with each other. Options for coastal risk reduction include:

- Natural or nature-based measures: Natural features are created through the action of physical, biological, geologic, and chemical processes operating in nature, and include marshes, dunes and oyster reefs. Nature-based features are created by human design, engineering, and construction to mimic nature. A living shoreline is an example of a nature-based feature.
- Structural measures: Structural measures include sea walls, groins and breakwaters. These features reduce coastal risks by decreasing shoreline erosion, wave damage, and flooding.
- Non-structural measures: Includes modifications in public policy, management practices, regulatory policy and pricing policy (e.g., structure acquisitions or relocations, flood proofing of structures, implementing flood warning systems, flood preparedness planning, establishment of land use regulations, emergency response plans).

The types of risk reduction measures employed depend upon the geophysical setting, the desired level of risk reduction, objectives, cost, reliability, and other factors.

SAGE – Systems Approach to Geomorphic Engineering

USACE and NOAA recognize the value of an integrated approach to risk reduction through the incorporation of natural and nature-based features in addition to non-structural and structural measures to improve social, economic, and ecosystem resilience. To promote this approach, USACE and NOAA have engaged partners and stakeholders in a community of practice called SAGE, or a Systems Approach to Geomorphic Engineering. This community of practice provides a forum to discuss science and policy that can support and advance a systems approach to implementing risk reduction measures that both sustain a healthy environment and create a resilient shoreline.

SAGE promotes a hybrid engineering approach that integrates soft or 'green' natural and nature-based measures, with hard or 'gray' structural ones at the landscape scale. These stabilization solutions include "living shoreline" approaches which integrate living components, such as plantings, with structural techniques, such as seawalls or breakwaters.

Living Shorelines achieve multiple goals, such as:

- Stabilizing the shoreline and reducing current rates of shoreline erosion and storm damage;
- Providing ecosystem services (such as habitat for fish and other aquatic species) and increasing flood storage capacity; and
- Maintaining connections between land and water ecosystems to enhance resilience.

In order to determine the most appropriate shoreline protection technique, several site-specific conditions must be assessed. The following coastal conditions, along with other factors, are used to determine the combinations of green and gray solutions for a particular shoreline.

REACH: A longshore segment of a shoreline where influences and impacts, such as wind direction, wave energy, littoral transport, etc. mutually interact.

RESILIENCE: The ability to avoid, minimize, withstand, and recover from the effects of adversity, whether natural or man made, under all circumstances of use. This definition also applies to engineering (i), ecological (ii), and community resilience (iii).

FETCH: A cross shore distance along open water over which wind blows to generate waves. For any given shore, there may be several fetch distances depending on predominant wind direction.

PHYSICAL CONDITIONS: The slope of the foreshore or beach face, a geologic condition or bathymetry offshore.

TIDAL RANGE: The vertical difference between high tide and low tide.

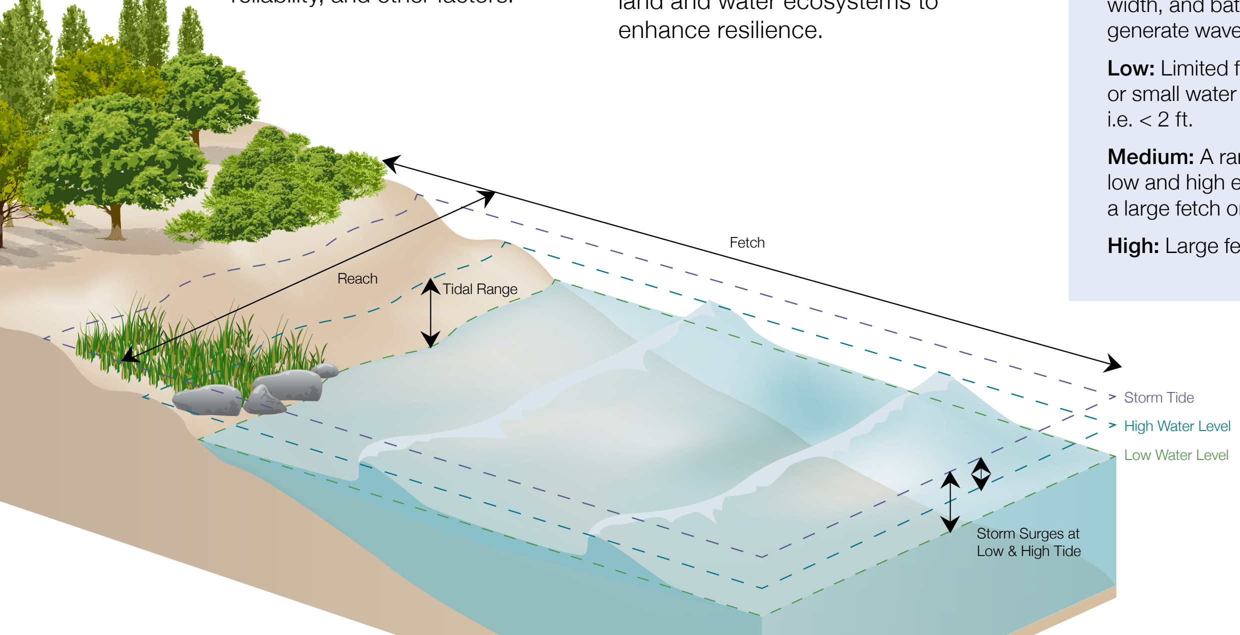
STORM SURGE: The resulting temporary rise in sea level due to the action of wind stress on the water surface and low atmospheric pressure created during storms which can cause coastal flooding. Surge is the difference from expected tide level. Storm tide is the total water level.

WAVE ENERGY: Wave energy is related to wave height and describes the force a wave is likely to have on a shoreline. Different environments will have lower or higher wave energy depending on environmental factors like shore orientation, wind, channel width, and bathymetry. Boat wakes can also generate waves.

Low: Limited fetch in a sheltered, shallow or small water body (estuary, river, bay) i.e. < 2 ft.

Medium: A range that combines elements of low and high energy (e.g., shallow water with a large fetch or partially sheltered) i.e. 2 - 5 ft.

High: Large fetch, deep water (open ocean).



GREEN - SOFTER TECHNIQUES

Small Waves | Small Fetch | Gentle Slope | Sheltered Coast

LIVING SHORELINE

VEGETATION ONLY

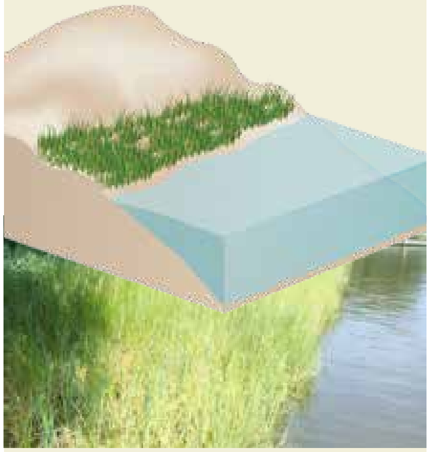


Photo Credit: Maryland Department of Natural Resources - Shoreline Conservation Service

Roots hold soil in place to reduce erosion. Provides a buffer to upland areas and breaks small waves.

Suitable For

Low wave energy environments.

Material Options

- Native plants*

Benefits

- Dissipates wave energy
- Slows inland water transfer
- Increases natural storm water infiltration
- Provides habitat and ecosystem services
- Minimal impact to natural community and ecosystem processes
- Maintains aquatic/terrestrial interface and connectivity
- Flood water storage

Disadvantages

- No storm surge reduction ability
- No high water protection
- Appropriate in limited situations
- Uncertainty of successful vegetation growth and competition with invasive

Initial Construction: ●
Operations & Maintenance: ●

EDGING

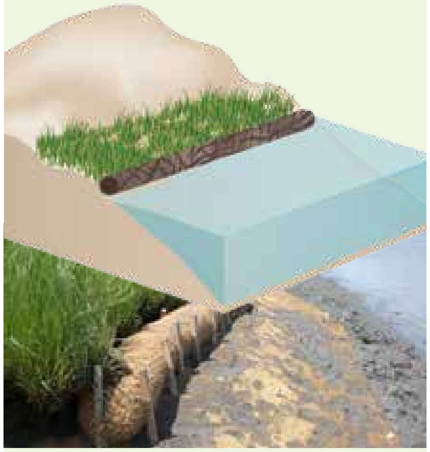


Photo Credit: Partnership for Delaware Estuary

Structure to hold the toe of existing or vegetated slope in place. Protects against shoreline erosion.

Suitable For

Most areas except high wave energy environments.

Vegetation* Base with Material Options

(low wave only, temporary)

- "Snow" fencing
- Erosion control blankets
- Geotextile tubes
- Living reef (oyster/mussel)
- Rock gabion baskets

Benefits

- Dissipates wave energy
- Slows inland water transfer
- Provides habitat and ecosystem services
- Increases natural storm water infiltration
- Toe protection helps prevent wetland edge loss

Disadvantages

- No high water protection
- Uncertainty of successful vegetation growth and competition with invasive

Initial Construction: ●●
Operations & Maintenance: ●

SILLS

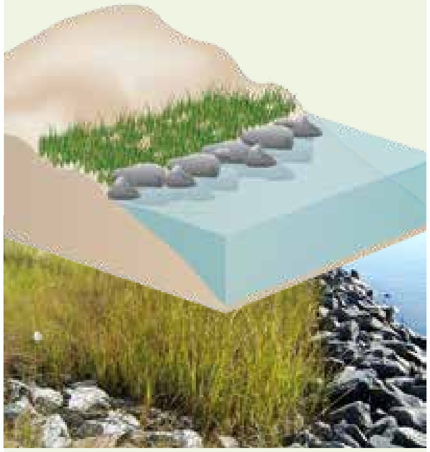


Photo Credit: Maryland Department of Natural Resources - Shoreline Conservation Service

Parallel to existing or vegetated shoreline, reduces wave energy and prevents erosion. A gapped approach would allow habitat connectivity, greater tidal exchange, and better waterfront access.

Suitable For

Most areas except high wave energy environments.

Vegetation* Base with Material Options

- Stone
- Sand breakwaters
- Living reef (oyster/mussel)
- Rock gabion baskets

Benefits

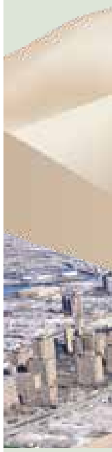
- Provides habitat and ecosystem services
- Dissipates wave energy
- Slows inland water transfer
- Provides habitat and ecosystem services
- Increases natural storm water infiltration
- Toe protection helps prevent wetland edge loss

Disadvantages

- Require more land area
- No high water protection
- Uncertainty of successful vegetation growth and competition with invasive

Initial Construction: ●●
Operations & Maintenance: ●

BEA



Large vo
outside s
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shoreline

Suitable

Low-lyin
existing
sedimen

Materia

- Sand

Benefits

- Expan
- Lower than h
- Flexib
- Redes
- Provid ecosys

Disadva

- Requir for ren
- No hig
- Appro
- Possib sedim

Initial Co
Operatio

* Native plants and materials must be appropriate for current salinity and site conditions.

Initial Construction: ● = up to $1000 per linear foot, ●● = $1001 - $2000 per linear foot, ●●● = $2001 - $5000 per linear foot, ●●●● = $5001 - $10,0
Operations and Maintenance (yearly for a 50 year project life): ● = up to $100 per linear foot, ●● = $101 - $500 per linear foot, ●●● = over $500 per li

HOW GREEN OR GRAY SHOULD YOUR SHORELINE SOLUTION BE?

ACH NOURISHMENT ONLY

olume of sand added from
source to an eroding beach.
the beach and moves the
e seaward.

e For

g oceanfront areas with
sources of sand and
t.

l Options

s

ds usable beach area
environmental impact
ard structures
le strategy
signed with relative ease
les habitat and
stem services

ntages

res continual sand resources
nourishment
gh water protection
priate in limited situations
ble impacts to regional
ent transport

onstruction: ●●●
ons & Maintenance: ●●

BEACH NOURISHMENT & VEGETATION ON DUNE

Photo Credit: USACE New York District Public Affairs

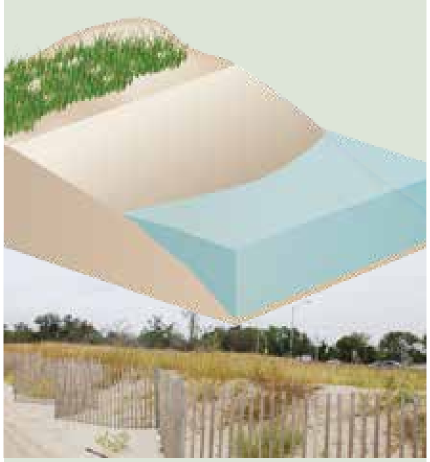

Photo Credit: USACE New York District Public Affairs

Helps anchor sand and provide a buffer to protect inland area from waves, flooding and erosion.

Suitable For

Low-lying oceanfront areas with existing sources of sand and sediment.

Material Options

Sand with vegetation
Can also strengthen dunes with:
- Geotextile tubes
- Rocky core

Benefits

- Expands usable beach area
- Lower environmental impact
- Flexible strategy
- Redesigned with relative ease
- Vegetation strengthens dunes and increases their resilience to storm events
- Provides habitat and ecosystem services

Disadvantages

- Requires continual sand resources for renourishment
- No high water protection
- Appropriate in limited situations
- Possible impacts to regional sediment transport

Initial Construction: ●●●
Operations & Maintenance: ●●

BREAKWATER

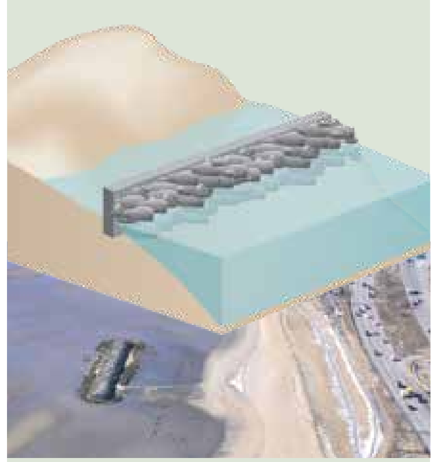

Photo Credit: USACE New York District Public Affairs

Offshore structures intended to break waves, reducing the force of wave action and encourages sediment accretion. Can be floating or fixed to the ocean floor, attached to shore or not, and continuous or segmented. A gapped approach would allow habitat connectivity, greater tidal exchange, and better waterfront access.

Suitable For

Most areas except high wave energy environments often in conjunction with marinas.

Material Options

- Grout-filled fabric bags
- Armorstone
- Pre-cast concrete blocks
- Living reef (oyster/mussel) if low wave environment
- Wood
- Rock†

Benefits

- Reduces wave force and height
- Stabilizes wetland
- Can function like reef
- Economical in shallow areas
- Limited storm surge flood level reduction

Disadvantages

- Expensive in deep water
- Can reduce water circulation (minimized if floating breakwater is applied)
- Can create navigational hazard
- Require more land area
- Uncertainty of successful vegetation growth and competition with invasive
- No high water protection
- Can reduce water circulation
- Can create navigation hazard

GRAY CAN BE GREENER: e.g., 'Livin

Initial Construction: ●●●●
Operations & Maintenance: ●●●

GROIN

Perpendicular, projecting fro
shoreline. Intercept water flo
and sand moving parallel to
shoreline to prevent beach e
and break waves. Retain sar
placed on beach.

Suitable For

Coordination with beach nourishment.

Material Options

- Concrete/stone rubble†
- Timber
- Metal sheet piles

Benefits

- Protection from wave force
- Methods and materials are adaptable
- Can be combined with bea nourishment projects to ex their life

Disadvantages

- Erosion of adjacent sites
- Can be detrimental to shor ecosystem (e.g. replaces n substrate with rock and red natural habitat availability)
- No high water protection

† Rock/stone needs to b

Initial Construction: ●●●
Operations & Maintenance: ●

00 per linear foot
near foot

GRAY - HARDER TECHNIQUES

Large Waves | Large Fetch | Steep Slope | Open Coast

COASTAL STRUCTURE

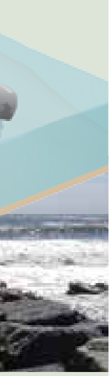

Photo Credit: USACE New York District Public Affairs

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REVETMENT

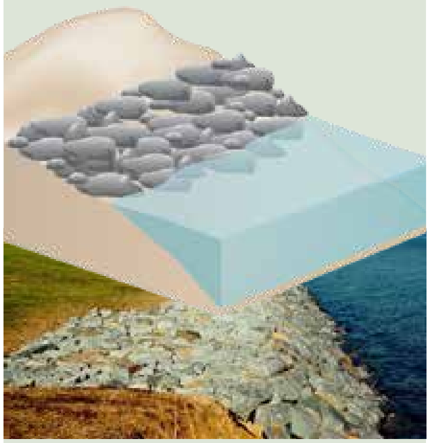

Photo Credit: Maryland Department of Natural Resources - Shoreline Conservation Service

Lays over the slope of a shoreline. Protects slope from erosion and waves.

Suitable For

Sites with pre-existing hardened shoreline structures.

Material Options

- Stone rubble†
- Concrete blocks
- Cast concrete slabs
- Sand/concrete filled bags
- Rock-filled gabion basket

Benefits

- Mitigates wave action
- Little maintenance
- Indefinite lifespan
- Minimizes adjacent site impact

Disadvantages

- No major flood protection
- Require more land area
- Loss of intertidal habitat
- Erosion of adjacent unreinforced sites
- Require more land area
- No high water protection
- Prevents upland from being a sediment source to the system

BULKHEAD

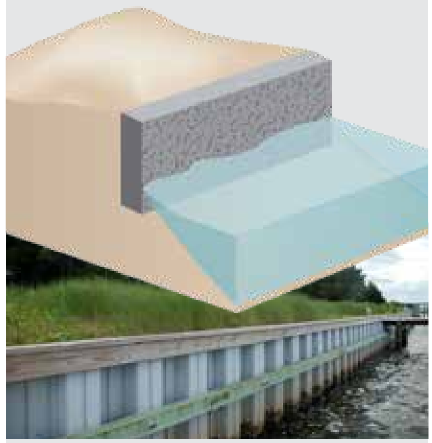

Photo Credit: North Carolina Department of Environment and Natural Resources

Parallel to the shoreline, vertical retaining wall. Intended to hold soil in place and allow for a stable shoreline.

Suitable For

High energy settings and sites with pre-existing hardened shoreline structures. Accommodates working water fronts (eg: docking for ships and ferries).

Material Options

- Steel sheet piles
- Timber
- Concrete
- Composite carbon fibers
- Gabions

Benefits

- Moderates wave action
- Manages tide level fluctuation
- Long lifespan
- Simple repair

Disadvantages

- No major flood protection
- Erosion of seaward seabed
- Erosion of adjacent unreinforced sites
- Loss of intertidal habitat
- May be damaged from overtopping oceanfront storm waves
- Prevents upland from being a sediment source to the system
- Induces wave reflection

SEAWALL

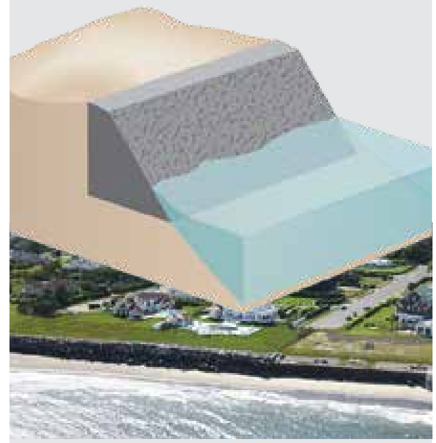

Photo Credit: USACE New York District Public Affairs

Parallel to shoreline, vertical or sloped wall. Soil on one side of wall is the same elevation as water on the other. Absorbs and limits impacts of large waves and directs flow away from land.

Suitable For

Areas highly vulnerable to storm surge and wave forces.

Material Options

- Stone
- Rock
- Concrete
- Steel/vinyl sheets
- Steel sheet piles

Benefits

- Prevents storm surge flooding
- Resists strong wave forces
- Shoreline stabilization behind structure
- Low maintenance costs
- Less space intensive horizontally than other techniques (e.g. vegetation only)

Disadvantages

- Erosion of seaward seabed
- Disrupt sediment transport leading to beach erosion
- Higher up-front costs
- Visually obstructive
- Loss of intertidal zone
- Prevents upland from being a sediment source to the system
- May be damaged from overtopping oceanfront storm waves

e appropriately sized for site specific wave energy.

g Breakwater' using oysters to colonize rocks or 'Greenwall/Biowall' using vegetation, alternative forms and materials

●●

Revetment — Initial Construction: ●●●●
Operations & Maintenance: ●●

Bulkhead — Initial Construction: ●●●
Operations & Maintenance: ●●

Seawall — Initial Construction: ●●●●
Operations & Maintenance: ●●●

Is a Living Shoreline a Good Fit for What I Need?

Living Shorelines achieve multiple goals such as:

- Stabilizing the shoreline and reducing current rates of shoreline erosion and storm damage
- Providing ecosystem services, such as habitat for fish and other aquatic species and increasing flood storage capacity
- Maintaining connections between land and water ecosystems to enhance resilience

Site-specific conditions will influence your choice of shoreline protection technique (ex: wave energy level, fetch lengths, rate and pattern of erosion, etc). Here are some additional factors to keep in mind as you consider Living Shorelines.

WHAT ARE THE BENEFITS?

- Erosion control and shore stabilization.
- Restored and enhanced habitat which supports fish and wildlife populations.
- Increased property values.
- Enhanced community enjoyment.
- Opportunities for education.
- Improved public access to waterfront through recreational activities such as fishing, boating and birding. Can be used to satisfy zoning and permitting requirement for waterfront development projects.
- Complemented natural shoreline dynamics & movement; increased resilience and absorption of wave energy, storm surge and floodwaters; and an adaptive tool for preparation of sea level rise.
- Improved water quality from settling or trapping sediment (e.g. once established, a marsh can filter surface water runoff or oysters can provide coastal water filtration).

WHAT ARE SOME CHALLENGES?

- Uncertainty in risk because of lack of experience of techniques.
- Public funds are often tied to government permit compliance.
- Permitting processes can be lengthy and challenging. The existing regulatory process is centered on traditional “gray” or “hard” techniques. Regulators and project sponsors alike are learning how to design living shorelines projects. Talk with someone about your state’s permitting process or to hear about their experiences.
- It takes time to develop and test new shoreline protection methods.
- There may be land ownership constraints. Consider where federal and state jurisdiction for the water body starts and ends.
- In urban environments, there is limited land (bulkheads may seem like the only option), a variety of upland uses (industrial past use may have left legacy contaminants) and high velocity waters.
- The overall sediment system needs to be taken into account to protect neighboring properties from experiencing starved down drift shorelines or other consequences as a result of a project.
- Lack of public awareness of performance and benefits of living shorelines.
- Not all techniques have the same level of performance or success monitoring. Less practiced techniques may require more monitoring.

WHAT INFLUENCES COST?

- The materials chosen for the project influence cost.
- Including green techniques can be cheaper than traditional gray techniques.
- Sometimes it’s possible to install the project yourself, other times you will need help from a professional.
- Long term maintenance is required as any landscape project (e.g. replanting may be needed after a storm).

HOW TO FIND OUT MORE

If you have a Living Shorelines permitting question, contact your state’s office of Environmental Protection, Conservation or Natural Resources, your coastal zone manager such as your state’s Department of State, as well as your local U.S. Army Corps of Engineers (USACE) district office.

If you would like science or engineering advice, or to talk to people who have experience studying or constructing living shorelines, reach out to some of the following: your local universities, your City’s Department of Planning and Department of Parks, Sea Grant Chapter, Littoral Society, The Nature Conservancy, The Trust for Public Land, The Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), USACE, engineering firms and other organizations that focus on your local waterfront.

These and other websites are good references to learn more about Living Shorelines:

SAGE
www.SAGEcoast.org

NOAA Restoration
www.habitat.noaa.gov/livingshorelines

USACE Engineer Research Development Center, Engineering with Nature
el.erdc.usace.army.mil/ewn

USACE North Atlantic Division, National Planning Center of Expertise for Coastal Storm Damage Reduction
www.nad.usace.army.mil/About/NationalCentersofExpertise/CoastalStormDamageReduction(Planning).aspx

Virginia Institute of Marine Science (VIMS) Center for Coastal Resources Management
ccrm.vims.edu/livingshorelines/index.html

Coasts, Oceans, Ports & Rivers Institute (CORPI)
www.mycopri.org/livingshorelines

The Nature Conservancy
www.nature.org/ourinitiatives/habitats/oceanscoasts/howwework/helping-oceans-adapt-to-climate-change.xml

US Army Corps of Engineers®

Developed with support and funding from SAGE, NOAA and USACE; February 2015

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Fact Sheet 5.4: Shorelines

The mitigation objective of this Fact Sheet is to protect areas inland from shorelines from coastal erosion and flooding.

Coastal erosion typically is caused by wave action, coastal flooding, currents, water runoff, wind effects, and other impacts of storms. Coastal erosion can damage property and infrastructure, while also impacting beach construction and access. Protecting the shoreline using structural and non-structural stabilization methods can reduce the effects of coastal erosion and flooding. The ability to reduce losses from wave action, erosion and flooding depends on the elevation, configuration, strength and durability of stabilization.

Table 5.4.1 summarizes some common mitigation options for dealing with coastal erosion. The options marked with “O” are for ocean shorelines, the options marked with “S” are for sheltered water shorelines, and those marked with “O, S” are for both ocean and sheltered water shorelines.

Table 5.4.1. Common Shoreline Mitigation Solutions

Solutions and Options	***Reduce Wave Risk***	***Reduce Land Loss***	***Reduce Flooding***
Mitigation Solution: Structurally Stabilize Shorelines			
Option 1: Construct Seawalls	**O, S**	**O, S**	**O, S**
Option 2: Construct Bulkheads	**S**	**S**	**S**
Option 3: Install Revetments	**O, S**	**O, S**	**O, S**
Option 4: Place Detached Breakwaters	**O, S**	**O, S**	**O, S**
Option 5: Build Jetties and Groins	**S**	**S**	
Option 6: Reinforce Dunes	**O, S**	**O, S**	**O, S**
Mitigation Solution: Use Non-Structural Stabilization			
Option 1: Nourish Beaches and Restore Dunes	**O, S**	**O, S**	**O, S**
Option 2: Stabilize Using Living Shorelines	**S**	**S**	

O = ocean shoreline, **S** = sheltered water shoreline

Mitigation Solution: Structurally Stabilize Shorelines

Mitigation options aim to stabilize coastal areas by building shoreline structures, such as seawalls, bulkheads, revetments, detached breakwaters, groins/jetties, reinforced dunes or coastal levees/dikes.

Seawalls, bulkheads, revetments and detached breakwaters are usually built parallel to the shore or at the base of a bluff. These structures are intended to keep the sediment or soil along the shoreline and to protect against high water levels, waves and erosion. Jetties and groins are built perpendicular to the shore to block the movement of sediment along the shore, hold back currents, protect areas from wave forces, guide sand movement and maintain navigation depth. Reinforced dunes have internal support that is designed to reduce dune loss and lessen flooding on the inland side of dunes.

Evaluate the following considerations when determining which structural shoreline stabilization method is an appropriate mitigation measure:

- The degree of protection these structural methods offer depends on their design, construction and maintenance. Some options may be suitable for ocean shoreline only or sheltered water areas only, while others may be suitable both ocean and sheltered water areas.
- These structural methods may not prevent erosion of the beach on the waterside of the structure and may, in fact, worsen ongoing erosion of the beach.
- Depending on the design, some structures can:
    - Trap sediments on the land that otherwise would erode and nourish the beach
    - Lead to passive erosion (eventual loss of the beach since the structure prevents movement of the beach toward the land)
    - Lead to active erosion (localized scour on the waterside of the structure and on unprotected property beyond the ends of the structure)

Some jurisdictions distinguish between erosion control structures built to protect existing development and those built to create a buildable area on an otherwise unbuildable site. Designers should investigate federal, state and local regulations and requirements for erosion control structures before starting design.

Option 1: Construct Seawalls

Seawalls are built to resist the effects of waves and protect against land loss from erosion, current and wave action. As the term is used here, seawalls are suitable for ocean shorelines and shorelines that receive lower wave energy. Seawalls can be constructed of concrete, steel, large stones or a combination of these materials. They can be built with several different face shapes to deflect wave energy (Figure 5.4.1).

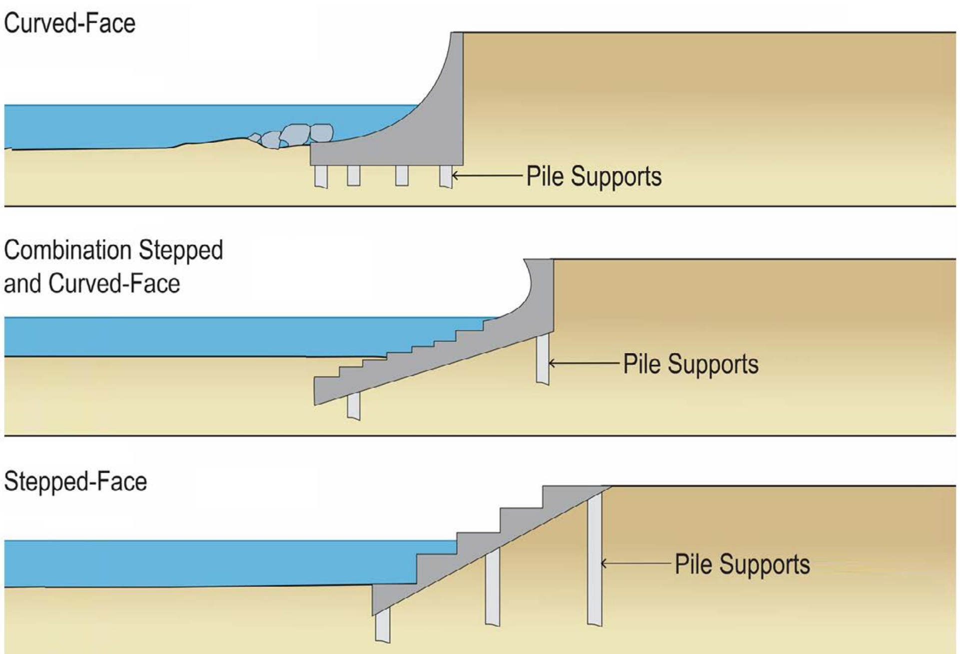


Figure 5.4.1. Example seawall cross-sections.

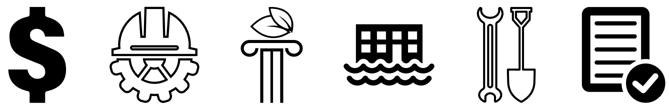
Drainage and designed filters can help maintain backfill behind seawalls. Void spaces that may develop under the toe of rock or armor-type protection can be resolved by grouting under the wall, depending on the elevation of the footing relative to tide levels. Where seawalls protect docks, wharfs, or piers that are elevated, elevate the top elevation of the seawall to match the dock, wharf, or pier.

When evaluating seawalls as a mitigation option, consider the following:

- Consider future conditions such as sea level rise and post-storm beach profiles in the design of a seawall.
- Vertical seawalls often deflect wave energy instead of dissipating it, which can make the shoreline more subject to erosion.
- Waves and tidal effects of large storms and hurricanes can erode the beach profile and undermine the seawall foundation, leading to failure.
- If the seawall is not constructed high enough, backfill behind seawalls can be lost when waves overtop. When the backfill is lost, structures on land can be undermined and damaged.

- Consider permitting requirements before choosing to use a seawall. Some jurisdictions may prohibit or limit the number of new seawalls. Check with the jurisdiction before selecting this, or any, stabilization option.
- Implement an inspection and maintenance program to maintain the seawall's stability throughout its intended life.

CONSIDERATIONS:



Option 2: Construct Bulkheads

Bulkheads are barriers constructed of wood, steel, stone, vinyl or concrete to prevent sliding or erosion of the land (Figure 5.4.2). The primary purpose of a bulkhead is to keep soil in place and prevent the shoreline from sliding during flooding and wave attack. Protecting the land beyond the bulkhead generally is a secondary consideration. Bulkheads are not as strong as seawalls and are not suitable for ocean shorelines.

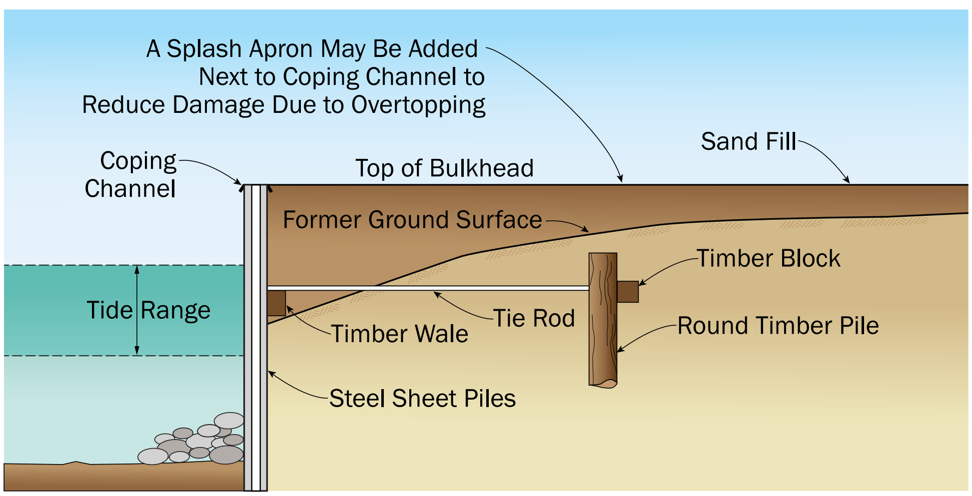


Figure 5.4.2. Example of an anchored sheet-pile bulkhead.

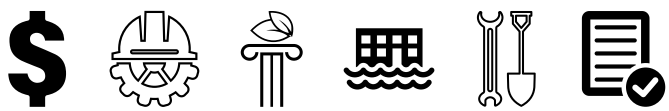
Bulkheads provide protection against low to moderate wave action. They can be used where deep water is needed directly at the shore to navigate or at harbors and marinas. Bulkheads can be cantilevered, anchored or gravity structures (such as rock-filled timber cribs). Piles or caissons can be reinforced by jacketing to provide additional strength. Void spaces that may develop under the toe of rock or armor-type protection can be resolved by grouting under the wall, depending on the elevation of the footing relative to tide levels. If the dock, wharf or pier being protected by a bulkhead is raised, the bulkhead itself also should be raised to match the dock, wharf or pier.

When evaluating bulkheads as a mitigation option, consider the following:

- Structurally, bulkheads do not resist wave action as well as seawalls.

- Consider future conditions, such as sea level rise, when designing the height of the bulkhead to reduce the likelihood of overtopping.
- Carefully consider the location if the bulkhead is built near existing structures since installation may impact existing structures and lead to potential maintenance issues with the bulkhead system.
- Consider permitting requirements before choosing to use a bulkhead. Some jurisdictions may prohibit or limit the installment of bulkheads. Check with the jurisdiction before selecting this, or any, stabilization option.
- Implement an inspection and maintenance program to maintain the bulkhead's stability throughout its intended life.

CONSIDERATIONS:



Option 3: Install Revetments

Coastal revetments generally are built of durable stone, concrete or other materials placed on an earthen slope to protect the shoreline from erosion caused by floodwater or wave action. Coastal revetments typically are comprised of an armor layer, filter layer(s), geotextile filter fabric, and toe protection (Figure 5.4.3). Revetments are suitable for ocean shorelines and sheltered water shorelines.

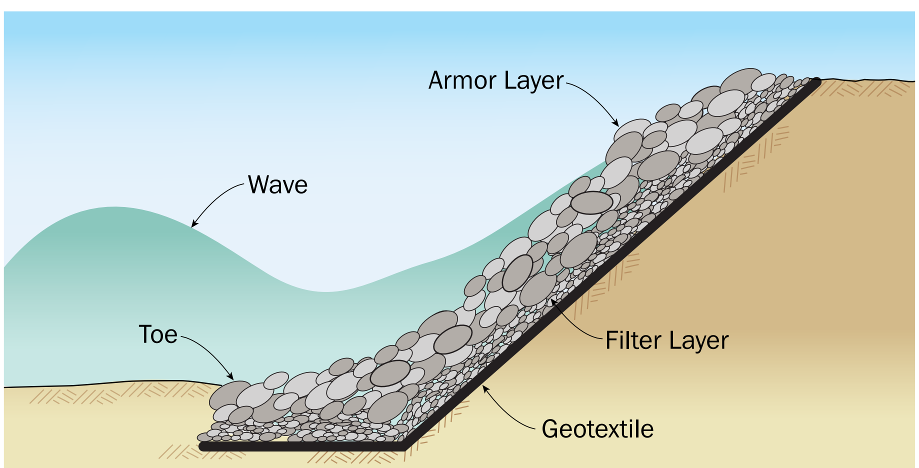


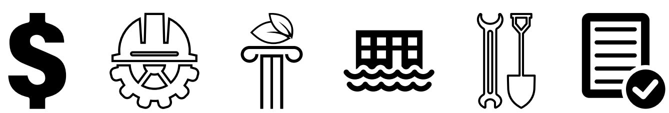
Figure 5.4.3. Typical cross section of an armor stone revetment.

The armor layer may be made from stone, concrete, concrete rubble or other structural elements such as gabions that are heavy enough to resist shifting during wave attack. The wave height and water velocity will determine the type and size of armor needed. The filter layer, also called the bedding layer, promotes drainage and helps seat the armor without damaging the geotextile fabric. Geotextile filter fabric generally is placed between the filter layer and the existing soil layer to prevent movement of soil through the revetment. Movement of the underlying soil can lead to revetment settlement or collapse, losing protection to land areas beyond the revetment. Finally, toe protection provides stability against undermining at the bottom of the structure. Increasing the size of the stones or armor units in the armor layer can improve revetments' ability to resist damage from larger waves.

When evaluating revetments as a mitigation option, consider the following:

- Consider future conditions, such as sea level rise, and post-storm beach profiles when deciding the revetment's height and slope to reduce the chance of overtopping.
- Consider minimum expected water levels in the design of the armor layer depth at the toe to avoid scour.
- Revetments may not be as strong against wave action as seawalls are.
- Implement an inspection and maintenance program to maintain the revetment's stability throughout its intended life.
- Consider Federal, state and local permitting requirements before choosing to use a revetment. Some jurisdictions may prohibit or limit the installment of revetments. Check with the jurisdiction before selecting this, or any, stabilization option.

CONSIDERATIONS:



Option 4: Place Detached Breakwaters

A detached breakwater is a manmade structure placed offshore to protect land areas beyond the shoreline from high waves, to maintain the structure of the beach, and to create or stabilize wetland areas. Detached breakwaters help disperse wave energy and encourage sediment to deposit along the shoreline in the area protected by the structure. Breakwaters generally are situated parallel to the shore (Figure 5.4.4).

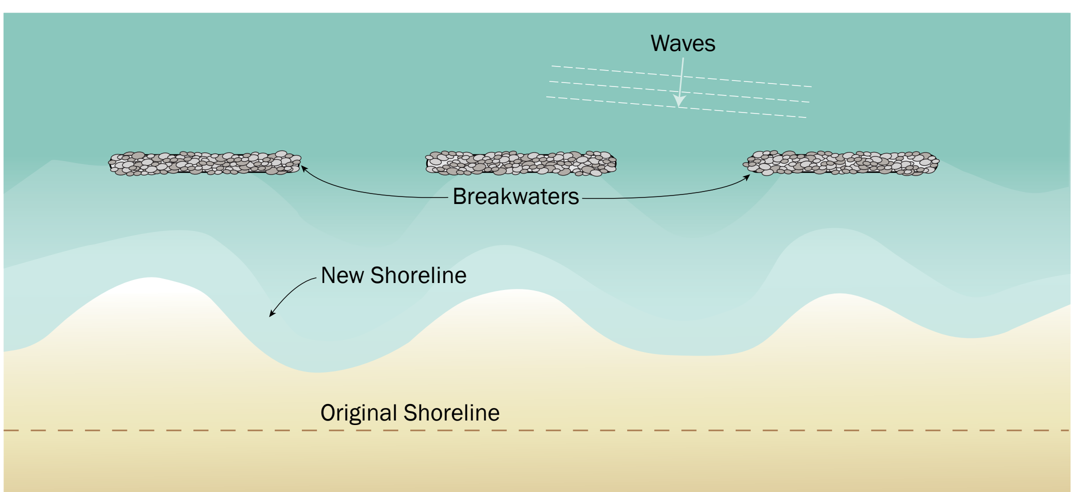
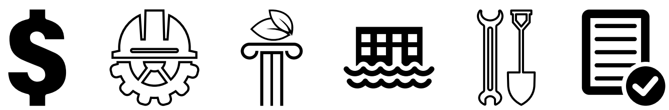


Figure 5.4.4. Typical plan view of a breakwater system.

Detached breakwaters can be high above the water level for maximum wave dispersal, low-crested to reduce construction costs (but these will allow greater wave transmission) or designed as reef-type breakwaters that are under water. Some systems use a combination of shore-connected and detached breakwaters. Most breakwaters in the U.S. are made of rubble-mound construction. The breakwater's crest elevation, width, permeability, slope angles and type of construction can be adjusted based on the desired level of wave energy dispersal and sand buildup.

When considering this mitigation option, evaluate the impact to sediment movement toward downdrift beaches, which may receive less sand deposit after a breakwater is built.

CONSIDERATIONS:



Option 5: Build Jetties and Groins

Jetties and groins are built perpendicular to the shore to slow down sediment transport along the shoreline, control currents, protect areas from wave forces, impact sand movement, and preserve navigation depth (Figure 5.4.5). Jetties usually are built at tidal inlets, river entrances or port or harbor entrances to reduce channel shoaling or stabilize the updrift shoreline. Single jetties can be built on one or both sides of the entrance.

Groins generally are built in larger numbers along a shoreline—there usually are several to many of them, spaced hundreds of feet apart. Jetties and groins can be built on both ocean and sheltered water shorelines. Sometimes a jetty is called a terminal groin (meaning a single groin at the end of a section of land, acting like a jetty).

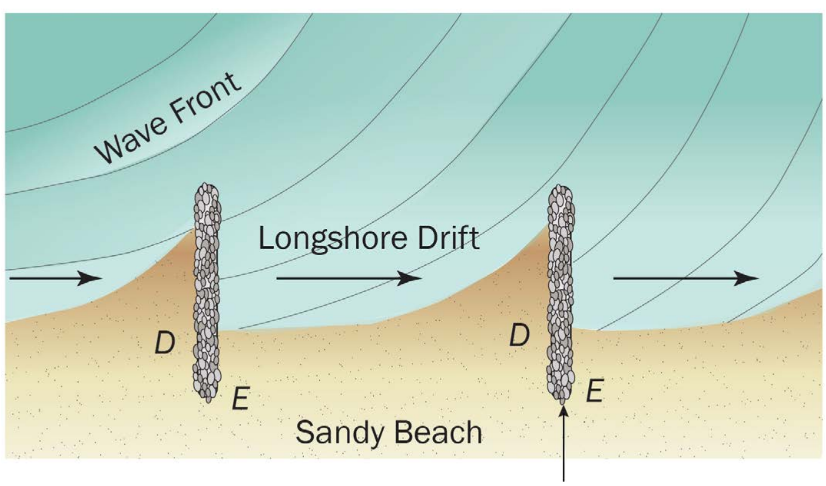


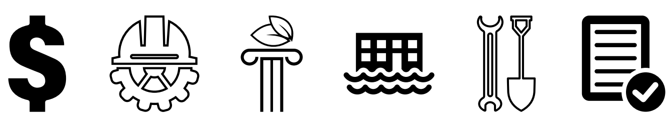
Figure 5.4.5. Example sand accretion and erosion patterns around a groin system.

Jetties and groins typically are built of various stone filter and base layers overlain by large armor stone or concrete armor units. Timber, steel and concrete also can be used in jetty design. Designers should know about coastal processes at the site, such as dominant wave directions and sediment movement along and across the coastline. The design also must consider wave forces, ocean currents and changing tidal patterns. Increasing the size of the stones or armor units in the armor layer can improve the ability of jetties and groins to resist damage from waves.

When evaluating jetties as a mitigation option, consider the following:

- Periodic dredging of the sand that builds up against the jetty or groin may be necessary to repair downdrift shorelines that do not receive sand due to the structure. Dredging to maintain navigation depth also may be necessary.
- Consider future conditions, such as sea level rise, and the expected maximum wave crest when deciding the structure's height to reduce the chance of overtopping.
- Consider impact protection from ships and other vessels in the design.
- Implement an inspection and maintenance program to maintain the jetty or groin throughout its intended life.
- Consider Federal, state and local permitting requirements before choosing to use a jetty or groin. Some jurisdictions may prohibit or limit the installment of jetties and groins. Check with the jurisdiction before selecting this, or any, stabilization option.

CONSIDERATIONS:



Option 6: Reinforce Dunes

Reinforced dunes protect the inland areas behind the dunes from flooding and loss of ecological value. Reinforced dunes are built with solid cores using components such as geotubes, rock revetments and sheet piles to maximize the dune's ability to resist erosion by waves and surge during severe storms. Figure 5.4.6 shows an example of a rock core used to reinforce a dune.

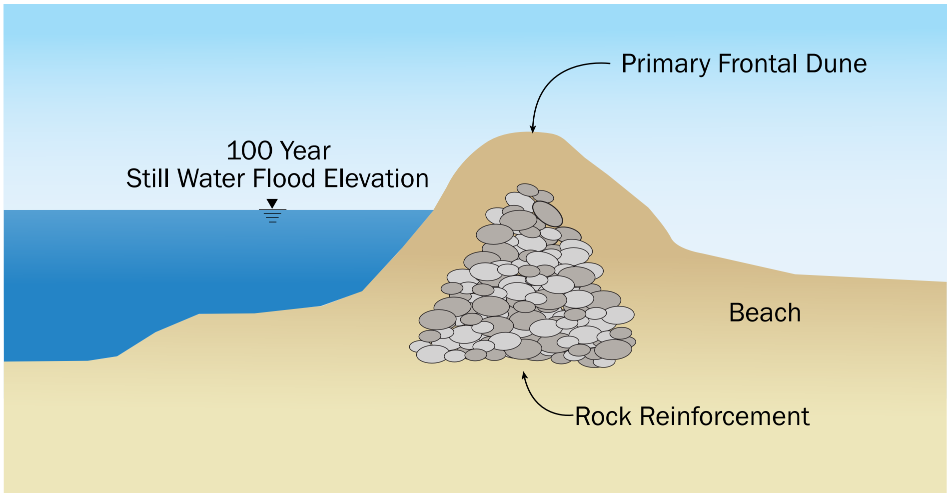
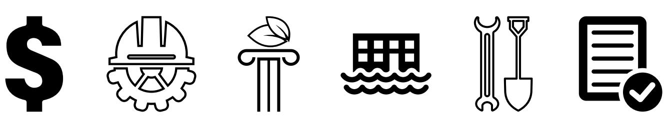


Figure 5.4.6. Rock cores can be used to build dunes that resist erosion from waves and surge.

When evaluating reinforced dunes as a mitigation option, consider the following:

- Raise the crests of reinforced dunes to reduce wave overtopping and landside flooding under extreme storm conditions.
- Grow vegetation on reinforced dunes to mitigate them further. This step is described in the following non-structural stabilization section.
- Design reinforced dunes to preserve the ecological functions of the original dunes.
- Reinforced dunes must comply with permit requirements.

CONSIDERATIONS:



Mitigation Solution: Use Non-Structural Stabilization

There are also non-structural mitigation solutions that can help stabilize the shoreline, including beach nourishment, dune restoration, and living shorelines. Natural or nature-based shoreline stabilization methods use living plants together with natural and synthetic construction materials to reduce coastal erosion, establish vegetation and stabilize shorelines.

Option 1: Nourish Beaches and Restore Dunes

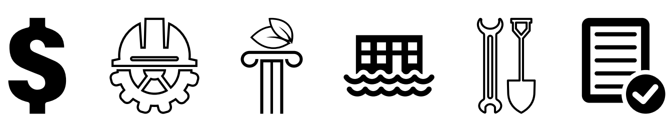
Beach nourishment replaces sand lost through longshore drift or erosion (Figure 5.4.7). Beach nourishment results in a wider beach between the water and the land, which can reduce storm damage and protect the land beyond the beach. Beach nourishment typically is not a one-time fix; it will need to be repeated because the beach is still subject to longshore drift and erosion at the original site.

Figure 5.4.7. Beach nourishment replaces sand lost through longshore drift or erosion and increases resilience. (Source: USACE, 2020).

Dune restoration is accomplished by building or rebuilding dunes, and it often includes planting native dune vegetation to stabilize the dune, trap windblown sand and add coastal habitat. Vegetated dune restoration involves re-establishing native plants and installing fencing to keep sand in place and help dunes grow. Vegetated dunes can help protect against storm surge and provide habitat for many animal species.

Dune restoration or beach nourishment combined with sediment stabilization with plantings and fencing can be used in addition to other stabilization measures to protect the shoreline and nearby structures.

CONSIDERATIONS:



Option 2: Stabilize Using Living Shorelines

Living shoreline stabilization involves using vegetation combined with geogrids, crib walls, brush mattresses, root wads or other bioengineered construction materials. Living shorelines can mitigate erosion in lesser-developed areas that do not experience high velocity waves (Figure 5.4.8).

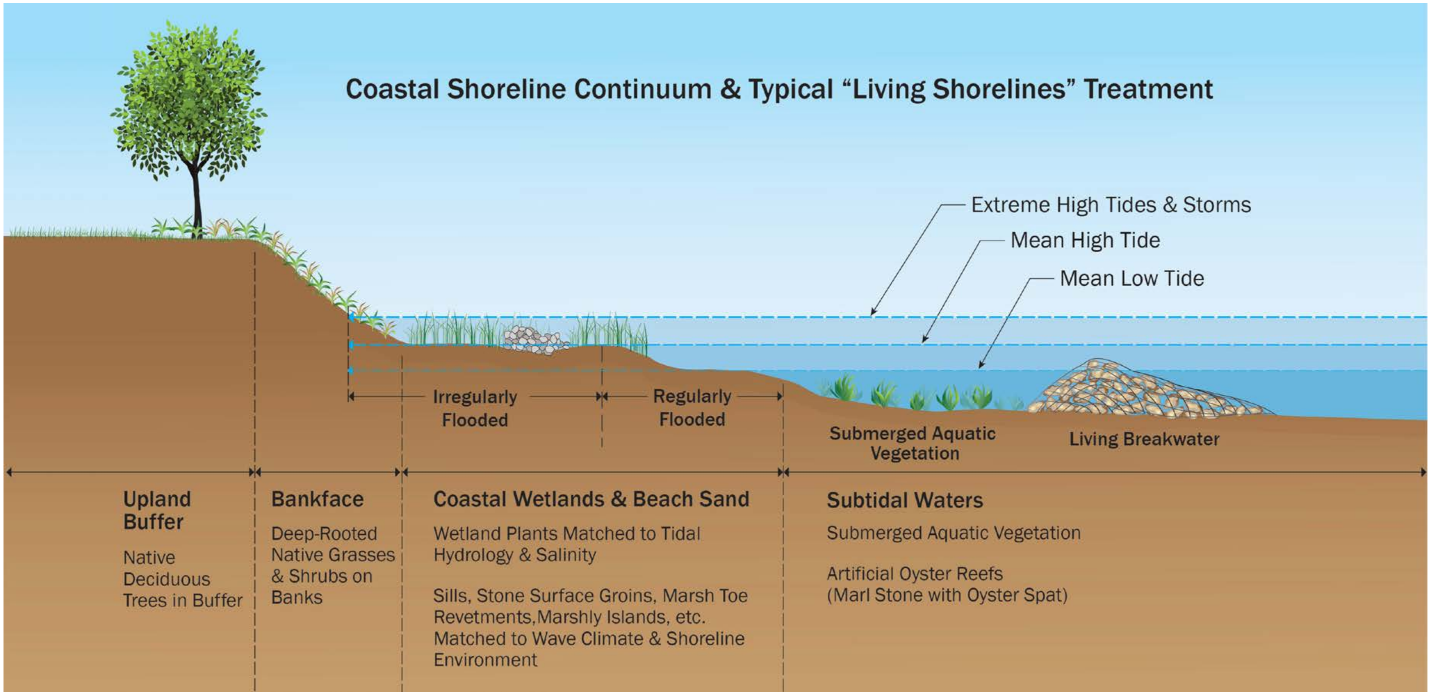


Figure 5.4.8. Nature-based solutions for shoreline stabilization via a “Living Shorelines” approach. (Source: Adapted from NOAA, 2016)

A living breakwater may include, but is not limited to, an oyster reef, seagrasses, mangroves, and vegetated dunes.

- Oyster reefs serve as natural breakwaters, which can calm waves and reduce erosion on the shoreline side of the reef. They also can provide habitat for fish and some invertebrates. Oyster reefs can be constructed of bagged oyster shells placed in the intertidal area. Shell bags may need to be anchored in place, particularly if they are stacked, or waves may overtop the structure.
- Seagrasses typically grow as underwater grass fields in shallow water off coastlines. They help protect the coastline by slowing wave energy and trapping sediment, thus reducing erosion. They also serve as a habitat to many different sea creatures.
- Mangroves are trees or shrubs that grow primarily in shallow tropical water. The dense root systems of mangrove forests help trap sediment, which can help stabilize the coastline and protect reefs and seagrasses from being trapped under sediments. Mangroves also can reduce the impacts of waves, and wide mangrove belts can help reduce wind speed.

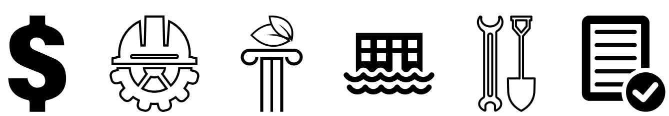
Bioengineered shoreline protection can:

- Protect against erosion while augmenting the natural ecosystem and providing habitat for plant and animal species.
- Provide low-maintenance shoreline stability when the vegetation's root system is established and strengthened as it matures.
- Restore many natural ecosystem functions and have ancillary benefits to the human and the ecological communities.

When evaluating living shorelines as a mitigation option, consider the following:

- Designers need to understand the coastal sediment transport system and erosion cycle in the coastal zone in which the project is located.
- Designers should use sound engineering practices and ecological principles to assess, design, construct and maintain living vegetation systems that are blended into the shoreline and the supported coastal ecosystem.
- Living shorelines typically are effective only in low-energy environments and may need to be paired with other mitigation techniques to provide a desired level of protection.
- Projects likely will involve an interdisciplinary effort between scientists, engineers and landscape architects.
- Implement an inspection and maintenance program to maintain a bioengineered shoreline stabilization system throughout its intended life.
- Consider Federal, state and local permitting requirements before choosing to use living shoreline stabilization methods.
- As with structural mitigation methods, heavy storms can damage living shorelines, requiring them to be repaired to provide the same level of protection they did prior to the storm.

CONSIDERATIONS:



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Attorney for Plaintiff State of New Jersey
Department of Environmental Protection

By: Dianna E. Shinn (242372017)
Deputy Attorney General
(609) 376-2789

SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. CPM-C-55-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **CERTIFICATION OF JENNIFER L. MORIARTY IN SUPPORT OF PLAINTIFF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S OPPOSITION TO NWW's MOTION FOR LEAVE TO FILE COUNTERCLAIM**

I, JENNIFER L. MORIARTY, of full age, certify and say:

1. I am the Director of the Division of Land Resource Protection ("DLRP") at the Department of Environmental Protection ("DEP"), which includes the Bureau of Coastal and Land Use Compliance and Enforcement ("BCLUCE").

2. I make this certification in support of the Department's Opposition to NWW's Motion for Leave to File Counterclaim, and I am fully familiar with the facts supporting the Department's Opposition to this Motion.

3. Attached hereto as **Exhibit 1** is a true and correct copy of the Administrative Order and Notice of Civil Administrative Penalty Assessment ("AONOCAPA") prepared by BCLUCE staff and reviewed by me and Assistant Commissioner Katrina Angarone.

4. At my direction, the AONOCAPA was served on Mayor Patrick Rosenello via certified mail on January 12, 2023, and I also sent the AONOCAPA to Mayor Rosenello via electronic mail on the same date.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Dated: January 13, 2023

____
Jennifer L. Moriarty
Director Division of Land Resource Protection

MORIARTY CERTIFICATION EXHIBIT 1

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Watershed & Land Management
Division of Land Resource Protection
501 East State St, PO Box 420, 501-2A
Trenton, New Jersey 08625
Tel. (609) 984-3444

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

January 11, 2023

CERTIFIED MAIL/RRR & Via email
7017 2620 0000 1758 0251

Honorable Patrick Rosenello, Mayor
City of North Wildwood
901 Atlantic Avenue
North Wildwood, New Jersey 08260

RE: Administrative Order and Notice of Civil Administrative Penalty Assessment
Block 291.01 Lot 1; Block 315.02, Lot 1; Block 316.02, Lot 1;
Block 317.02, Lots 1 & 2; Block 317.03, Lot 1; Block 289.03, Lot 1
North Wildwood City, Cape May County
PEA230001-0507-03-0009.3

Dear Mayor Rosenello:

Enclosed for service upon you is an Administrative Order and Notice of Civil Administrative Penalty Assessment issued by the Department.

Contained within the enclosed document is a notice and instructions for requesting an Administrative Hearing. Failure to request a hearing within 35 days as per instructions will result in the loss of your right to a hearing.

If you have any questions concerning the Administrative Order and Notice of Civil Administrative Penalty Assessment, please contact Michele Kropilak of my staff at michele.kropilak@dep.nj.gov or by letter at the address above.

Sincerely,

Jennifer Moriarty, Director
Division of Land Resource Protection

c: Kimberly Cahall, NJDEP, OEP
Dennis Reinknecht, NJDEP, DREC
Kevin Terhune, NJOAG, DOL-EEEJ
Neil Yoskin, Esq., Cullen & Dykman LLP

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF COASTAL AND LAND USE COMPLIANCE & ENFORCEMENT
Toms River Office
1510 Hooper Avenue, Suite 140
Toms River, New Jersey 08753
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PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

January 11, 2023

CERTIFIED MAIL/RRR & Via email
7017 2620 0000 1758 0251

IN THE MATTER OF	
City of North Wildwood 901 Atlantic Avenue North Wildwood, New Jersey 08260	ADMINISTRATIVE ORDER AND NOTICE OF CIVIL ADMINISTRATIVE PENALTY ASSESSMENT

ID # PEA230001-0507-03-0009.3

This Administrative Order and Notice of Civil Administrative Penalty Assessment (AONOCAPA) is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (hereinafter, NJDEP or the Department) by N.J.S.A. 13:1D-1, et seq., and the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., ("FHA") and the rules promulgated at N.J.A.C. 7:13-1 et seq., the Coastal Area Facility Review Act N.J.S.A. 13:19-1 et seq. ("CAFRA") and rules promulgated at N.J.A.C. 7:7-1 et seq., and the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 et. seq.) and the rules promulgated at N.J.A.C. 7:7A-1, et. seq., and duly delegated to the Assistant Commissioner, Watershed and Land Management and her assignees pursuant to N.J.S.A. 13:1B-4.

FINDINGS

1. The City of North Wildwood, hereinafter "Respondent," owns the oceanfront beach and dune property located at Block 291.01, Lot 1; Block 315.02, Lot 1; Block 316.02, Lot 1; Block 317.02, Lots 1 & 2; Block 317.03, Lot 1, Block 289.03, Lot 1, North Wildwood City, Cape May County, hereinafter the "site".

2. On December 1, 2014, the Department's Division of Land Resource Protection (DLRP) issued a CAFRA and Freshwater Wetland Permit (File # 0507-03-0009.2 CAF140001, FWW140001 & FWW140002) to the Respondent, which authorized street and utility reconstruction, beachfront storm sewer/outfall reconstruction, construction of a multi-use path from 5th to 15th Avenues and widening of sidewalks between 1st and 2nd Avenues in North Wildwood. The freshwater wetlands buffer for the wetlands was identified as exceptional resource value and designated as 150 feet wide. Pre-construction condition #2 of this permit required that prior to site preparation, the permittee shall complete a transition area and adjacent freshwater wetland conservation restriction and file the completed restriction with the Cape May County Clerk's Office preserving the freshwater wetlands and transition areas located within the existing dunes. A copy of the recorded restriction was also required to be submitted to the Department prior to construction. The freshwater wetlands

conservation restriction was not filed as required by the Freshwater Wetland Permit and construction has been completed. The Respondent's counsel admitted in an August 17, 2020 letter to DEP that a conservation restriction was drafted at the time but the Respondent has failed to file the conservation restriction with the Cape May County Clerk's Office to date.

3. On June 9, 2017, the DLRP issued a CAFRA and Waterfront Development permit to the Respondent, File #0507-03-0009.3 (CZM170001) for routine beach and dune maintenance and on June 29, 2018, DRLP issued a CAFRA and Waterfront Development Permit File #0500-07-0006.3 (CAF180001, WFD180001) for sand back passing which included the harvesting of sand from the City of Wildwood and the deposition of that sand in specifically designated areas only on the beach waterward toe of the dunes in North Wildwood between 2nd and 26th Avenues in accordance with NJDEP approved location plans. These permits do not authorize any disturbance to existing dunes, wetlands or stockpiling of sand and are valid for 5 years.

4. On December 19, 2017, the Respondent submitted a jurisdictional determination request to DLRP to determine if proposed concrete and composite decking surrounding the beach patrol building at 15th Ave at the oceanfront required an NJDEP coastal permit. The DLRP issued a Coastal Jurisdictional Determination letter, File #0507-03-0009.2 (APD170001) on August 14, 2019, that a CAFRA permit would be required for the decking. As seen on Nearmap aerial imagery from March 6, 2017, the Respondent had already constructed approximately 4, 216 square feet of concrete and composite decking at the beach patrol building without obtaining the required CAFRA permit.

5. On July 10, 2019, DLRP issued a Freshwater Wetlands Letter of Interpretation File #0507-03-0009.2 FWW180001 to the Respondent for a portion of the site that identified freshwater wetlands and transition areas near the Lou Booth Amphitheatre and within and surrounding the dunes to the north of the beach patrol building at 15th Avenue.

6. On April 3, 2020, the Respondent submitted a CAFRA and Freshwater Wetlands permit application, File #0507-03-0009.4 (LUP200001), to DLRP to construct ADA and other improvements at the 22nd Avenue beach, the Lou Booth Amphitheatre and Hereford Inlet.

7. The DLRP advised the Respondent that the application was deficient on May 6, 2020. There were numerous deficiencies, including, but not limited to, inaccurate plan submittals that did not depict all existing structures or freshwater wetlands and transition area disturbances. The Respondent was advised that bike, concrete and other pathways, foot showers and stairs were constructed without prior CAFRA authorization and may need to be removed and/or be legalized if the Respondent can demonstrate compliance with the Coastal Zone Management Rules at N.J.A.C. 7:7 and Stormwater Rule, N.J.A.C. 7:8. On March 31, 2022, the Respondent submitted information to address some of the deficiencies. As a result, the DLRP issued another deficiency letter on April 7, 2022. As of this date, the application remains deficient and is awaiting additional information from the Respondent.

8. On April 28 and May 26, 2020, in response to calls to the Department's Communication Center of alleged unauthorized dune disturbance at the site, the Department's Bureau of Coastal & Land Use Compliance & Enforcement (CLUE) conducted site investigations and determined that approximately 8 acres of vegetated dunes, including approximately 6.7 acres of critical wildlife habitat and approximately 1.1 acres of freshwater wetlands, throughout the North Wildwood oceanfront had been destroyed and numerous structures had been constructed on the site without NJDEP authorization. These unauthorized structures included a vinyl and steel oceanfront bulkhead from approximately 3rd Avenue to almost 13th Avenue, gazebos, sheds, shower platforms, bike paths, walkways, concrete landing with flagpole and other improvements along the oceanfront, including dune disturbance/removal in and around the Lou Booth Amphitheatre and Surf Avenue area.

9. CLUE documented that the Respondent had graded and removed approximately 0.57 acres of the dune adjacent to and waterward of Seaport Pier just prior to the opening of Seaport Pier in spring of 2018 and was now stockpiling back passed sand within this area, had altered or removed vegetated dunes during the unauthorized

construction of the various bulkhead segments from 2012 to 2020, including the removal of approximately 0.58 acres of prior dune/beach area to install an irregularly shaped bulkhead and create a park area on the oceanfront between 5th and 7th Avenues, and also placed some of the harvested sand from Wildwood in large stockpiles on top of approximately 6.7 acres of existing vegetated dunes from 7th Avenue south towards 13th Avenue in 2020. Placement of the stockpiled sand on top of the vegetated dunes and in other locations on the beach and dunes throughout the site were not authorized by any NJDEP permit or in compliance with any approved permit or plan. In late spring of 2020, these large stockpiles of harvested sand were graded waterward of the unauthorized steel bulkhead destroying the mature, densely vegetated dunes between 7th Avenues and 13th Avenues. Additional unauthorized large stockpiles of sand remained throughout the site at this time.

10. Based on the violations described in paragraphs above, the Department issued a June 6, 2020 CAFRA, Freshwater Wetlands and Flood Hazard Area Notice of Violation ("NOV") to the Respondent. In the NOV, the Department advised that all unauthorized activities must cease immediately, and that Respondent was not to conduct any regulated activities except in compliance with valid NJDEP land use permits in accordance with approved plans. The June 6, 2020 NOV requested a response within 10 days and copies of all work/site plans, as built surveys, planning board and local/county/federal/state approvals for the unauthorized work as well as a list of all contractors, their contracts, and identify the specific projects completed for the Respondent related to the NOV.

11. On June 8, 2020, CLUE visited the site to assess site conditions. Sand grading of the stockpiles within the area of vegetated dunes near 11th and 12th Avenues was still underway. The same day, the Department again advised the Respondent via e-mail that the work in progress was not authorized by any permit and must stop immediately or additional enforcement action would be taken. CLUE proceeded to City Hall and met with the City Administrator and via telephone with the City's attorney. Both were advised that the work underway was not in compliance with the sand back passing permit and that all work must cease and a restoration plan should be submitted within 10 days as required by the June 6, 2020 NOV. Subsequent to this meeting, the City's attorney emailed NJDEP and admitted that the City's position is that due to storm erosion, by the time the sand was harvested from Wildwood to be brought to North Wildwood there was no room to place it other than on what remained of the vegetated dunes. The City felt the remaining sand stockpiles were unstable and proposed to stop working at the 12th Avenue site, but be allowed to complete work from 17th -23rd Avenues, and suggested a site meeting be scheduled immediately to discuss further. The Department did not agree to any continuation of site work. The Respondent's attorney requested a thirty-day extension to respond to the NOV and a meeting to further discuss the NOV and path forward. No thirty-day extension was granted by the Department at this time.

12. On June 9, 2020, the Respondent and Department staff met on site to view current the public safety hazardous conditions created by the Respondent's unauthorized movement and stockpiling of sand. The Respondent was concerned about the remaining large stockpiles of sand that had not yet been distributed and graded, which might be susceptible to erosion and collapse, and presented a public safety hazard. The Department advised the Respondent to close off or fence the areas of safety concern and stop work, prepare and/or provide surveys documenting the location of the dunes prior to the commencement of this year's back passing, and stake the area 25 feet waterward of the remaining dunes so that they would not be impacted/excavated. The Department advised that the stockpiled sand should remain in place and eventually be utilized to begin restoration of the 6.7 acres of dunes that were destroyed by the Respondent. It was also recommended that the Respondent submit an emergency authorization request to address the alleged public safety hazard, and once submitted, DLRP agreed to expedite review of same. Later that day, the Department received an email from the Respondent that they planned to continue to move sand but would apply for an emergency authorization.

13. On June 10, 2020, the Respondent requested an emergency authorization for public safety to complete the distribution of the remaining sand stockpiled along the oceanfront and to grade that sand between 2nd and 26th Avenues. The Respondent proposed to establish a flagged buffer line located 25 feet waterward of the visible limit of remaining vegetated dunes and utilize the stockpiled sand for continued beach placement and grading, and also planned to retain 75,000 cubic yards of sand for future erosion events. The Respondent expected the

work to be completed by June 14, 2020 and did not submit a site/work plan. The Department did not authorize any continuation of the sand movement or grading at that time. The Respondent acknowledged that their NJDEP approved plans delineated areas to place the sand waterward of all existing dunes, however in late 2019 and 2020, the Respondent instead placed the harvested sand landward of the authorized sand locations within dunes, wetlands and critical wildlife habitat areas because the delineated approved locations were either subject to erosion or currently underwater. The Respondent agreed to coordinate on the submittal of a restoration and/or mitigation plan for the areas impacted. DLRP continued to request a plan depicting the proposed limits of sand removal/transfer from the stockpiled areas.

14. On June 12, 2020, CLUE staff conducted a site inspection and determined that the Respondent was continuing to conduct unauthorized regulated activities despite being advised by the Department on multiple occasions to stop working. Specifically, he Respondent had continued to move sand from the large stockpiles near 21st and 22nd Avenues, grading those areas level, and placing and grading the harvested sand at the oceanfront between 2nd and 7th Avenues. None of the work was in compliance with any permits/approved plans and no emergency authorization had been issued for this activity to date.

15. On June 15, 2020, through counsel, Respondent requested a status update on the emergency authorization request. CLUE staff responded and once again asked that the Respondent provide a plan depicting the proposed limits of sand removal from the stockpiles and limits of the area to be transferred to. The Respondent was again reminded that the ongoing work was not in compliance and subject to enforcement action.

16. On June 17, 2020, the Respondent's attorney provided a plan depicting a 25-foot offset to the dunes. This plan did not address where the sand was to be placed or to what elevation/slope the sand would be graded to. Sand transfers and grading were still ongoing. DLRP staff advised once again that the ongoing work should cease, and only a one-time grading of the waterward slope of the stockpiles to address safety concerns would be authorized, and the remaining sand stockpiles should not be moved or graded any further so that the sand could be utilized to address all violations.

17. On June 22, 2020, through its counsel, DEP issued a reminder letter to the Respondent's attorney of the now past due requirement to submit all supplemental information related to the June 6, 2020 NOV. This information had been due within 10 days of the NOV (on June 16, 2020). The letter also reiterated that no extension had been provided to respond to the NOV.

18. On June 24, 2020, the DLRP issued an Emergency Authorization (File # 0500-07-0006.3 CAF200001) for a one-time slope adjustment to the sand stockpiles between 12th and 14th Avenues and 16th and 22nd Avenues to address the public safety concerns. The Emergency Authorization included specific limitations to the sand movement/grading and sand stockpile slopes and specifically directed that no grading or sand removal/movement shall occur beyond what was necessary to create a 5:1 slope to the sand stockpiles and 7:1 slope at the beach accessways for public safety. The Emergency Authorization allowed the Respondent to place limited excess sand within 75 feet of the steel bulkhead between 8th and 12th Avenues only. The elevation of the beach area was required to be no lower than 7 feet NAVD88, North American Vertical Datum of 1988, which is the standard used by surveyors to measure elevation. The Emergency Authorization specifically prohibited the continued removal, relocation, filling and grading of all stockpiled sand, or the continued movement of stockpiled sand beyond the limits above related to public safety and had to be completed within 60 days. The Respondent was required to submit a CAFRA and Waterfront Development permit application to the Department within 90 days. The Respondent was advised that the work authorized under the Emergency Authorization did not satisfy any of June 6, 2020 NOV compliance requirements to correct the violations.

19. On June 24, 2020, CLUE conducted a site inspection and observed sand being transported to, placed and graded between 3rd and 14th Avenues, without a valid NJDEP permit and in violation of the June 24, 2020 Emergency Authorization.

20. On June 29, 2020, CLUE conducted a site inspection and observed sand grading was ongoing at 12th Avenue not in compliance with any NJDEP approvals. This site inspection also confirmed that unauthorized transport, placement, filling and grading of sand had now occurred within a combined total area of approximately 12 acres of beach and prior dune areas throughout the North Wildwood oceanfront. The previously stockpiled sand had now been graded throughout the City's beach and prior dune area, beyond the approved areas listed within the June 24, 2020 Emergency Authorization. Substantial grading and removal of the stockpiled sand between 13th and 15th Avenues had occurred beyond the grading and sand movement authorized under the June 24, 2020 Emergency Authorization.

21. On July 14, 2020, the Respondent provided an initial response to the June 6, 2020 NOV and admitted work was completed without the required permits, but did not explain how the violations would be resolved, either via a timeframe for permit application submittal or restoration as needed. No other responsive documents were submitted at this time. Legal counsel for the Department advised the Respondent via email later that day that the response by the Respondent was incomplete and requested all responsive documents to address the NOV.

22. On September 17, 2020, the Department issued a second NOV (File# 0507-03-0009.3 PEA200002) to the Respondent for continuing and new violations at the site since June 6, 2020, including non-compliance with the June 24, 2020 Emergency Authorization (File# 0500-07-0006.3 CAF200001). The second NOV advised the Respondent to cease unauthorized grading and sand movement activities, and either submit a permit application to attempt to legalize the unauthorized work or submit a restoration plan to remove all unauthorized structures and restore the site. In addition, the Department reminded the Respondent that a CAFRA and Waterfront Development permit application was required no later September 24, 2020 in accordance with the June 24, 2020 Emergency Authorization.

23. On September 23, 2020, the Respondent's attorney advised the Department that the site had been experiencing erosion, the bulkhead between 2nd and 12th Avenues was subject to both direct wave attack and water was up to the bulkhead in these locations, and that jersey barriers had been placed south of 12th Avenue on the beach to provide protection to the dune system south of this location adjacent to the unauthorized bulkhead.

24. On September 24, 2020, CLUE conducted a site inspection and observed the unauthorized placement of concrete jersey barriers on the beach between 12th and 13th Avenues within a CAFRA regulated area.

25. On October 5, 2020, the Department issued a third NOV (File# 0507-03-0009.3 PEA20001) to the Respondent for placement of concrete "jersey" barriers on the beach between 12th and 13th Avenues without CAFRA permit approval in violation of N.J.A.C. 7:7-2.2. The NOV required either the removal of the jersey barriers or obtaining a CAFRA permit for them.

26. On October 9, 2020, the Respondent's attorney provided a response to the third NOV issued October 5, 2020, arguing that a CAFRA permit and/or emergency authorization should not be required, and that the Respondent intends to keep the jersey barriers in place for the remainder of the hurricane season. The Respondent did not submit a permit application, but the jersey barriers were removed from the beach by February 2021.

27. On October 16, 2020, the Respondent's attorney provided a response to the second NOV issued September 17, 2020 and admitted that the Respondent took actions that were outside the scope of the permit(s) and acknowledged disturbing the dunes, wetlands and wetland transition areas. Through counsel, the Respondent further conceded that the terms and conditions of the June 24, 2020 Emergency Authorization were not complied with because it felt they were outdated and obsolete upon issuance.

28. On October 21, 2020, the Department met with the Respondent to provide additional compliance assistance. The Respondent advised that it planned to submit an after the fact permit application for the existing unauthorized bulkhead together with a request to extend the bulkhead south the entire length of the City's oceanfront. and intended to add and address many of the other unauthorized structures within the pending deficient permit application File #0507-03-0009.4 (LUP200001), noted in paragraph 6. The Respondent

planned to apply for another permit or emergency authorization within 60 days for the upcoming round of back passing, thereby curing any alleged violations by way of that application. The Department requested the Respondent address, a holistic approach, including long and short-term resolution of all the violations by October 30, 2020 , and advised that the permit applications must address the disturbance of dunes, wetlands, wetland transition areas, and critical wildlife habitat. Dune removal near Seaport Pier was discussed, and CLUE agreed to provide documentation of the removal to the Respondent, which was provided on October 29, 2020. On November 9, 2020, Respondent's attorney sent a letter to NJDEP that acknowledged the approximately 0.57 acre dune adjacent to Seaport Pier had been graded, removed and relocated landward by the Respondent without DEP permit approval.

29. On November 20, 2020, the Respondent submitted a CAFRA and Freshwater Wetlands permit application (File #0507-03-0009.6 LUP20001) to attempt to legalize a previously constructed vinyl bulkhead between 3rd and 5th Avenues and steel bulkhead between 5th and 13th Avenues; and to obtain approvals for a proposed steel bulkhead adjacent to the boardwalk between 13th and 25th Avenues. The permit application and submitted plans included information related to the dates of unauthorized installation for each segment of bulkhead as well as the lengths and materials installed. Specifically, 229 linear feet of vinyl bulkhead was installed from 3rd to 4th Avenues between 11/27/2012-12/09/2012, 267 linear feet of vinyl bulkhead was installed from 4th to 5th Avenues between 11/27/2017-05/06/2018, 630 linear feet of steel bulkhead was installed from 5th to 7th Avenues between 11/27/2017-05/06/2018, and 1, 614 linear feet of steel bulkhead was installed from 7th to 13th Avenues between 11/08/2019 – 5/5/2020. The Respondent was notified that this application was determined to be deficient on December 3, 2020. As of this date, the application requires additional information from the Respondent prior to review.

30. On December 8, 2020, DLRP approved an Emergency Authorization, File #0500-07-0006.4 CAF200001, to conduct a sand back passing project in response to a request submitted by the Respondent to harvest sand from Wildwood, temporarily stockpile the material in Wildwood, place temporary jersey barriers waterward of existing piers from 23rd Aves to 26th Avenues to protect truck access, stockpile the sand on the beach between 17th and 23rd Avenues and 7th and 13th Avenues not closer than 15 feet to the existing seaward dune toe and then deposit and grade the sand on the beach between 5th Avenues and 17th Avenues in North Wildwood. In addition, the Respondent was required to reestablish a dune from 16th Avenue north to 12th Avenue with an elevation of 14.75 feet NAVD88, and a 25-foot wide dune crest. The Respondent was required to provide before and after surveys to the Department and comply with all other conditions, including submission of a complete CAFRA and Waterfront Development permit application within 90 days. Multiple modifications and approvals were provided to the Respondent for the December 8, 2020 Emergency Authorization into 2021.

31. On August 12, 2021, DLRP issued a CAFRA/Waterfront Development Individual Permit, 0500-07-0006.4 LUP210001, which legalized the beach back passing and beach nourishment activities authorized by DLRP in the December 8, 2020, April 1, 2020 and May 19, 2021 Emergency Authorizations. The authorized activities include beach sand harvesting, temporary stockpiles, and maintenance of six (6) outfall structures between Leaming Avenue and Juniper Avenue in the City of Wildwood, and deposition and grading of beach sand, temporary stockpiles, construction access ways, jersey barriers, dune creation, and outfalls repair and abandonment between 2nd and 26th Avenue in the City of North Wildwood. The August 12, 2021 permit stipulates that the Respondent shall request and obtain written approval from the DLRP prior to conducting any work referenced in the permit for the duration of the permit. The permit specifically does not legalize any of the unauthorized activities cited within the June 6 and September 17, 2020 NOVs. On June 22, 2022, representatives from the Department met with NWW City representatives (including Mayor Rosenello) and their consultants to discuss the requested, required additional information for the pending CAFRA IP and FWW GP6A (DLRP File No. 0507-03-0009.4 LUP 200001) which has been deficient since 5/6/20.

32. On July 27, 2022, CLUE issued a CAFRA NOV File# 0507-03-0009.3 PEA220001 to the Respondent as the City's beach and dune maintenance permit, 0507-03-0009.3 CZM170001, had expired on June 8, 2022. The Respondent was advised that all beach and dune maintenance activities should cease immediately. The City's consultant responded and advised a CAFRA permit application was being prepared. A beach and dune

maintenance permit application File#0507-20-0001.2 LUP220001 was submitted on December 16, 2022 and is under DEP review at this time.

33. On October 3, 2022, the Respondent's consultant advised DLRP via email that the site, and specifically the area near the beach patrol building at 15th Avenue, was sustaining dune losses and storm damage due to Hurricane Ian and indicated that he and may apply for an emergency authorization. DLRP replied that day to advise that the DLRP was available for any questions, would review any submissions quickly and provided guidance on what information was required to be submitted to apply for an emergency authorization. Later that day, the Respondent's consultant advised that an emergency authorization would likely be needed because there was a concern for a breach of dune at the beach patrol building.

34. On October 4, 2022, DLRP responded to the Respondent's consultant and again advised that DLRP would expedite review of any submitted emergency authorization request and provided both day and evening contact phone numbers. DLRP advised that no work should be completed unless and until DLRP reviewed and provided either written or verbal authorization. The consultant was provided specific guidance from N.J.A.C. 7:7-10.3(b) regarding acceptable emergency beach restoration activities including placement of fill material, alongshore transfer of sand on the beach, placement of rock and/or sand filled geotextile tubes and advised that these activities should be considered prior to placement of a bulkhead which could increase erosion to adjacent areas.

35. On the evening of October 5, 2022, the Respondent requested an emergency authorization to conduct multiple emergency shore protection measures in response to Hurricane Ian storm damage. The request included placement of 400 linear feet of concrete jersey barriers at the inland toe of the dune from 15th to 16th Avenues at the beach patrol building, removal of timber decking walkway to allow for jersey barrier installment, installation of 404 linear feet of bulkhead in this location, reshaping the dune scarp and landward side of the dune to provide an angle of repose to the bulkhead in this location, and reconstruction of the vehicular beach accessway at 25th Avenue. The request stated that the deployment of the jersey barriers, relocation of the decking and the reshaping of the dune to stabilize the slope would commence immediately and be completed within one day and the installation of bulkhead and reconstruction of the accessways would commence upon receipt of materials and would require several weeks.

36. On October 6, 2022, the DLRP requested clarification via email on what "reshaping the dune scarp" entailed. The Respondent's consultant responded that that grading of the waterside side of the dune scarp would establish a stable slope so that continued collapse would not occur, and this may be needed on the landward side as well where the dune will meet the proposed bulkhead. The consultant opined that the grading may be covered by the August 12, 2021, back passing permit. The permit, however, specifically requires DLRP review and approval prior to conducting any work. The Respondent did not have any Department permit or approval to reshape the dune.

37. On October 7, 2022, DLRP issued an Emergency Authorization, File# 0507-03-0009.7 CAF220001 FWW220001, to remove the walkway and install the jersey barriers only, ensuring no dune disturbance. The other requests by the Respondent were under review, required additional information from the Respondent's consultant and not authorized at the time. The Respondent had already completed the installation of the jersey barriers prior to receipt of this Emergency Authorization. The October 7, 2022 Emergency Authorization requires a complete CAFRA and Freshwater Wetland permit application be submitted within 90 days (no later than January 7, 2023). To date, no CAFRA and Freshwater Wetland application has been submitted as required.

38. The Department's Division of Resilience Engineering & Construction (DREC) also issued a letter to the Respondent on October 7, 2022, reiterating that an emergency authorization from the DLRP is required prior to conducting regulated activities and the Respondent is not authorized to proceed until Department approval is provided. DREC has provided both technical and administrative assistance to the Respondent for several back passing permits. This letter also explained that emergency authorizations as outlined in N.J.A.C. 7:7-10.3(b) authorize certain emergency post storm measures designed to return the beach to pre-storm conditions,

such as placement of fill material, alongshore transfer of sand, placement of rock and/or geotextile tubes. The provision does not include placement of a bulkhead, which is likely to increase erosion to adjacent areas, and the Department can only approve such measures where the Respondent has demonstrated the alternatives are not feasible.

39. On October 12, 2022, the DLRP sent an email to the Respondent. DLRP determined that upon full review of all of information provided by the Respondent for the October 5, 2022 emergency authorization application, the installation of 404 linear feet of bulkhead at the beach patrol building, reshaping the dune scarp and dune to provide an angle of repose to the bulkhead in this location, and reconstruction of vehicular beach access at 25th Avenue were not eligible for an emergency authorization. Specifically, the 25th Avenue vehicular access was constructed without permit approval between 2013 and 2014 and was not able to be legalized via an emergency authorization, and other vehicle accessways are available adjacent to this area. The bulkhead and dune reshaping were also not eligible for an emergency authorization because it has not been demonstrated that there was an imminent threat to loss of life or property at the time and the Respondent advised the proposed bulkhead was not going to be installed immediately, but only after ordering materials. Emergency authorizations are intended for immediate action within 30 days, and the standards under N.J.A.C. 7:7-21.1(a) have not been demonstrated. As there was a pending deficient permit application (see paragraph 32) for the proposed bulkhead, the DLRP recommended the Respondent cure the deficiencies, and DRLP committed to expediting the technical review once the deficiencies were addressed. , the installation of a bulkhead would in fact worsen the erosion on site, which counsel for the Respondent acknowledged was a possibility in their October 20, 2022 letter to the Department. Alternative shore protection measures, including back passing for which the City holds a valid permit, must be conducted to determine the necessity of the proposed bulkhead and to determine which solution would have the least coastal impact on the adjacent beach and dune system as required by the Coastal Zone Management rules. To date, and more than two years later, the Respondent has not addressed all of the pending bulkhead permit application deficiencies. The Respondent was again advised that any regulated activity conducted without NJDEP approval would be subject to enforcement action including civil administrative penalties. To date, the Respondent has taken no formal action to object to or appeal this emergency authorization decision of ineligibility for the bulkhead, reshaping the dune and reconstruction of the vehicular access. for the bulkhead, reshaping the dune and reconstruction of the vehicular access.

40. On October 20, 2022, CLUE conducted a site inspection and observed the Respondent excavate sand from the beach berm near 11th Avenue, transport and place the excavated sand on the beach waterward of the dune between 14th and 16th Avenues. The sand was then graded into the dune scarp to reshape the dune in this location. The Respondent did not seek prior approval for this CAFRA regulated activity, and specifically advised the Department in their October 5, 2022 emergency authorization request that there was no available sand source. The Respondent was also specifically advised on October 7, 2022, that dune disturbance was not authorized. CLUE issued a CAFRA NOV to the Respondent, File# 0507-03-0009.3 PEA220002, for the unauthorized excavation, grading and reshaping of the dune without permit approval. The October 20, 2022 NOV advised the Respondent to cease the activity and attempt to obtain after the fact NJDEP permit approval. To date, no permit application has been submitted for this unauthorized CAFRA regulated activity.

41. On October 21, 2022, the Respondent's attorney advised the Department that the Respondent had completed the regrading of the dune and that because of supply chain issues the bulkhead materials were not yet available but should be within 30 days therefore the matter could be further discussed. The Respondent also disagreed that the bulkhead permit application remained deficient but provided no further information.

42. On October 27, 2022, the Department sent an email to the Respondent's attorney requesting a meeting to discuss the deficiencies in its 2020 pending bulkhead application. The email specifically identified the deficiencies cited on December 3, 2020 that have not been resolved. To date, the Respondent has not accepted the Department's offer to meet and discuss the bulkhead permit application deficiencies.

43. The following are violations the Department has identified to date:

CAFRA Violations

Violations of N.J.A.C. 7:7-2.1 and 2.2- engaging in a regulated activity within a CAFRA area without a coastal permit. Initiation of a regulated activity without a coastal permit is considered a violation of this chapter and shall subject the person or persons responsible for the regulated activity to enforcement action in accordance with N.J.A.C. 7:7-29
The following regulated activity occurred without NJDEP permit authorization:

A. Vinyl bulkhead construction (approximately 496 linear feet x 2 ft wide) from 3rd to 5th Avenues
B. Steel bulkhead construction (approximately 2244 linear feet x 2 ft wide) from 7th- 13th Avenues within a dune
C. Removal of vegetation, filling and grading of the (now bulkheaded) beach and dune area (approximately 0.58 acres) from 5th to 7th Avenues, to create a park with playground, walkways and other amenities
D. Construction and placement of crushed clam fill material (approximately 8,565 square feet) for the creation of path through the dune/CAFRA area from Surf Avenue to the Lou Booth Amphitheatre
E. Construction and placement of a concrete landing and flagpole (approximately 96 square feet) within a dune adjacent to the Lou Booth Amphitheatre (LBA)
F. Concrete sidewalk expansion at Surf Ave (approximately 1,084 square feet) connected to D.
G. Concrete path construction (approximately 470 square feet) near intersection of 2nd Avenue & Ocean/LBA
H. Removal of vegetation, grading and filling of the CAFRA area of Surf Ave and the construction of concrete & gravel for pathways, bike rack area (approximately 4234 square feet)
I. Removal of vegetation, grading and filling of the CAFRA area for the construction and placement of a platform with benches (approximately 230 square feet)
J. Construction of a gazebo at 1st Ave & Surf (approximately 598 square feet)
K. Construction of a gazebo at 2nd Ave & JFK Blvd (approximately 357 square feet)
L. Placement/construction of storage sheds/fenced storage area at the Beach Patrol building at 15th Avenue (approximately 4691 square feet)
M. Construction of a composite 8' wide bike path adjacent to the boardwalk between 15th – 26th Avenues (approximately 13,104 square feet)
N. Construction and placement of crushed clam fill material for the creation of a walkway between 15th -21st along the oceanfront (approximately 44, 981 square feet)
O. Construction of composite walkways/foot showers and bench platforms along the oceanfront at multiple street end entrances to the beach (approximately 24, 264 square feet)
P. Placement of concrete jersey barrier structures on the beach at 12th Avenue (approximately 300 square feet)
Q. Construction of a vehicular accessway/filling and fencing on the beach at 25th Avenue (approximately 3,789 square feet)
R. Excavation of sand from the beach berm at 11th Ave, transporting and filling the beach area between 14th and 16th Avenues, and then grading the sand landward into the dune scarp (approximately 3,969 square feet)

Violations of N.J.A.C 7:7-27.2 (c) 8 -failure to comply with the conditions of a CAFRA permit is a violation of the Coastal Zone Management Rules and is grounds for enforcement action under N.J.A.C. 7:7-29

A. Failure to comply with CAFRA permit File #0507-03-0009.3 CZM170001 for beach and dune maintenance -including permit special conditions 4, 10 – special condition #4 requires all activities be conducted in accordance with best management practices as defined by the Department in N.J.A.C.7:7-10.2 for routine beach maintenance, at N.J.A.C.7:7-10.3 for emergency post storm beach restoration and N.J.A.C.7:7-10.4 for dune creation and maintenance. Activities other than those outlined in these subchapters shall require additional authorization from the DLRP. Failure to receive such authorization prior to activities may warrant enforcement action. Special condition #10 states" bulldozing, excavation, grading, vegetation removal or clearing and relocation of existing dunes, whether existing or constructed in conjunction with this permit are not authorized under this general permit. Violations of these conditions and the permit include:

1. The stockpiling of sand on top of existing vegetated dunes and the subsequent vegetation removal, clearing, excavation, grading and removal of these dunes (approximately 6.7 acres) between 7th and 13th Avenues not in compliance with or authorized by the permit or plans.
2. The removal of vegetation, filling, grading, removal and relocation of a dune area waterward of and adjacent to Seaport Pier (approximately 0.57 acres) not in compliance with or authorized by the permit or plan

B. Failure to comply with CAFRA permit File #0507-03-0009.3 CZM170001 for beach and dune maintenance -including special condition #13 which states, "sand transfers to and from wetland areas that may exist on the beach are not authorized by this permit"- The Respondent first stockpiled sand on top of the existing vegetated dunes with wetland areas and then subsequently removed vegetation, cleared, excavated, graded and removed these dunes that contained freshwater wetland areas (approximately 1.1 acres) between 7th and 13th Avenues in violation of this permit condition.

C. Failure to comply with the CAFRA sand back passing permit File#0500-07-0006.3 CAF180001 WFD180001 and standard condition #12 which states that the project does not propose disturbance within freshwater wetlands and standard condition #12 states "The permittee and its contractors and subcontractors shall comply with all conditions, site plans, and supporting documents approved by the permit. Any noncompliance with a permit constitutes a violation of this chapter and is grounds for enforcement action"- Violations of this permit include:

1.Harvested sand from Wildwood was transferred to and stockpiled within multiple beach and dune locations in North Wildwood not authorized by the permit or approved plans. The permit did not authorize stockpiling at all. The sand was to be placed in specifically designated beach berm areas as depicted on the approved plans and graded in the location where the sand was deposited. Instead, and in violation of the approved permit and plans, sand was stockpiled on top of existing vegetated dunes that included freshwater wetlands and were critical wildlife habitat between 7th and 13th Avenues (approximately 6.7 acres). This was not authorized by the permit or approved plans. The permit and approved plans for this permit do not depict stockpiling of sand on top of existing dunes or in wetlands. In addition, 1.7 acres of sand stockpiling occurred between 17th and 20th Avenues in a location not depicted or approved on the permit plans, and 1.3 acres of stockpiled sand was placed on the beach and dune between 13th and 15th Avenues in a location not depicted or approved by the permit or plans.

2.Harvested sand from Wildwood was stockpiled within a 0.57 acre prior dune area adjacent to Seaport Pier, which is not in compliance with the approved permit and plans – this sand stockpile is outside of the approved areas depicted on the approved permit plans.

D. Failure to comply with the June 24, 2020 Emergency Authorization File# 0500-07-0006.3 CAF200001 for a one-time slope adjustment to the sand stockpiles between 12th and 14th

Avenues and 16th and 22nd Avenues to address the public safety concerns. The Emergency Authorization included specific limitations to sand movement/grading and the sand stockpile slopes and specifically directed that no grading or sand removal/movement shall occur beyond what was necessary to create a 5:1 to the sand stockpiles and 7:1 slope at the beach accessways in this sand stockpile area for public safety. The sand stockpiles were to remain as stockpiles with limited slope grading for public safety. Any limited excess sand could be placed within 75 feet of the steel bulkhead between 8th and 12th Avenues only. The elevation of the beach area was required to be no lower than 7 feet NAVD88. The Emergency Authorization specifically did not allow the continued removal, relocation, filling and grading of all stockpiled sand, or the continued movement of stockpiled sand beyond the limits above related to public safety and had to be completed within 60 days. A complete CAFRA and Waterfront Development permit application was required to be submitted within 90 days, no later than September 24, 2020. No permit application was ever submitted for this Emergency Authorization. The Respondent continued to transport the sand stockpiles, place and grade the sand between 3rd and 14th Avenues, not in compliance with any of the NJDEP permits or the June 24, 2020 Emergency Authorization.

E. Failure to comply with the Emergency Authorization, File# 0507-03-0009.7 CAF220001 FWW220001. The October 7, 2022 Emergency Authorization requires a complete CAFRA and Freshwater Wetland permit application be submitted within 90 days (no later than January 7, 2023). To date, no CAFRA and Freshwater Wetland application has been submitted as required.

Flood Hazard Area Violations

Violations of N.J.A.C. 7:13-2.1(a)- no person shall engage in a regulated activity in a regulated area without a flood hazard area permit or a coastal permit as required by N.J.A.C 7:7- following was constructed without permit authorization:

A. Vinyl bulkhead construction (approximately 496 linear feet x 2 ft wide) from 3rd to 5th Avenues
B. Steel bulkhead construction (approximately 2244 linear feet x 2 ft wide) from 7th- 13th Avenues
C. Placement/construction of storage sheds/fenced storage area at the Beach Patrol building at 15th Avenue (approximately 4691 square feet)

Freshwater Wetland Violations

Violations of N.J.A.C. 7:7A-2.2(a)-the following activities are regulated when performed in a freshwater wetland and require prior permit approval for the Department: the removal, excavation, disturbance or dredging of soil, sand, gravel, or aggregate material of any kind; the drainage or disturbance of the water level or water table so as to alter the existing elevation of groundwater or surface water, regardless of the duration or such alteration; the dumping, discharging or filling with any material; the driving of pilings; the placing of obstructions, including depositing, constructing, installing or otherwise situating an obstacle which will affect the values or functions of a freshwater wetland; or the destruction of plant life which would alter the character of the freshwater wetlands; including killing vegetation by applying herbicides or by other means, the physical removal of wetland vegetation, and/or cutting of trees;

The following are unauthorized regulated activities in freshwater wetlands:

A. The destruction of vegetation, filling of freshwater wetlands, excavation and grading within the dunes between 7th and 13th Avenues that contained freshwater wetlands (approximately 47, 792 square feet/1.1 acres) and also associated with the installation of the steel bulkhead based upon georeferenced freshwater wetlands delineated on DEP approved plans from permit File# 0500-

07-0006.1 CAF070001 WFD070001.

Violations of N.J.A.C. 7:7A- 2.3 (a)-the removal, excavation or disturbance of the soil; dumping or filling with any material; erection of structures; placement of pavements; destruction of plant life which would alter the existing pattern of vegetation within a freshwater wetland transition area are regulated activities which require prior permit approval form the Department.

The following are unauthorized regulated activities in freshwater wetland transition areas:

A. The destruction of vegetation, filling of freshwater wetlands transition areas, construction of a bulkhead and composite bike paths, excavation and grading within the dunes containing transition areas and landward of the dunes and bulkhead and between 7th and 13th Avenues that contained exceptional resource value freshwater wetlands transition areas (approximately 6.7 acres) based upon site plans submitted with CAFRA and Freshwater Wetlands permit application (File #0507-03-0009.6 LUP20001)

Violations of N.J.A.C. 7:7A-20.2 (c) 8- any noncompliance with a permit constitutes a violation of this chapter and is grounds for enforcement action under N.J.A.C. 7:7A-22-
The following are permit violations:

A. Violation of pre-construction condition #2 of CAFRA and Freshwater Wetland Permit File# 0507-03-0009.2 CAF140001, FWW140001 & FWW140002 which required that prior to site preparation, the Respondent shall complete a transition area and adjacent freshwater wetland conservation restriction and file the completed restriction with the Cape May County Clerk's Office preserving the freshwater wetlands and exceptional resource value transition areas located within the existing dunes and a copy of the recorded restriction shall be submitted to the Department. The freshwater wetlands conservation restriction was not filed.

44. Based on the facts set forth in these FINDINGS, the Department has determined that the Respondent has violated the Coastal Area Facility Review Act, N.J.S.A. 13:19-1 et seq., and the regulations promulgated pursuant thereto, N.J.A.C. 7:7 et seq., the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., ("FHA") and the rules promulgated at N.J.A.C. 7:13-1 et seq. and the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 et. seq.) and the rules promulgated at N.J.A.C. 7:7A-1 et. seq.

ORDER

NOW, THEREFORE, IT IS HEREBY ORDERED THAT:

45. The Respondent shall comply with the following:

a. Immediately cease any and all NJDEP unauthorized regulated activities at the site.

b. Do not conduct any additional unauthorized regulated activities on site. Ensure NJDEP permit authorization is obtained prior to conducting any NJDEP regulated activity and comply with all NJDEP issued permits and approved plans.

c. Within 30 days of receipt of this document, submit a proposal to CLUE for review and approval for full restoration of the site. The proposal must include complete details as to how the Respondent will restore the CAFRA, flood hazard areas, dunes, beaches, freshwater wetlands, transition areas and critical wildlife habitat to their pre-disturbance condition and remove and restore all violations/unauthorized structures identified in paragraph 49. The restoration plan must include the following:

- Removal of all unauthorized fill material and structures, and restoration of all disturbed areas to pre-disturbance grades;

- A description of how the disturbed area will be re-graded to re-establish pre-disturbance topography and hydrology;

- A stabilization plan prepared in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey";

- A planting plan that includes a list of all indigenous plant species (use of non-native and invasive species is prohibited) intended to recreate the pre-existing vegetation type including the pattern and spacing of these plantings;

- A preventative maintenance plan to ensure success of the restoration project;

- A time schedule for implementation and completion of all aspects of the restoration work;

- The restoration proposal must insure 85% survival and 85% vegetative coverage of the plantings after 3 complete growing seasons. Monitoring reports shall be provided yearly, for 3 years, to CLUE documenting the success of the restoration. Should the approved restoration plan, as implemented, fail to achieve this requirement, the Respondent will be required to implement corrective actions at CLUE's direction to achieve 85% survival and vegetative cover.

- Should CLUE determine that the restoration proposal is inadequate or incomplete, CLUE shall provide comments to the Respondent. Within 10 calendar days of receipt of CLUE's comments, the Respondent shall submit a revised restoration proposal that conforms to the CLUE's comments. The determination as to whether or not the restoration proposal as resubmitted conforms to CLUE's comments shall made solely by CLUE.

- The restoration proposal must be approved by CLUE prior to implementation. Upon CLUE approval, the Respondent(s) shall implement the approved restoration plan in accordance with the approved time schedule.

- Upon successful completion of restoration of all freshwater wetland and transition areas as determined by the Department, a conservation restriction shall be filed with the Cape May County Clerk's Office using the Department approved template.

OR

Submit complete application(s) for the appropriate CAFRA, Freshwater Wetlands and/or Flood Hazard permit(s) and/or cure all deficiencies to any pending permit application(s) to the Department's Division of Land Resource Protection to attempt to legalize all of the violations identified in paragraph 49. Permit review may result in approval, partial approval, withdrawal or denial. Within 45 days of issuance of the permit decision or withdrawal of the permit application, any activity or structure that does not attain complete permit approval must be either 1) removed from the site and the area restored to its authorized condition as required by the Department; or 2) altered to comply with the conditions and requirements of the NJDEP permit approval.

46. This Order shall be effective upon receipt by the Respondent or someone on the Respondent's behalf authorized to accept service.

NOTICE OF CIVIL ADMINISTRATIVE PENALTY ASSESSMENT AND NOTICE OF RIGHT TO A HEARING

47. Pursuant to N.J.S.A. 13:19-18, N.J.A.C. 7:7-29.1 et seq., N.J.S.A. 13:9B-1 et. seq., N.J.A.C. 7:7A-1 et. seq., N.J. S.A. 58:16A-50 et seq and N.J.A.C. 7:13-1 et seq. and based upon the above FINDINGS, the Department has determined that a civil administrative penalty is hereby assessed against the Respondent in the amount of **$8,661,000.00.** The Department's rationale for the civil administrative penalty is set forth in the attachment and incorporated herein.

48. Pursuant to N.J.S.A 13:19-18, N.J.S.A 13:9B-1 et seq., and N.J.S.A. 58:16A-50 et seq., the Department may, in addition to any other civil administrative penalty assessed, include as a civil administrative penalty the economic benefit (in dollars) which a Respondent has realized as a result of not complying with, or by delaying compliance with, the requirements of the Act.

49. Pursuant to N.J.S.A. 52:14B-1 et seq., N.J.A.C. 7:7-29.2, N.J.S.A 13:9B-1 et seq., and N.J.S.A. 58:16A-50 et seq., Respondent is entitled to request a hearing. The Respondent shall, in its request for a hearing, complete and submit the enclosed ADMINISTRATIVE HEARING REQUEST AND CHECKLIST TRACKING FORM along with all required information. Submittal or granting of a hearing request does not stay the terms or effect of this ORDER.

50. If no request for a hearing is received within 35 calendar days from receipt of this AONOCAPA, it shall become a Final Order upon the 36th calendar day following its receipt, and the penalty shall be due and payable.

51. If a timely request for a hearing is received, payment of the penalty is due when the Respondent receives a notice of the denial of the request, or, if the hearing request is granted, when the Respondent withdraws the request or abandons the hearing, or, if the hearing is conducted, when the Respondent receives a final decision from the Commissioner in this matter.

52. Payment shall be made by check payable to Treasurer, State of New Jersey and shall be submitted along with the enclosed Enforcement Invoice to:

Department of Treasury
Division of Revenue
P.O. Box 417
Trenton, NJ 08646-0417

GENERAL PROVISIONS

53. This AONOCAPA is binding on the Respondent, their principals, directors, officers, agents, successors, assigns, employees, tenants, any trustee in bankruptcy or other trustee, and any receiver appointed pursuant to a proceeding in law or equity.

54. No obligations imposed by this AONOCAPA are intended to constitute a debt which should be limited or discharged in a bankruptcy proceeding. All obligations are imposed pursuant to the police powers of the State of New Jersey, intended to protect the public health, safety, welfare, and the environment.

55. This AONOCAPA is issued only for the violations identified in the FINDINGS herein above and that violations of any statutes, rules or permits other than those herein cited may be cause for additional enforcement actions, either administrative or judicial, being instituted. By issuing this AONOCAPA, NJDEP does not waive its rights to initiate additional enforcement actions.

56. Neither the issuance of this AONOCAPA nor anything contained herein shall relieve the Respondent of the

obligation to comply with all applicable laws, including but not limited to the statutes and regulations cited herein.

57. The Respondent is not entitled to approval of any permit application(s) submitted pursuant to requirements contained herein. In the event the Department determines that regulated activities do not meet the requirements for permit approval, full restoration of the unauthorized disturbance will be required.

58. Pursuant to N.J.S.A. 13:19-18(e), N.J.S.A 13:9B-1 et seq., and N.J.S.A. 58:16A-50 et seq, any person who violates the provisions of the Act, or any code, rule regulation or order promulgated or issued pursuant thereto, or who fails to pay a civil administrative penalty in full, shall be subject, upon order of the court, to a civil penalty not to exceed $25,000 for each violation. Each day during which the violation continues constitutes an additional, separate, and distinct offense.

59. Pursuant to N.J.S.A.13:9B-21, N.J.S.A 58:16A-63and N.J.S.A. 13:19-18 any person who willingly or negligently violates the provisions of the FWPA, CAFRA, FHACA, or any code, rule, regulation, administrative order or court order, promulgated or issued pursuant thereto, shall be guilty, upon conviction, of a crime of the third degree.

Katrina Angarone — Digitally signed by Katrina Angarone Date: 2023.01.11 15:50:51 -05'00'

DATE: ____________________

Katrina Angarone, Assistant Commissioner
Watershed and Land Management

City of North Wildwood

Watershed & Land Management
File# PEA230001-0507-03-0009.3

CAFRA PENALTY RATIONALE
FOR FAILURE TO OBTAIN A PERMIT PRIOR TO CONDUCTING REGULATED ACTIVITIES

Pursuant to N.J.A.C. 7:7-29.5, the Department has determined that the base, or daily, penalty shall be determined by totaling the points assigned as follows: (1) **Type**- conducting a regulated activity without a permit or violation of a permit condition (2) **Conduct**; (3) **Seriousness**; and (4) **Duration**.
Pursuant to N.J.A.C. 7:7-29.5(b), each violation of N.J.A.C. 7:7-2.1/2.2 shall constitute an additional, separate and distinct violation.

1. **Type of Violation**: Conducting a regulated activity without a permit.

The Department has categorized the unpermitted unauthorized activities that have occurred:

1. **The construction of bulkhead "A":**
   i. The construction 630 linear feet x 2ft wide of steel bulkhead between 5th to 7th Avenue, within a prior dune area. (approx..1260 sq ft) The described length of this bulkhead is based on information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by van note-harvey associates.

2. **The construction of bulkhead "B":**
   i. The construction of approximately 1,614 linear feet x 2ft wide of steel bulkhead from 7th to 13th Avenue within a prior dune area.(approx.. 3228 sq ft) The described length of this bulkhead is based on information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by van note-harvey associates.

3. **The construction of bulkhead "C":**
   i. The construction of approximately 229 linear feet x 2ft wide of vinyl bulkhead along the oceanfront from 3rd to 4th avenues, waterward of the existing bulkhead on a beach. (approx. 458 sq ft) The described length of this bulkhead is based on information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by van note-harvey associates.

4. **The construction of bulkhead "D":**
   i. The construction of approximately 267 linear feet x 2ft wide of vinyl bulkhead along the oceanfront from 4th to 5th avenues, waterward of the existing bulkhead on a beach (approx. 534 sq ft) The described length of this bulkhead is based on information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by van note-harvey associates

5. **The destruction/removal/disturbance of dune with or without construction throughout North Wildwood:**
   i. The removal of vegetation, filling and grading of the (now bulkheaded) beach and dune area (approx. 0.58 acres) from 5th to 7th Avenue, to create a park with playground, walkways and other amenities.
   ii. The placement of crushed clam fill material for the creation of a path through approx. 8,565 sqft of dune/CAFRA area from Surf Ave to the Lou Booth Amphitheater.
   iii. The excavation of beach berm at 11th Avenue and the transport and placement of the excavated sand between 14th-16th Avenues, including grading the sand landward into the dune scarp impacting approx. 3,969 sqft of beach/dune in a CAFRA area.

6. **For the construction and placement of miscellaneous unauthorized structures:**
   i. The placement of an approx. 96 sqft concrete landing/flagpole adjacent to the Lou Booth Amphitheater.
   ii. The 1,084 sqft expansion of concrete sidewalk at Surf Avenue leading to the path through the dune that leads to the Lou Booth Amphitheater.
   iii. The construction of a 470 square of concrete path in a CAFRA area near the intersection of 2nd & Ocean. (adjacent to amphitheater)
   iv. The construction of a 357 sqft roof covered gazebo structure at the intersection of 2nd and JFK Blvd.
   v. The construction of approx. 4,216 sqft of concrete walkway and composite walkway at the Beach Patrol building at 15th Avenue.
   vi. The placement/construction of approx. 4,691 sqft of storage sheds and fenced storage area at the Beach Patrol building at 15th Avenue.
   vii. The placement/construction of an approx. 8' wide composite bike path between 15th & 21st along the oceanfront. (approx. 13,104 sqft)
   viii. The placement of approx. 44,981 sqft of crushed clam fill material for the creation of a walkway between 15th and 21st along the oceanfront.
   ix. The removal of vegetation, grading, and filling of a CAFRA area at the intersection of 1st & Surf: specifically, the placement of concrete & gravel for pathways and a bike rack area within a 4,234 sqft area.
   x. The clearing of vegetation and grading of a CAFRA area at the intersection of 1st & Surf: Specifically, the placement of an approx. 230 sqft platform with benches.
   xi. Construction of a 598 sqft roofed gazebo at 1st & Surf
   xii. The construction of 24,264 sqft of composite walkways/ shower platforms/ bench platforms etc. along the oceanfront at multiple street end entrances to the beach.

2. **Conduct**:

Minor: any conduct not identified as major or moderate point	= 1 point
Moderate: any unintentional but foreseeable act or omission	= 2 points
Major: any intentional, deliberate, purposeful, knowing or willful act or omission	= 5 points

The conduct for the above-mentioned activities have been determined as the following:

1. **For the construction of bulkhead "A"**	The conduct of the Respondent is considered to be **Moderate**	**= 2 points**
2. **For the construction of bulkhead "B"**	The conduct of the Respondent is considered to be **Moderate**	**= 2 points**
3. **For the construction of bulkhead "C"**	The conduct of the Respondent is considered to be **Moderate**	**= 2 points**
4. **For the construction of bulkhead "D"**	The conduct of the Respondent is considered to be **Moderate**	**= 2 points**
5. **For the destruction/disturbance of dune with or without construction**	The conduct of the Respondent is considered to be **Moderate**	**= 2 points**
6. **For the construction and placement of miscellaneous unauthorized structures:**	The conduct of the Respondent is considered to be **Moderate**	**= 2 points**

3. Seriousness:
The seriousness factor of the violation is assigned points as provided below and shall be based on the a) size of violation and b) whether the activity was conducted in a Special Area or resource.
a. Size:

i.	a violation impacting >200,000 sqft	= 13 points
ii.	a violation impacting >150,000 sqft up to and including 200,000 sqft	= 12 points
iii.	a violation impacting >100,000 sqft up to and including 150,000 sqft	= 11 points
iv.	a violation impacting >70,000 sqft up to and including 100,000 sqft	= 10 points
v.	a violation impacting >40,000 sqft up to and including 70,000 sqft	= 9 points
vi.	a violation impacting >20,000 sqft up to and including 40,000 sqft	= 8 points
vii.	a violation impacting >10,000 sqft up to and including 20,000 sqft	= 7 points
viii.	a violation impacting > 5,000 sqft up to and including 10,000 sqft	= 6 points
ix.	a violation impacting >2,000 sqft up to and including 5,000 sqft	= 5 points
x.	a violation impacting > 750 sqft up to and including 2,000 sqft	= 4 points
xi.	a violation impacting >500 sqft up to and including 750 sqft	= 3 points
xii.	a violation impacting >50 sqft up to and including 500 sqft	= 2 points
xiii.	a violation impacting up to and including 50 sqft	= 1 point

The size of the following violations are determined as follows:

1. **For the construction of bulkhead "A" =**
   630 linear feet x 2ft wide of steel bulkhead from 5th to 7th Avenue (1260 sq ft) **= 4 points**
2. **For the construction of bulkhead "B"**
   1,614 linear feet x 2ft wide of steel bulkhead from 7th to 13th Avenue (3228 sq ft) **= 5 points**
3. **For the construction of bulkhead "C"**
   229 linear feet x 2 ft wide of vinyl bulkhead from 3rd to 4th Avenue (428 sq ft) **= 2 points**
4. **For the construction of bulkhead "D"**
   267 linear feet x 2 feet wide of vinyl bulkhead from 4th to 5th Avenue (534 sq ft) **=3 points**
5. **For the destruction/grading of dune/construction**
   i. The removal of vegetation, filling and grading of the (now bulkheaded) beach/ dune area (approx. 0.58 acres) from 5th to 7th Avenue, to create a park with playground, walkways and other amenities. **= 8 points**

   ii. The placement of crushed clam fill material for the creation of a path through approx. 8,565 sqft of dune and CAFRA area from Surf Ave to the Lou Booth Amphitheater. **= 6 points**

   iii. The excavation of beach at 11th Ave and the placement of the excavated sand between 12th-16th Ave and grading the sand landward into the dune scarp impacting approx. 3,969 sqft of beach/dune in a CAFRA area. **= 5 points**

6. **For the construction and placement of miscellaneous unauthorized structures:**
   i. The placement of an approx. 96 sq ft concrete landing/flagpole adjacent to the Lou Booth Amphitheater. **= 2 points**

   ii. The 1,084 sq ft expansion of concrete sidewalk at Surf Avenue leading to the path through the dune that leads to the Lou Booth Amphitheater. **= 4 points**

   iii. The placement of a 470 sq ft of concrete path in a CAFRA area near the intersection of 2nd & Ocean. (adjacent to amphitheater) **= 2 points**

   iv. The construction of a 357 sq ft roof covered gazebo structure at the intersection of 2nd and JFK Blvd. **= 2 points**

   v. The construction of approx. 4,216 sq ft of concrete walkway and composite walkway at **= 5 points** the Beach Patrol building at 15th Avenue.

vi. The placement/construction of approx. 4,691 sq ft of storage sheds/fenced storage area at the Beach Patrol building at 15th Avenue. **= 5 points**

vii. The placement/construction of an approx. 8' composite bike path between 15th & 21st along the oceanfront. (approx. 13,104 sq ft) **= 7 points**

viii. The placement of approx. 44,981 sq ft of crushed calm shell fill material for the creation of a walkway between 15th and 21st along the oceanfront **= 9 points**

= 5 points

ix. The removal of vegetation, grading and filling of a CAFRA area at the intersection of 1st & Surf. Specifically, the placement of concrete and gravel for pathways and a bike rack area within an approx. 4,234 sqft area **= 2 points**

x. The removal of vegetation, grading and filling of a CAFRA area at the intersection of 1st & Surf, Specifically, the construction and placement of an approx.. 230 sqft platform with benches

xi. Construction of a 598 sq ft gazebo at 1st and Surf **= 3 points**

xii. The construction of 24,264 sq ft of composite walkways/ shower platforms/ bench platforms etc. along the oceanfront at multiple street end entrances to the beach. **= 8 points**

c. Special Areas(s)
In addition to the points assessed above, violations conducted in a special area or resource included in N.J.A.C. 7:7-9 shall be assessed an additional one point per special area or resource. The following Special Areas were impacted:

N.J.A.C.	Bulkhead "A"	Bulkhead "B"	Bulkhead "C"	Bulkhead "D"	Dune Disturbance	Miscellaneous Structures
7:7-9.16 Dunes	X	X			X	
7:7-9.22 Beaches	X		X	X	X	
7:7- 9.25 Flood Hazard Areas	X	X	X	X	X	X
7:7 9.27 Wetlands						
7:7- 9.28 Wetland Buffers		X				
Total Point(s)	3	3	2	2	3	1

Each special area impacted is 1 point

TOTAL POINTS-SERIOUSNESS:

Seriousness Total (Special Area + Size Total)

1. **For the construction of bulkhead "A"** **= 7 points**

2. **For the construction of bulkhead "B"** **= 8 Points**

3. **For the construction of bulkhead "C"** **= 4 Points**

4. **For the construction of bulkhead "D"** **= 5 Points**

5. **For the destruction/grading of dune and other special areas**
   i. The removal of vegetation, filling and grading of the (now bulkheaded) beach and dune area (approx. 0.58 acres) from 5th to 7th Avenue, to create a park with playground, walkways and other amenities. (3 special areas-dune, beach, flood hazard area) **= 11 Points**
   ii. The placement of crushed clam fill material for the creation of a path through approx. 8,565 sqft of dune and CAFRA/FHA area from Surf Ave to the Lou Booth Amphitheater. (2 special areas-dune, flood hazard area) **= 8 Points**
   iii. The excavation of beach at 11th Ave and the placement of the excavated sand between 12th-16th Ave and grading the sand landward into the dune scarp impacting approx. 3,969 sqft of beach/dune in a CAFRA area. (3 special areas-dune, beach, flood hazard area) **= 8 Points**

6. **For the construction and placement of miscellaneous unauthorized structures:**
   i. The placement of an approx. 96 sqft concrete landing/flagpole adjacent to the Lou Booth Amphitheater. **= 3 Points**

   ii. The 1,084 sqft expansion of concrete sidewalk at Surf Avenue leading to the path through the dune that leads to the Lou Booth Amphitheater. **= 5 Points**

   iii. The placement of a 470 square of concrete path in a CAFRA area near the intersection of 2nd & Ocean. (adjacent to Lou Booth Amphitheatre) **= 3 Points**

   iv. The construction of a 357 sqft roof covered gazebo structure at the intersection of 2nd and JFK Blvd. **= 3 Points**

   v. The construction of approx. 4,216 sqft of concrete walkway and composite walkway at the Beach Patrol building at 15th Avenue. **= 6 Points**

   vi. The placement/construction of approx. 4,691 sqft of storage sheds at the Beach Patrol building at 15th Avenue. **= 6 Points**

   vii. The placement/construction of an approx. 8' wide composite bike path between 15th & 25th along the oceanfront. (approx. 13,104 sqft) **= 8 Points**

   viii. The placement of approx. 44,981 sqft of crushed clam fill material for the creation of a walkway between 15th and 21st along the oceanfront. **= 10 Points**

   ix. The removal of vegetation, grading and filling of a CAFRA area at 1st & Surf: Specifically, the placement of concrete and gravel for pathways and a bike rack area within an approx.. 4,234 sqft area **= 6 Points**

   x. The removal of vegetation and grading of a CAFRA area at 1St & Surf: Specifically, the construction and placement of an approx. 230 sqft platform with benches. **= 3 points**

   xi. Construction of a approx.598 sqft gazebo at 1st & Surf **= 4 points**

xii. Construction of approx. 24,264 sqft of composite walkways/shower/bench platforms along the oceanfront at multiple street end entrances to the beach. **= 9 points**

The total number of points calculated for Type, Conduct and Seriousness of the violations and the amount of daily penalty utilizing the Coastal Zone Management Penalty Assessment Table below is as follows:

COASTAL ZONE MGMT
PENALTY ASSESSMENT TABLE

Total Points	Penalty Amount
1 - 3	$500
4 – 6	$1,000
7 - 8	$2,000
9 - 10	$3,000
11 - 12	$6,000
13 - 14	$8,000
15 - 16	$10,000
17 - 19	$15,000
20 - 22	$20,000
23 or more	$25,000

	TOTAL POINTS (CONDUCT + SERIOUSNESS)	PENALTY AMOUNT PER DAY
1. For the construction of bulkhead "A" The construction 630 linear feet x 2 ft wide of steel bulkhead between 5th to 7th Avenue, within a prior beach and dune area.	**= 9 points**	**$3,000.00**
2. For the construction of bulkhead "B" The construction of approximately 1,614 linear feet x 2 ft wide of steel bulkhead from 7th to 13th Avenue.	**= 10 Points**	**$3,000.00**
3. For the construction of bulkhead "C" The construction of approximately 229 linear feet x 2 ft wide of vinyl bulkhead along the oceanfront from 3rd to 4th avenues along, waterward of the existing bulkhead	**= 6 Points**	**$1,000.00**
4. For the construction of bulkhead "D" The construction of approximately 267 linear feet x 2 ft wide of vinyl bulkhead along the oceanfront from 4th to 5th avenues, waterward of the existing bulkhead.	**= 7 Points**	**$2,000.00**
5. For the destruction of dunes		
i. The removal of vegetation, filling and grading of the (now bulkheaded) beach and dune area (approx. 0.58 acres) from 5th to 7th Avenue, to create a park with playground, walkways and other amenities.	**= 13 Points**	**$8,000.00**
ii. The placement of crushed clam fill material for the creation of a path through approx. 8,565 sqft of beach, dune, and CAFRA area from Surf Ave to the Lou Booth Amphitheater.	**= 10 Points**	**$3,000.00**

iii. The excavation of beach at 11th Ave and the transport/placement of the excavated sand between 14th-16th Ave, including grading the sand landward into the dune scarp impacting approx. 3,969 sqft of beach/dune in a CAFRA area.	**= 10 Points**	**$3,000.00**

6. **For the construction and placement of miscellaneous unauthorized structures:**

i. The placement of an approx. 96 sqft concrete landing/flagpole adjacent to the Lou Booth Amphitheater.	**= 5 Points**	**$1,000.00**
ii. The 1,084 sqft expansion of concrete sidewalk at Surf Avenue leading to the path through the dune that leads to the Lou Booth Amphitheater.	**= 7 Points**	**$2,000.00**
iii. The placement of a 470 square of concrete path in a CAFRA area near the intersection of 2nd & Ocean. (adjacent to amphitheater)	**= 5 Points**	**$1,000.00**
iv. The construction of a 357 sqft roof covered gazebo structure at the intersection of 2nd and JFK Blvd.	**= 5 Points**	**$1,000.00**
v. The construction of approx. 4,216 sqft of concrete walkway and composite walkway at the Beach Patrol building at 15th Avenue	**= 8 Points**	**$2,000.00**
'i. The placement/construction of approx. 4,691 sqft of storage sheds at the Beach Patrol building at 15th Avenue.	**= 8 Points**	**$2,000.00**
i. The placement/construction of an approx. 8' wide composite bike path between 15th & 21st along the oceanfront.(approx. 13,104 sqft)	**= 10 Points**	**$3,000.00**
viii. The placement of approx. 44,981 sqft of crushed clam fill material for the creation of a walkway between 15th and 21st along the oceanfront.	**= 12 Points**	**$6,000.00**
ix. The removal of vegetation, grading and filling of a CAFRA area at 1st & Surf: Specifically, the placement of concrete & gravel for pathways and a bike rack area within 4,234 sqft	**= 8 Points**	**$2,000.00**
x. The clearing of vegetation and grading of a CAFRA area at 1st & Surf: Specifically, the placement of approx. 230 platform with benches	**= 5 Points**	**$1,000.00**
xi. Construction of an approx. 598 sqft gazebo at 1st & Surf	**= 6 Points**	**$1,000.00**
xii. The construction of 24,264 sqft of composite walkways/ shower platforms/ bench platforms etc. along the oceanfront at multiple street end entrances to the beach.	**= 11 Points**	**$6,000.00**

4. **Duration**:

Pursuant to N.J.A.C. 7:7-29.5(c), the Department is authorized to assess a daily penalty, as each day during which the violations continue or remain in place without the required permit shall constitute an additional, separate and distinct offense.

The Department hereby exercises its discretion to assess a penalty for 1 day per month per violation.

Therefore, the Civil Administrative Penalty for unpermitted activities is as follows:

	Date Since Non-Compliance to Present	1 day/Per Month	Total Penalty
1. For the construction of bulkhead "A"	May 6, 2018	3K x 61 Months	**$183,000.00**
2. For the construction of bulkhead "B"	May 5, 2020	3K x 35 Months	**$105,000.00**
3. For the construction of bulkhead "C"	December 12, 2012	1K x 131 Months	**$131,000.00**
4. For the construction of bulkhead "D"	May 6, 2018	2K x 61 Months	**$122,000.00**
5. For the destruction of dunes			
i. The removal of vegetation, filling and grading of the (now bulkheaded) beach and dune area (approx. 0.58 acres) from 5th to 7th Avenue, to create a park with playground, walkways and other amenities.	March 10, 2018	8K x 63 Months	**$504,000.00**
ii. The placement of crushed clam fill material for the creation of a path through approx. 8,565 sqft of beach, dune, and CAFRA area from Surf Ave to the Lou Booth Amphitheater.	March 22, 2016	3K x 88 Months	**$264,000.00**
iii. The excavation of beach at 11th Ave and the placement of the excavated sand between 12th-16th Ave, and grading the sand landward into the dune scarp impacting approx. 3,969 sqft of beach/dune in a CAFRA area.	October 20, 2022	3K x 2 Months	**$6,000.00**
6. For the construction and placement of miscellaneous unauthorized structures:			
i. The placement of an approx. 96 sqft concrete landing/flagpole adjacent to the Lou Booth Amphitheater.	March 8, 2020	1K x 37 Months	**$37,000.00**
ii. The 1,084 sqft expansion of concrete sidewalk at Surf Avenue leading to the path through the dune that leads to the Lou Booth Amphitheater.	March 10, 2018	2K x 63 Months	**$126,000.00**
iii. The placement of a 470 square of concrete path in a CAFRA area near the intersection of 2nd & Ocean. (adjacent to amphitheater)	March 10, 2018	1K x 63 Months	**$63,000.00**
iv. The construction of a 357 sqft roof covered gazebo structure at the intersection of 2nd and JFK Blvd.	March 6, 2017	1K x 76 Months	**$76,000.00**
v. The construction of approx. 4,216 sqft of concrete/composite walkway at the Beach Patrol building at 15th Ave	March 22, 2016	2K x 88 Months	**$176,000.00**
vi. The placement/construction of approx. 4,691 sqft of storage sheds/fenced storage area at the Beach Patrol building at 15th Avenue.	March 29, 2016	2K x 88 Months	**$176,000.00**

vii. The placement/construction of an approx. 8' wide composite bike path between 15th & 25th along the oceanfront. (approx. 13,104 sqft)	December 31, 2001	3K x 274 Months	**$822,000.00**
viii. The placement of approx. 44,981 sqft of crushed clam fill material for the creation of a walkway between 15th and 21st along the oceanfront.	March 12, 2019	6K x 50 Months	**$300,000.00**
ix. The removal of vegetation, grading, filling of a CAFRA area at 1st & Surf: Specifically the placement of concrete and gravel for pathways and a bike rack within approx.. 4,234 sqft	March 12, 2019	2K x 50 Months	**$100,000.00**
x. The clearing of vegetation and grading of a CAFRA area at 1st & Surf: Specifically, the placement of a approx.. 230 sqft platform with benches	March 12,2019	1K x 50 Months	**$50,000.00**
xi. Construction of an approx.. 598 sqft gazebo at 1st & Surf	March 6, 2017	1K x 76 Months	**$76,000.00**
xii. The construction of 24,264 sqft of composite walkways/ shower platforms/ bench platforms etc. along the oceanfront at multiple street end entrances to the beach. The showers have been constructed outside of the sewer service area. (Also in violation of N.J.S.A. 58:10A-1 et seq. & N.J.A.C. 7:14 et. seq.)	March 10, 2018	6K x 63 Months	**$378,000.00**

The Department at its discretion, may continue to assess daily penalties until the current violations are resolved to the Department's satisfaction.

**** In general, start dates for determining this penalty rationale have been based upon aerial photography and/or other documentation provided by the City or determined based upon site inspections. *******

**UANUTHORIZED ACTIVITIES WITHOUT A CAFRA PERMIT –
TOTAL PENALTY ASSESSMENT:
$3,619,000.00**

CAFRA PENALTY RATIONALE FOR
EMERGENCY AUTHORIZATION & PERMIT/CONDITION VIOLATIONS

The Department has determined that the base, or daily, penalty shall be determined as follows: (1) **Type-** violation of permit conditions (2) **Conduct**; (3) **Seriousness**; and (4) **Duration**.

1. **Type of Violation**: There are 4 violations of permits/permit conditions:

Violation 1

The following is combined as one violation for penalty assessment purposes:

Noncompliance with the Beach & Dune Maintenance Permit File# 0507-03-0009.3 CZM170001 and with its Special conditions 4 & 10. Special condition #4 states, "The proposed activities must be conducted in accordance with Best Management Practices as defined by the Department in the Rules on Coastal Zone Management in Standards applicable to routine beach maintenance (N.J.A.C. 7:7-10.2), Standards applicable to emergency post-storm beach restoration (N.J.A.C. 7:7-10.3) and Standards applicable to dune creation and maintenance (N.J.A.C. 7:7-10.4). Activities other than those outlined in these subchapters shall require additional authorization from the Program. Failure to receive such authorization prior to activities may warrant enforcement action by the Bureau of Coastal and Land Use Enforcement."

Per N.J.A.C. 7:7-10.2/10.3/10.4 -Standards for beach and dune activities: Bulldozing, excavation, grading, vegetation removal or clearing, and the relocation of the existing dunes is not authorized, and there shall be no disturbance to existing dunes. Special condition #10 states, "Bulldozing, excavation, grading, vegetation removal, or clearing and relocation of existing dunes, whether existing or constructed in conjunction with this permit are not authorized under this general permit." Dunes were destroyed, removed, relocated, cleared and graded throughout North Wildwood. Beach and dune areas were cleared, graded and activities conducted not in compliance with the permit or best management practices at N.J.A.C. 10.2-4

And noncompliance with the Sand Back Passing Permit File#0500-07-0006.3 CAF180001 WFD180001 Failure to comply with Standard condition #12 which requires the permittee to comply with all conditions, site plans, and supporting documents approved by the permit.

Stockpiles of sand were placed on top of approx. 6.7 acres of dunes between 7th & 13th Avenues and in stockpiled locations throughout the City that were not authorized by either the beach and dune maintenance permit or the sand back passing permit/approved plans. The stockpiled sand was then graded over the 6.7 acres of dune area, thus removing the existing dunes that also included critical wildlife habitat not in compliance with either permit or approved plans. See FINDINGS.

Violation 2

The vegetation removal, filling, relocation and grading of an approx. 0.57 acres dune adjacent to Seaport Pier occurred prior to issuance of the Sand back passing permit File#0500-07-0006.3 CAF180001 WFD180001 and is a violation of the Beach and Dune Maintenance CAFRA Permit File# 0507-03-0009.3 CZM170001 & special conditions 4 & 10

Violation 3

The following is combined as one violation for penalty assessment purposes:

Failure to comply with Special condition #13 of Beach and Dune Maintenance CAFRA permit 0507-03-0009.3 CZM170001. Special condition #13 states, "Sand transfers to or from wetland areas that may exist on the beach are not authorized by this permit." Sand was stockpiled on top of the vegetated dunes/wetlands and the wetlands were completely removed / destroyed between 7th and 13th Avenues (approx. 1.1 acres of freshwater wetlands)
Failure to comply with special condition #4 of Sand Harvesting/Sand Transfer Permit #: 0500-07-0006.3 CAF180001 & WFD180001. The permit states that the project does not propose disturbance within freshwater wetlands. Approx. 1.1 acres of freshwater wetlands were destroyed.

Violation 4
Failure to comply with condition 5 of Emergency Authorization 0507-03-0009.7 CAF22001. A complete application for a CAFRA Individual Permit and a Freshwater Wetlands Permit was not submitted within 90 calendar days of the Department's authorization of the emergency permit.

2. **Conduct**: Conduct shall be classified as major, moderate or minor as follows:

Major:	any intentional, deliberate, purposeful, knowing or willful act or omission by the violator. The Department presumes all violations of Department permits or authorizations to be knowing violations.
Moderate:	any unintentional but foreseeable act or omission
Minor:	any conduct not identified as major or moderate point

Conduct for all permit violations is **MAJOR** as the Department presumes all violations of Department permits or authorizations to be knowing violations.

3. **Seriousness**: Seriousness shall be classified as major, moderate or minor as follows:

Major:	any violation which has caused or has the potential to cause serious harm to human health, safety, the Coastal regulatory program or the environment; or seriously deviates from the applicable law and/or condition. "Serious" deviations include but are not limited to those violations which are in complete contravention of the law, requirement and/or condition, and/or which severely impair or undermine the protection, operation, or intent of the law, requirement or condition. Violations of "major" seriousness include but are not limited to any unauthorized activity occurring within or impacting a Special Area, as defined in N.J.A.C. 7:7–9.
Moderate:	any violation which has caused or has the potential to cause substantial harm to human health, safety, the Coastal regulatory program or the environment; or substantially deviates from the applicable law and/or condition. "Substantial deviation" shall include, but not be limited to violations which are in substantial contravention of the law, requirement and/or condition, and/or which severely impair or undermine the protection, operation, or intent of the law, requirement and/or condition. The Department will consider a violation to be of moderate seriousness if limited solely to upland areas that are not designated as a wetland, or other Special Area, as defined in N.J.A.C. 7:7 – 9.
Minor:	any violation not described above as Major or Moderate.

The City has failed to comply with various Land Use permits / multiple permit conditions and the conditions of the issued Emergency Authorizations. The violations included unauthorized activities and impacts within multiple Special Areas as defined in N.J.A.C. 7:7-9, including dunes, beaches, wetlands, critical wildlife habitat and flood hazard areas and were in contravention of the approved permits.
The Seriousness of all permit violations is **MAJOR.**

The Department shall determine the applicable daily penalty amount from the Base Daily Penalty Matrix below:

SERIOUSNESS

CONDUCT		MAJOR	MODERATE	MINOR
	MAJOR	$25,000	$15,000	$10,000
	MODERATE	$15,000	$7,500	$5,000
	MINOR	$10,000	$5,000	$1,000

All permit violations are Major Conduct and Major Seriousness = Daily Base Penalty $25,000.00

4. **Duration**:

Pursuant to N.J.A.C. 7:7-29.6(g), the Department is authorized to assess a daily penalty for the total number of calendar days during which each violation continued or remained in place without the required permit.

The Department is using its discretion to assess a daily base penalty of $25,000.00 per month for violations 1-3.

The Department is using its discretion to assess a daily base penalty of $25,000.00 for one day of penalty for violation 4.

EACH violation of any permit, permit condition, or requirement issued pursuant to N.J.S.A. 13:19-1 et seq. and/or N.J.S.A. 12:5-3 et seq. or N.J.S.A. 13:9A-1 et. seq. or any permit, condition or requirement issued by the Department pursuant thereto, shall constitute an additional, separate and distinct violation. Where any requirement of these statutes or any regulation, rule, permit condition, or order adopted pursuant thereto, may pertain to more than one act, condition, or occurrence, the failure to comply with such requirement as it pertains to each such act, condition, or occurrence shall constitute an additional, separate and distinct violation.

The Department is using its discretion to combine/collectively issue a violation/penalty assessment for similar violations of both the Beach and Dune Maintenance Permit CAFRA permit # 0507-03-0009.3 CZM170001. and Sand Back Passing Permit CAFRA/WFD Permit #: 0500-07-0006.3 CAF180001 & WFD180001 rather than each violation of each permit as noted below.

	Date Since Non-Compliance	1 Day/Month to Present	TOTAL PENALTY AMOUNT
Violation 1 Combined Noncompliance with the Beach & Dune Maintenance Permit File# 0507-03-0009.3 CZM170001and with its Special conditions 4 & 10 of & noncompliance with the Sand Back Passing Permit File#0500-07-0006.3 CAF180001 WFD180001 Failure to comply with Standard condition #12 which requires the permittee shall comply with all conditions, site plans, and supporting documents approved by the permit.			
Stockpiles of sand were placed on top of approx. 6.7 acres of dunes between 7th & 13th Avenues and in stockpiled locations throughout the City that were not authorized by either the beach and dune maintenance permit or the sand back passing permit/plans.	April 16, 2020	25K x 35 Months	**$875,000.00**

The stockpiled sand was then graded over the 6.7 acres of dune area, thus removing the existing dunes that also included critical wildlife habitat not in compliance with either permit or approved plans.

Violation 2 The vegetation removal, filling, relocation and grading of an approx. 0.57 acres dune adjacent to Seaport Pier occurred prior to issuance of the Sand back passing permit and is a violation of the Beach and Dune Maintenance Permit & special conditions 4 & 10	June 19, 2018	25K x 59 Months	**$1,475,000.00**
Violation 3 Combined Noncompliance with Special condition 13 of the Beach & Dune Maintenance Permit that states sand transfers to and from wetland areas that may exist on the beach are not authorized and noncompliance with the Sand Back Passing Permit and plans which states that the project does not propose to disturb freshwater wetlands. The approved plans do not authorize placement of sand in wetland areas. Sand was transferred on top of 1.1 acres of wetlands from 7th – 13th Avenues destroying the wetlands.	April 16, 2020	25K x 35 Months	**$875,000.00**
Violation 4 – Failure to comply with condition 5 of Emergency Authorization 0507-03-0009.7 CAF22001. A complete application for a CAFRA Individual Permit and a Freshwater Wetlands Permit was not submitted within 90 calendar days of the Department's authorization of the emergency permit.	January 5, 2023	25K x 1 Days	**$25,000.00**

TOTAL CAFRA Civil Administrative Penalty violations of Emergency Authorization/ CAFRA Permits/permit conditions = $3,250,000,000.00

TOTAL CAFRA PENALTY ASSESSMENT

UNAUTHORIZED ACTIVITIES WITHOUT A CAFRA PERMIT
PENALTY ASSESSMENT: $3,619,000.00

VIOLATION OF CAFRA PERMIT & EMERGENCY AUTHORIZATION

PENALTY ASSESSMENT: $3,250,000,000.00

TOTAL CAFRA PENALTY ASSESSMENT: $6,869,000.00

FLOOD HAZARD AREA CONTROL ACT (FHACA) PENALTY RATIONALE
FOR FAILURE TO OBTAIN A PERMIT PRIOR TO CONDUCTING REGULATED ACTIVITIES

Pursuant to N.J.A.C. 7:13-24.5, the Department has determined that the base, or daily, FHACA penalty shall be determined by totaling the points assigned as follows: (1) **Type**- conducting a regulated activity without a permit or violation of a permit condition (2) **Conduct**; (3) **Seriousness** – a. Floodway Impacts; b. Flood Fringe Impacts; c. Area of Riparian Disturbance; d. Severity of Riparian Disturbance; and e. Impacts to Other Special Resources of Concern; (4) **Duration**.

Pursuant to N.J.A.C. 7:13-24.5(b), each violation of N.J.A.C. 7:13-2.1 shall constitute an additional, separate and distinct violation.

1. **Type**: Conducting a regulated activity without a permit

The Department has categorized the unpermitted unauthorized activities that have occurred:

1. **The construction of bulkhead "A":**
   i. The construction 630 linear feet x 2 feet wide of steel bulkhead between 5th to 7th Avenue, within a prior dune area. The described length of this bulkhead is based on updated information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by van note-harvey associates. (approx. 1260 sq ft)

2. **The construction of bulkhead "B":**
   i. The construction of approximately 1,614 linear feet x 2 feet wide of steel bulkhead from 7th to 13th Avenue within a prior dune area. The described length of this bulkhead is based on updated information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by van note-harvey associates. (approx.. 3,228 sq ft)

3. **The construction of bulkhead "C":**
   i. The construction of approximately 229 linear feet x 2 feet wide of vinyl bulkhead along the oceanfront from 3rd to 4th avenues, waterward of the existing bulkhead on a beach. The described length of this bulkhead is based on updated information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by van note-harvey associates. (approx. 458 sq ft)
4. **The construction of bulkhead "D":**
   i. The construction of approximately 267 linear feet x 2 ft wide of vinyl bulkhead along the oceanfront from 4th to 5th avenues, waterward of the existing bulkhead on a beach. The described length of this bulkhead is based on updated information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by van note-harvey associates. (approx 534 sq ft)
5. **The constructions of sheds at 15th Avenue.**
   i. The placement/construction of approx. 4,691 sqft of storage sheds at the Beach Patrol building at 15th Avenue.

2. **Conduct of the Respondent**:

Major:	any intentional, deliberate, purposeful, knowing, or willful act or omission	= 5 points
Moderate:	any unintentional but foreseeable act or omission	= 2 points
Minor:	any conduct not identified as Major or Moderate	= 1 point

1. **The construction of bulkhead "A"**
   The conduct of the Respondent(s) is considered to be **Moderate**
   = 2 Points
2. **The construction of bulkhead "B"**
   The conduct of the Respondent(s) is considered to be **Moderate**
   = 2 Points
3. **The construction of bulkhead "C"**
   The conduct of the Respondent(s) is considered to be **Moderate**
   = 2 Points
4. **The construction of bulkhead "D"**
   The conduct of the Respondent(s) is considered to be **Moderate**
   = 2 Points
5. **The construction of sheds at 15th Avenue**
   The conduct of the Respondent(s) is considered to be **Moderate**
   = 2 Points

3. Seriousness:

a. Channel Impacts: The Department shall assign points as follows for channel impacts:

i. Up to and including 75 linear feet of channel impacts
= 1 point

ii. Greater than 75 linear feet and up to and including 300 linear feet of channel impact
= 3 points

iii. Greater than 300 linear feet of channel impacts
= 5 points

Channel impacts were not identified for the referenced violations. 0 points.

b. Floodway Impacts: The Department shall assign points as follows for floodway impacts:

i. Up to and including 25 cubic yards of fill or obstruction
= 1 point

ii. Greater than 25 cubic yards and up to and including 100 cubic yards of fill or obstruction
= 3 points

iii. Greater than 100 cubic yards of fill or obstruction
= 5 points

AND iv. Construction of a habitable building or addition within the floodway
= 5 points

AND v. Construction of any other structure having a footprint greater than 150 sq. ft.
= 3 points

Floodway impacts were not identified for the referenced violations. 0 points.

c. Flood Fringe Impacts: The Department shall assign points as follows for impacts within the flood fringe:

i. Greater than 5 cubic yards up to and including 50 cubic yards of fill or obstruction
= 1 point

ii. Greater than 50 cubic yards up to and including 200 cubic yards of fill or obstruction
= 3 points

iii. Greater than 200 cubic yards of fill or obstruction
= 5 points

AND iv. Construction of a structure constructed with 1st floor at or above flood hazard elevation
= 2 points

v. Construction of a habitable structure constructed with 1st floor below flood hazard elevation
= 5 points

AND vi. Construction of any other structure constructed without a permit that does not comply with N.J.A.C. 7:13

= 3 points

vii. Construction of any other structure constructed without a permit that does comply with N.J.A.C. 7:13

= 1 point

Pursuant to the Findings, the flood fringe impacts are:

1. **The construction of bulkhead "A"**
   The construction of the bulkhead was completed without a coastal permit in violation of N.J.A.C. 7:13

   = 3 Points
2. **The construction of bulkhead "B"**
   The construction of the bulkhead was completed without a coastal permit in violation of N.J.A.C. 7:13

   = 3 Points
3. **The construction of bulkhead "C"**
   The construction of the bulkhead was completed without a coastal permit in violation of N.J.A.C. 7:13

   = 3 Points
4. **The construction of bulkhead "D"**
   The construction of the bulkhead was completed without a coastal permit in violation of N.J.A.C. 7:13

   = 3 Points
5. **The construction of sheds at 15th Avenue**
   The obstruction caused by the construction of the sheds and associated fencing is estimated to be in excess of 200 cubic yards AND the construction of the sheds was completed without a coastal permit in violation of N.J.A.C. 7:13

   = 8 Points

d. Area of Riparian Disturbance: The Department shall assign points as follows for an impact to a riparian zone, such as the clearing cutting, and/or removal of vegetation, the construction, reconstruction, relocation, or enlargement of the footprint of any structure, and all site preparation such as excavation, filling, and grading of any kind within the riparian zone.

i. Greater than 400 sqft up to and including 7,000 sqft

= 1 point

ii. Greater than 7,000 sqft up to and including 15,000 sqft

= 2 points

iii. Greater than 15,000 sqft and greater

= 3 points

Riparian zone impacts were not identified for the referenced violations. 0 points.

e. Severity of Riparian Disturbance: The Department shall assign points as follows based on the area disturbed and the type of vegetation disturbed.

i. The existing shrub layer within the riparian zone has been removed and the herbacous layer remains

= 1 point

ii. The riparian zone has been clear-cut of existing woody vegetation (trees and shrubs) with stumps remaining
= 2 points

iii. The riparian zone has been clear-cut of existing woody vegetation and stumped with the removal of the root, or vegetation otherwise destroyed by being buried under fill
= 3 points

Riparian zone impacts were not identified for the referenced violations. 0 points.

f. Violations located in State Owned Tidelands: The Department shall assign 1 point for violations located within State-owned Tidelands area for which a current tidelands instrument has not been obtained or for which payment is in arrears.

Tidelands impacts were not identified for the referenced violations. 0 points.

g. Impacts to Resources of Concern: The Department shall assign one (1) point for each of the following special areas or resources in which the unauthorized activity occurred, or which was adversely impacted by the unauthorized activity:

i. A regulated water identified as Trout Production or Trout Maintenance, or which contains other fishery resources;
ii. A regulated waters designated as Category One;
iii. A regulated water within the Central Passaic Basin, as defined at N.J.A.C. 7:13-1.2;
iv. A regulated water that is a present or documented habitat for threatened or endangered species;
vi. A channel or floodway;
vii. The portion of the riparian zone within 25 feet of the top of bank of a regulated water.

Impacts to Resources of Concern were not identified for the referenced violations. 0 points.

The total number of points calculated for Type, Conduct and Seriousness of the violations and the amount of daily penalty utilizing the Flood Hazard Area Control Act Penalty Assessment Table below is as follows:

FHACA PENALTY ASSESSMENT TABLE

Total Points	Penalty Amount
1-3	$ 500
4-6	$ 1,000
7-8	$ 2,000
9-10	$ 3,000
11-12	$ 6,000
13-14	$ 8,000
15-16	$10,000
17-19	$15,000
20-22	$20,000
23 or more	$25,000

	TOTAL POINTS (CONDUCT + SERIOUSNESS)	PENALTY AMOUNT PER DAY
1. **For the construction of bulkhead "A"** The construction 630 linear feet of steel bulkhead between 5th to 7th Avenue, within a flood hazard area.	**= 5 points**	**$1,000.00**

2.	**For the construction of bulkhead "B"** The construction of approximately 1,614 linear feet of steel bulkhead from 7th to 13th Avenue within a flood hazard area.	**= 5 Points**	**$1,000.00**
3.	**For the construction of bulkhead "C"** The construction of approximately 229 linear feet of vinyl bulkhead along the oceanfront from 3rd to 4th avenues along, waterward of the existing bulkhead, within a flood hazard area.	**= 5 Points**	**$1,000.00**
4.	**For the construction of bulkhead "D"** The construction of approximately 267 linear feet of vinyl bulkhead along the oceanfront from 4th to 5th avenues, waterward of the existing bulkhead, within a flood hazard area.	**= 5 Points**	**$1,000.00**
5.	**For the construction of sheds at 15th Avenue** The placement/construction of approx. 4,691 sqft of storage sheds at the Beach Patrol building at 15th Avenue.	**= 10 Points**	**$3,000.00**

4. **Duration of the violation:**

Pursuant to N.J.A.C. 7:13-24.5(c), the Department is authorized to assess a daily penalty, as each day during which the violation continues or remains in place without the required permit shall constitute an additional, separate and distinct offense.
The Department hereby exercises its discretion to assess a penalty for 1 day per month per violation.
Therefore, the Civil Administrative Penalty for unpermitted activities is as follows:

	Date Since Non-Compliance to Present	**1 day/Per Month**	**Total Penalty**
1. **For the construction of bulkhead "A"**	May 6, 2018	1K x 61 Months	**$61,000.00**
2. **For the construction of bulkhead "B"**	May 5, 2020	1K x 35 Months	**$35,000.00**
3. **For the construction of bulkhead "C"**	December 12, 2012	1K x 131 Months	**$131,000.0**
4. **For the construction of bulkhead "D"**	May 6, 2018	1K x 61 Months	**$61,000.00**
5. **For the construction of sheds/fenced storage area at 15th Avenue**	March 29, 2016	3K x 88 Months	**$264,000.00**

The Department at its discretion, may continue to assess daily penalties until the current violations are resolved to the Department's satisfaction.

**** In general, start dates for determining this penalty rationale have been based upon aerial photography and/or other documentation provided by the City or determined based upon site inspections. *******

UANUTHORIZED ACTIVITIES WITHOUT A FHACA PERMIT –
TOTAL PENALTY ASSESSMENT:
$552,000.00

FRESHWATER WETLANDS PROTECTION ACT (FWPA) PENALTY RATIONALE FOR FAILURE TO OBTAIN A PERMIT PRIOR TO CONDUCTING REGULATED ACTIVITIES

Pursuant to N.J.A.C. 7:7A-22.7, the Department has determined that the base, or daily, FWPA penalty shall be determined by totaling the points assigned as follows: (1) **Type**- conducting a regulated activity without a permit or violation of a permit condition (2) **Conduct**; (3) **Seriousness** – a. acreage of wetlands and/or transition area impacted and b. resource value classification; (4) **Duration**.

Pursuant to N.J.A.C. 7:13-22.7(b), each violation of N.J.A.C. 7:7A-2.1 shall constitute an additional, separate and distinct violation.

1. **Type**: Conducting a regulated activity without a permit

The Department has categorized the unpermitted unauthorized activities that have occurred – no Freshwater Wetland Permit was obtained to remove/disturb/fill and construct a bulkhead within these freshwater wetlands and/or transition areas:

1. **The destruction of Freshwater Wetlands associated with the construction of bulkhead "B", sand backpassing & beach and dune maintenance activities:**
   i. The removal of vegetation, filling, and grading of approximately 1.1 acres of regulated freshwater wetlands in the dune area for the construction of approximately 1,614 linear feet of steel bulkhead from 7th to 13th Avenue, sand back passing and beach and dune maintenance within this area. The described length of this bulkhead is based on information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by Van Note-Harvey Associates.
2. **The destruction of Freshwater Wetlands Transition Area associated with the construction of bulkhead "B", sand back passing and beach and dune maintenance activities:**
   i. The removal of vegetation, filling, and grading of approximately 6.7 acres of regulated freshwater wetland transition areas in a beach and dune area for the construction of approximately 1,614 linear feet of steel bulkhead from 7th to 13th Avenue within a prior dune area. The described length of this bulkhead is based on information contained in the "Combined Environmental Impact Statement and Compliance Statement Pursuant to N.J.A.C. 7:7 and 7:7A dated 11/17/2020, prepared by Van Note-harvey Associates.

2. **Conduct**:

Minor: any conduct not identified as major or moderate point	= 1 point
Moderate: any unintentional but foreseeable act or omission	= 2 points
Major: any intentional, deliberate, purposeful, knowing or willful act or omission	= 5 points

The conduct for the above-mentioned activities have been determined as the following:

1.	**For destruction of Freshwater Wetlands**	The conduct of the Respondent is considered to be **Moderate**	**= 2 points**
2.	**For destruction of Transition Areas**	The conduct of the Respondent is considered to be **Moderate**	**= 2 points**

3. **Seriousness**:
The seriousness factor of the violation is assigned points as provided below and shall be based on the type, size, and location of the violation and the acreage of wetlands and/or transition areas impacted and the resource value of the freshwater wetland.

a. Acreage of wetlands and/or transition areas impacted:

i.	a violation impacting > 7 acres	= 7 points
ii.	a violation impacting > 4 acres feet up to and including 7 acres	= 6 points
iii.	a violation impacting > 2 acres up to and including 4 acres	= 5 points
iv.	a violation impacting > 1 acres up to and including 2 acres	= 4 points
v.	a violation impacting > 0.5 acres up to and including 1 acre	= 3 points
vi.	a violation impacting > 0.25 acre up to and including 0.5 acre	= 2 points
vii.	a violation impacting up to and including 0.25 acre	= 1 point

1. For destruction of Freshwater Wetlands	Per the freshwater wetlands area depicted on the plans for NJDEP permit approval #0500-07-0006.1 CAF070001 and WFD 070001, the estimated impact is approximately 1.1 acres	**= 4 points**
2. For destruction of Transition Areas	Based on the presence of freshwater wetlands in each disturbed vegetated dune area, transition area is estimated to be approximately 6.7 acres	**= 6 points**

b. Resource value classification:

i.	a violation impacting exceptional resource value wetlands	= 7 points
ii.	a violation impacting intermediate resource value wetlands	= 6 points
iii.	a violation impacting ordinary resource value wetlands	= 5 points
iv.	a violation impacting exceptional resource value transition areas	= 4 points
v.	a violation impacting intermediate resource value transition areas	= 3 points

1. For destruction of Freshwater Wetlands	Pursuant to NJDEP Permit# 0507-03-0009.2 CAF140001 & FWW140001, which established a 150ft transition area, the resource value is determined to be **Exceptional**	**= 7 points**
2. For destruction of Transition Areas	Pursuant to NJDEP Permit# 0507-03-0009.2 CAF140001 & FWW140001, which established a 150ft transition area, the resource value is determined to be **Exceptional**	**= 4 points**

TOTAL POINTS-SERIOUSNESS:

Seriousness Total (Acreage + Resource Value)

1. For the destruction of Freshwater Wetlands **= 11 points**

2. For the destruction of Transition Areas **= 10 Points**

The total number of points calculated for Type, Conduct and Seriousness of the violations and the amount of daily penalty utilizing the Freshwater Wetlands Protection Act Penalty Assessment Table below is as follows:

FRESHWATER WETLANDS PROTECTION ACT
Penalty Assessment Table

Total Points	Penalty Amount
17	$25,000.00
16	$23,000.00
15	$21,000.00
14	$19,000.00
13	$17,000.00

12	$15,000.00
11	$13,000.00
10	$11,000.00
9	$10,000.00
8	$9,000.00
7	$8,000.00
6	$6,000.00
5	$5,000.00
4	$4,000.00
3	$3,000.00

	TOTAL POINTS (CONDUCT + SERIOUSNESS)	PENALTY AMOUNT PER DAY
1. **For the destruction of Freshwater Wetlands** The destruction of approximately 1.1 acres of freshwater wetlands.	**= 13 points**	**$17,000.00**
2. **For the destruction of Transition Areas** The destruction of approximately 6.7 acres of transition areas.	**= 12 Points**	**$15,000.00**

4. **Duration of the violation:**

Pursuant to N.J.A.C. 7:7A-22.7(c), the Department is authorized to assess a daily penalty, as each day during which the violation continues or remains in place without the required permit shall constitute an additional, separate and distinct offense.

The Department hereby exercise its discretion to assess a penalty for 1 day per month per violation. Therefore, the Civil Administrative Penalty for unpermitted activities is as follows:

	Date Since Non-Compliance to Present	1 day/Per Month	Total Penalty
1. **For the destruction of Freshwater Wetlands**	May 5, 2020	17K x 35 Months	**$595,000.00**
2. **For the destruction of Transition Areas for the construction of bulkhead "B"**	May 5, 2020	15K x 35 Months	**$525,000.00**

The Department at its discretion, may continue to assess daily penalties until the current violations are resolved to the Department's satisfaction.

**** In general, start dates for determining this penalty rationale have been based upon aerial photography and/or other documentation provided by the City or determined based upon site inspections. *******

UANUTHORIZED ACTIVITIES WITHOUT A FRESHWATER WETLANDS PERMIT – $1,120,000.00

FRESHWATER WETLANDS PROTECTION ACT PENALTY RATIONALE FOR PERMIT CONDITION VIOLATIONS

The Department has determined that the base, or daily, penalty shall be determined as follows:
(1) **Type**- violation of permit conditions (2) **Conduct**; (3) **Seriousness**; and (4) **Duration**.

1. **Type of Violation**: There is 1 violation of a Freshwater Wetland permit and its permit conditions:

Violation

Failure to comply with Freshwater Wetland Permit Condition #10 of Bike Path, Sidewalk and Utility Reconstruction Permit #: 0507-03-0009.2 CAF140001 & FWW140001 & FWW140002. Permit Condition #10 states, "Prior to site preparation, the permittee shall complete a transition area and adjacent freshwater wetland area conservation restriction and file the completed restriction with the Office of the Cape May County Clerk." This conservation restriction was required to preserve and document the location of freshwater wetlands and transition areas within the oceanfront existing dunes in North Wildwood. The conservation restriction was not filed with the Office of the Cape May County Clerk.

2. **Conduct**: Conduct shall be classified as major, moderate or minor as follows:

Major:	any intentional, deliberate, purposeful, knowing or willful act or omission by the violator. The Department presumes all violations of Department permits or authorizations to be knowing violations.
Moderate:	any unintentional but foreseeable act or omission
Minor:	any conduct not identified as major or moderate point

Conduct for all permit violations is **MAJOR** as the Department presumes all violations of Department permits or authorizations to be knowing violations.

3. **Seriousness**: Seriousness shall be classified as major, moderate or minor as follows:

Major: any violation which has caused or has the potential to cause serious harm to human health, safety, property, the Freshwater Wetlands Protection Act regulatory program or the environment; or seriously deviates from the applicable law and/or condition. "Serious" deviations include but are not limited to those violations which are in complete contravention of the law, requirement and/or condition, and/or which severely impair or undermine the protection, operation, or intent of the law, requirement or condition. Violations of "major" seriousness include but are not limited to:

i. Any activity that negatively affects water quality;
ii. Clearing, grading, or filling of freshwater wetlands;
iii. Clearing, grading, or filling of transition areas when done in conjunction with such activities in freshwater wetlands;
iv. Clearing, grading, filling, or disturbance of freshwater wetlands and/or transition areas in excess of that authorized by a permit or plan;
v. Failure to timely record a conservation restriction or easement, and the property has been sold or transferred;
vi. Failure to report the presence of a historic resource during construction and/or the destruction of a historic resource without Department approval;

vii. Failure to comply with a historic resource of mitigation requirement; and

viii. Failure of an applicant or permittee to provide information upon request to determine compliance with any applicable law and/or condition

Moderate: any violation which has caused or has the potential to cause substantial harm to human health, safety, the Freshwater Wetlands Protection Act regulatory program or the environment; or substantially deviates from the applicable law and/or condition. "Substantial deviation" shall include, but not be limited to violations which are in substantial contravention of the law, requirement and/or condition, and/or which severely impair or undermine the protection, operation, or intent of the law, requirement and/or condition, and/or that substantially impair or undermine the protection, operation, or intent of N.J.S.A. 13:9B-1 et seq., or 58:10A-1 et seq., or any regulation, rule, or permit condition issued by the Department pursuant thereto. The Department shall consider a violation that is limited solely to the transition area but is not associated with a permit to be of moderate seriousness. Violations of moderate seriousness include, but are not limited to:

i. Failure to notify the Department of commencement of construction;

ii. Failure to transfer a permit in accordance with this chapter; and

iii. <u>Failure to timely record a conservation restriction or easement, and the property has not been sold or transferred.</u>

Minor: seriousness shall apply to any violation not described above as Major or Moderate.

The City has failed to comply with Freshwater Wetland Permit Condition #10 of Bike Path, Sidewalk and Utility Reconstruction Permit #: 0507-03-0009.2 CAF140001 & FWW140001 & FWW140002. Permit Condition #10 states, "Prior to site preparation, the permittee shall complete a transition area and adjacent freshwater wetland area conservation restriction and file the completed restriction with the Office of the Cape May County Clerk." This conservation restriction was required to preserve and document the location of freshwater wetlands and transition areas within the oceanfront existing dunes. The conservation restriction was not filed as required by the permit.
The Seriousness of this permit violations is **MODERATE.**

The Department shall determine the applicable daily penalty amount from the Base Daily Penalty Matrix below:

SERIOUSNESS

CONDUCT	MAJOR	MODERATE	MINOR
MAJOR	$25,000	$15,000	$10,000
MODERATE	$15,000	$7,500	$5,000
MINOR	$10,000	$5,000	$1,000

Major Conduct and Moderate Seriousness =
Daily Base Penalty $15,000.00

4. **Duration**:

Pursuant to N.J.A.C. 7:7A-22.8(g), the Department is authorized to assess a daily penalty for the total number of calendar days during which each violation continued or remained in place without the required permit.

The Department is using its discretion to assess a daily base penalty of $15,000.00 per year of violation.

Failure to comply with Freshwater Wetland Permit Condition #10 of Bike Path, Sidewalk and Utility Reconstruction Permit #: 0507-03-0009.2 CAF140001 & FWW140001 & FWW140002. Permit Condition #10 states, "Prior to site preparation, the permittee shall complete a transition area and adjacent freshwater wetland area conservation restriction and file the completed restriction with the Office of the Cape May County Clerk." This conservation restriction was required to preserve and document the location of freshwater wetlands and transition areas within the oceanfront existing dunes. The conservation restriction was not recorded.	December 1, 2014	15K x 8 Years	**$120,000.00**

TOTAL Civil Administrative Penalty for violations of Freshwater Wetland Permit conditions = $120,000.00

<u>TOTAL FRESHWATER WETLAND PENALTY ASSESSMENT</u>

UNAUTHORIZED ACTIVITIES WITHOUT A FRESHWATER WETLANDS PERMIT PENALTY ASSESSMENT: $1,120,000.00

VIOLATION OF FRESHWATER WETLAND PERMIT CONDITION

PENALTY ASSESSMENT: $120,000.00

TOTAL FRESHWATER WETLAND PENALTY ASSESSMENT: $1,240,000.00

AONOCAPA TOTAL CIVIL ADMINISTRATIVE PENALTY ASSESSMENT

TOTAL CAFRA PENALTY ASSESSMENT: $6,869,000.00

TOTAL FLOOD HAZARD AREA/ FHACA PENALTY ASSESSMENT: $552,000.00

TOTAL FRESHWATER WETLAND/FWPA PENALTY ASSESSMENT: $1,240,000.00

CAFRA + FHACA + FWPA = <u>$8,661,000.00</u>

Administrative Request Checklist and Tracking Form

I. Document Being Appealed: **EA ID #** PEA230001-0507-03-0009.3

____
Date Document Issued

II. Person Requesting Hearing (Each Respondent named in the Enforcement Document, who wants to contest the Enforcement Document must individually file a hearing request):

Name/Company	Name of Attorney (if applicable)
Address	Address
Telephone #	Telephone #

Please Include the Following Information As Part of Your Request:

A. The date the alleged violator received the Enforcement Document.
B. **A copy of the Enforcement Document** and a list of all issues being appealed.
C. An admission or denial of each of the findings of fact, or a statement of insufficient knowledge;
D. The defenses to each of the findings of fact in the enforcement document;
E. Information supporting the request;
F. An estimate of the time required for the hearing;
G. A request, if necessary, for a barrier-free hearing location for physically disabled persons;
H. A clear indication of any willingness to negotiate a settlement with the Department prior to the Department's processing of your hearing request to the Office of Administrative Law; and
I. This form, completed, signed and dated with all of the information listed above, including attachment, to:

1. New Jersey Department of Environmental Protection
Office of Legal Affairs
Attention: Adjudicatory Hearing Requests
401 E. State Street, P.O. Box 402
Trenton, New Jersey 08625

2. Michele Kropilak, Manager
Bureau of Coastal and Land Use Compliance and Enforcement
1510 Hooper Avenue, Suite 140
Toms River, New Jersey 08753

3. Colleen Keller, Assistant Director
Division of Land Resource Protection
501 East State Street
Mail Code 501-02A, PO Box 420
Trenton, New Jersey 08625-0420

IV. Signature:______________________________ Date:______________

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

ENFORCEMENT-FRESHWATER WETLANDS

INVOICE NO.
230042560

Program Interest
NORTH WILDWOOD CITY
OCEANFRONT BEACH
North Wildwood, NJ. 08260
0507-03-0009.3

Type of Notice	Amount Due
ORIGINAL(NON-INITIAL)	$ 1,240,000.00

Billing Date	Due Date	NJEMS Bill ID
01/10/23	02/20/23	000000251065500

Summary

Total Amount Assessed	1,240,000.00
Amount Received Before Creating Installment Plan (if installment plans is allowed)	0.00
Amount Transferred To Installment Plan	1,240,000.00
Installment Amount	0.00
Total Amount Credited	0.00
Total Amount Debited (Other Than Amounts Assessed)	0.00
Total Amount Due	1,240,000.00

REMINDER:
YOU CAN PAY THIS BILL ONLINE WITH A CREDIT CARD OR E-CHECK.
GO TO HTTP://WWW.NJ.GOV/DEP/ONLINE AND CLICK PAY A PAPER INVOICE.
THE SYSTEM WILL ASK FOR THE INVOICE NUMBER THAT IS FOUND AT THE TOP-RIGHT CORNER OF THIS BILL.
THERE IS NO FEE FOR PAYING VIA E-CHECK; FOR CREDIT CARD USE,2.0% OF THE TOTAL + $.50 IS CHARGED.
TO PAY BILL BY MAIL SEND A CHECK PAYABLE TO TREASURER-STATE OF NEW JERSEY.
WRITE INVOICE NUMBER AND PROGRAM INTEREST NUMBER ON CHECK.
RETURN CHECK WITH BOTTOM PORTION OF THIS INVOICE TO THE NJ DEPARTMENT OF TREASURY.
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See Back Of Page for Billing Inquiries

INVOICE NO.
230042560

D9901F (R 3/14/02)

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

ENFORCEMENT-FRESHWATER WETLANDS

INVOICE NO.
230042560

NJEMS Bill ID
000000251065500

Program Interest ID	Type of Notice	Billing Date	Due Date	Amount Due
0507-03-0009.3	ORIGINAL(NON-INITIAL)	01/10/23	02/20/23	$ 1,240,000.00

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and mail to:
NJ DEPARTMENT OF TREASURY
DIVISION OF REVENUE
PO BOX 417
TRENTON, NJ 08646-0417

C4

NORTH WILDWOOD CITY

901 ATLANTIC AVE
North Wildwood NJ 08260-5778

EP100005000710000310000000091003111111240000000000092300425602C42

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

ENFORCEMENT-FRESHWATER WETLANDS

INVOICE NO.
230042560

Program Interest
NORTH WILDWOOD CITY OCEANFRONT BEACH North Wildwood, NJ. 08260 0507-03-0009.3

Type of Notice	Amount Due
ORIGINAL(NON-INITIAL)	$ 1,240,000.00

Billing Date	Due Date	NJEMS Bill ID
01/10/23	02/20/23	000000251065500

AONOCAPA
Prescribed Enforcement Action

ASSESSMENTS
Start-End Date: 01/10/2023-01/10/2023 Activity: PEA230001
Assessment Type: PENALTY(Freshwater Wetlands) Status: Open (Pending Payment)
Regulatory Basis: Amount: $ 1240000.00

Total Amount Assessed: $ 1,240,000.00

D9902F (R 3/14/02)

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

INVOICE NO. 230042550

ENFORCEMENT-STREAM ENCROACHMENT

Program Interest
NORTH WILDWOOD CITY OCEANFRONT BEACH North Wildwood, NJ. 08260 0507-03-0009.3

Type of Notice
ORIGINAL(NON-INITIAL)

Amount Due
$ 552,000.00

Billing Date	Due Date	NJEMS Bill ID
01/10/23	02/20/23	000000251065600

AONOCAPA
Prescribed Enforcement Action

ASSESSMENTS
Start-End Date: 01/10/2023-01/10/2023 Activity: PEA230001
Assessment Type: PENALTY(Flood Hazard) Status: Open (Pending Payment)
Regulatory Basis: Amount: $ 552000.00

Total Amount Assessed: $ 552,000.00

D9902F (R 3/14/02)

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

ENFORCEMENT-STREAM ENCROACHMENT

INVOICE NO.
230042550

Program Interest
NORTH WILDWOOD CITY OCEANFRONT BEACH North Wildwood, NJ. 08260 0507-03-0009.3

Type of Notice	Amount Due
ORIGINAL(NON-INITIAL)	$ 552,000.00

Billing Date	Due Date	NJEMS Bill ID
01/10/23	02/20/23	000000251065600

Summary

Total Amount Assessed	552,000.00
Amount Received Before Creating Installment Plan (if installment plans is allowed)	0.00
Amount Transferred To Installment Plan	552,000.00
Installment Amount	0.00
Total Amount Credited	0.00
Total Amount Debited (Other Than Amounts Assessed)	0.00
Total Amount Due	552,000.00

REMINDER:
YOU CAN PAY THIS BILL ONLINE WITH A CREDIT CARD OR E-CHECK.
GO TO HTTP://WWW.NJ.GOV/DEP/ONLINE AND CLICK PAY A PAPER INVOICE.
THE SYSTEM WILL ASK FOR THE INVOICE NUMBER THAT IS FOUND AT THE TOP-RIGHT CORNER OF THIS BILL.
THERE IS NO FEE FOR PAYING VIA E-CHECK; FOR CREDIT CARD USE,2.0% OF THE TOTAL + $.50 IS CHARGED.
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WRITE INVOICE NUMBER AND PROGRAM INTEREST NUMBER ON CHECK.
RETURN CHECK WITH BOTTOM PORTION OF THIS INVOICE TO THE NJ DEPARTMENT OF TREASURY.
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INVOICE NO.
230042550

D9901F (R 3/14/02)

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

ENFORCEMENT-STREAM ENCROACHMENT

INVOICE NO.
230042550

NJEMS Bill ID
000000251065600

Program Interest ID	Type of Notice	Billing Date	Due Date	Amount Due
0507-03-0009.3	ORIGINAL(NON-INITIAL)	01/10/23	02/20/23	$ 552,000.00

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DIVISION OF REVENUE
PO BOX 417
TRENTON, NJ 08646-0417

C1

NORTH WILDWOOD CITY

901 ATLANTIC AVE
North Wildwood NJ 08260-5778

EP100005000710000310000000091003111111055200000000000823004255050C18

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

INVOICE NO.
230042520

ENFORCEMENT - CAFRA CCMRE FUND

Program Interest
NORTH WILDWOOD CITY OCEANFRONT BEACH North Wildwood, NJ. 08260 0507-03-0009.3

Type of Notice	Amount Due
ORIGINAL(NON-INITIAL)	$ 6,869,000.00

Billing Date	Due Date	NJEMS Bill ID
01/10/23	02/20/23	000000251065400

Summary	
Total Amount Assessed	6,869,000.00
Amount Received Before Creating Installment Plan (if installment plans is allowed)	0.00
Amount Transferred To Installment Plan	6,869,000.00
Installment Amount	0.00
Total Amount Credited	0.00
Total Amount Debited (Other Than Amounts Assessed)	0.00
Total Amount Due	6,869,000.00

REMINDER:
MAKE CHECKS PAYABLE TO: TREASURER - STATE OF NEW JERSEY
WRITE PROGRAM INTEREST ID ON YOUR CHECK (SEE BOTTOM STUB)
RETURN THE BOTTOM STUB WITH YOUR PAYMENT
MAIL PAYMENT AND STUB TO NJ DEPARTMENT OF TREASURY (SEE BOTTOM STUB)

See Back Of Page for Billing Inquiries

INVOICE NO.
230042520

D9901F (R 3/14/02)

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENFORCEMENT - CAFRA CCMRE FUND

INVOICE NO.
230042520

NJEMS Bill ID
000000251065400

Program Interest ID	Type of Notice	Billing Date	Due Date	Amount Due
0507-03-0009.3	ORIGINAL(NON-INITIAL)	01/10/23	02/20/23	$ 6,869,000.00

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and mail to:
NJ DEPARTMENT OF TREASURY
DIVISION OF REVENUE
PO BOX 417
TRENTON, NJ 08646-0417

CO

NORTH WILDWOOD CITY

901 ATLANTIC AVE
North Wildwood NJ 08260-5778

EP10000500071000031000000009100311111686900000000000052300425203C02

Let's protect our earth

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

INVOICE NO.
230042520

ENFORCEMENT - CAFRA CCMRE FUND

Program Interest
NORTH WILDWOOD CITY OCEANFRONT BEACH North Wildwood, NJ. 08260 0507-03-0009.3

Type of Notice	Amount Due
ORIGINAL(NON-INITIAL)	$ 6,869,000.00

Billing Date	Due Date	NJEMS Bill ID
01/10/23	02/20/23	000000251065400

AONOCAPA
Prescribed Enforcement Action

ASSESSMENTS
Start-End Date: 01/10/2023-01/10/2023 Activity: PEA230001
Assessment Type: PENALTY(CAFRA-CCMRE FUND) Status: Open (Pending Payment)
Regulatory Basis: Amount: $ 6869000.00

Total Amount Assessed: $ 6,869,000.00

D9902F (R 3/14/02)

MATTHEW J. PLATKIN
ATTORNEY GENERAL OF NEW JERSEY
R.J. Hughes Justice Complex
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By: Kevin A. Terhune (046601996)
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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	SUPERIOR COURT OF NEW JERSEY CAPE MAY COUNTY - CHANCERY DIVISION Docket No. CPM-C-55-22 **CIVIL ACTION** **CERTIFICATION OF ALICE A. PREVITE, ESQ.**

ALICE A. PREVITE, ESQ., of full age, hereby certifies as follows:

1. I am employed by the State of New Jersey, Department of Environmental Protection, Office of Legal Affairs, as a Regulatory Officer. I am fully familiar with the facts stated in this certification.

2. In my capacity, I have access to records kept in the ordinary course of State business concerning whether a Notice of

Claim was received by the Department of Environmental Protection, Office of Legal Affairs.

3. I have reviewed the above records with respect to whether Defendant City of North Wildwood filed a Notice of Claim pertaining to the allegations asserted in this matter.

4. A diligent search of the records maintained by the Department of Environmental Protection, Office of Legal Affairs, indicates that this office did not receive a Notice of Claim from Defendant City of North Wildwood regarding these claims.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements made by me are willfully false, I am subject to punishment.

ALICE A. PREVITE, ESQ.
Regulatory Officer
Office of Legal Affairs
Department of Environmental Protection
State of New Jersey

DATE: Jan. 10, 2023

MATTHEW J. PLATKIN
ATTORNEY GENERAL OF NEW JERSEY
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25 Market Street, P.O. Box 093
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Department of Environmental Protection

By: Kevin A. Terhune (046601996)
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NEW JERSEY DEPARTMENT OF, ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10 Defendants,	: : : : : : : : : : :	SUPERIOR COURT OF NEW JERSEY CAPE MAY COUNTY - CHANCERY DIVISION DOCKET NO. CPM-C-55-22 <u>Civil Action</u> **CERTIFICATION OF PETER RAMOS**

PETER RAMOS, of full age, certifies and says:

1. I am employed as Deputy Director, Division of Risk Management, State of New Jersey, Department of The Treasury.

2. By virtue of my position, I am familiar with and have access to the State of New Jersey's records regarding all notices of tort claim received thereby.

3. A search of our system database and files, reveals that the State of New Jersey did not receive a notice of tort claim with regard to any of these allegations from Defendant City of North Wildwood or anyone on their behalf in accordance with the New Jersey Contractual Liability Act, <u>N.J.S.A.</u> 59:13-5 <u>et seq.</u>

4. Pursuant to N.J.S.A. 59:13-5 et seq., public entities, such as the State of New Jersey, may by rule or regulation adopt forms specifying information to be contained in claims filed against it or its employee. Pursuant to this statute, the State of New Jersey is entitled to a particular Notice of Claims form, which provides specific details that enable it to initiate a satisfactory investigation of the alleged claims.

5. The Defendant's failure to serve a proper and complete notice of claim has made it difficult for the State of New Jersey to make a determination as to the extent of liability to which it is exposed to as a result of Defendant's lawsuit.

I certify that the foregoing statements made by me are true to the best of my knowledge. I am aware that if any of the foregoing statements made by me are willfully false, I am subject to punishment.

PETER RAMOS, C.P.M.
Deputy Director

Dated: January 13, 2023

MATTHEW J. PLATKIN
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SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. * ____-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **CERTIFICATION OF JENNIFER L. MORIARTY IN SUPPORT OF PLAINTIFF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S ORDER TO SHOW CAUSE FOR PRELIMINARY INJUNCTION & TEMPORARY RESTRAINTS**

I, JENNIFER L. MORIARTY, of full age, certify and say:

1. I am the Director of the Division of Land Resource Protection ("DLRP") at the Department of Environmental Protection ("DEP"). I have been in this position since March 2021. My duties include providing direction to the Division regarding, among other things, policies and procedures to be followed when making permitting decisions under the Coastal Zone Management Rules, N.J.A.C. 7:7-1.1 to -29.10 ("CZM Rules"). This includes reviewing decision-making where appropriate

related to permitting decisions, including emergency authorization requests pursuant to N.J.A.C. 7:7-21. In addition, I am responsible for providing direction to the Division on policies and procedures to be followed when pursuing enforcement actions related to violations of the CZM Rules.

2. I graduated from the University of Delaware and received a legal degree from Temple University. Before joining DEP, I worked as Deputy Attorney General in the New Jersey Division of Law.

3. Since I started as the Director of DLRP, I have become familiar with NWW's unauthorized regulated activities along its oceanfront beaches. These include the installation of a lengthy bulkhead from 3rd Avenue to 13th Avenue without the proper permit approval and the destruction of dunes, wetlands and wildlife habitat in violation of the CZM Rules, the Coastal Area Facility Review Act ("CAFRA"), and the Freshwater Wetlands Protection Act ("FWPA").

4. I make this certification in support of the Department's Order to Show Cause requesting a preliminary injunction and temporary restraints to stop NWW from installing a bulkhead as previously denied by the Department on October 12, 2022 and in violation of CAFRA, the CZM Rules, and the FWPA. This certification outlines NWW's Emergency Authorization request and the Department's responses to the request, justification for why

the Department determined no emergency conditions existed or currently exist for the installation of a bulkhead under an emergency authorization and without proper permit approval, why the permit approval process is critical for evaluating the bulkhead proposal and determining potential alternatives to a bulkhead under the Coastal Engineering Rule, and potential irreparable harm to the freshwater wetland transition area behind the Beach Patrol Building if the bulkhead is installed as such impacts have not been adequately addressed in the permitting process.

NWW's Post-Ian Emergency Authorization Request

5. On October 5, 2022, NWW submitted an Emergency Authorization ("EA") application to the Department pursuant to the CZM Rules. Attached to this certification as **Exhibit A** is NWW's EA application.

6. Following the remnants of Hurricane Ian along the shoreline, NWW claimed there was an absence of a defined beach berm and loss of greater than 75% of the protective dune system in front of the Beach Patrol Building/Oceanfront Safety Facility, Block 317.03, Lot 1 (generally the area between 15th and 16th Avenues), and that the City Engineer determined that a breach condition is imminent requiring emergency measures to re-establish reliable shore protection at this location. The EA also requested emergency relief regarding the 25th Avenue beach access, Block

289.03, Lot 1 because NWW alleged significant erosion in this area.

7. NWW specifically requested authorization to immediately deploy jersey barriers extending from the 15th Avenue northern right-of-way limit line along the landward edge of the dune to the 16th Avenue southern right-of-way limit line; remove/relocate existing composite/timber decking walkway from in front of the building to facilitate the jersey barrier deployment; reshape the dune remnants to protect the existing dune vegetation to the maximum extent possible, and to establish stabilized slopes secured landward by the jersey barrier wall; installation of a 404LF cantilevered bulkhead; and reconstruct/stabilize the vehicular/pedestrian access from the 16th Avenue right-of-way to the beach; and finally, immediately reconstruct the 25th Avenue beach access via grading and stabilizing fill material and reconstruct the sloped ramps and landings.

8. The Department quickly responded to NWW's EA, immediately granting partial approval. On October 7, 2022, the Department authorized the use of temporary jersey barriers in a 400 linear foot alignment extending from the 15th Avenue northern right-of-way limit line along the landward edge of dune to the 16th Avenue southern right-of-way limit line and the removal of composite/timber decking walkway. This authorization pursuant to the CZM Rules (N.J.A.C. 7:7-21) and the Freshwater Wetlands

Regulations (N.J.A.C. 7:7A-14) contained several conditions, including but not limited to no disturbance to dunes. The Department specifically directed NWW to not conduct any of the other requested emergency measures including reshaping the dunes, installation of the bulkhead, and reconstruction of the access point at 16th Avenue and 25th Avenue. Those activities were not authorized by the Department on October 7, 2022 as the Department needed additional time to further evaluate those measures under the emergency authorization provisions of the CZM Rules and the Freshwater Wetlands Regulations. Attached to this certification as **Exhibit B** is my October 7, 2022 email to Mr. Long.

9. On October 12, 2022, the Department responded to NWW and denied the remaining portions of NWW's EA request to install a bulkhead, scarp reshaping of the oceanside of the dune within this area by establishing an angle of repose and "marrying" sand and structure on the landward side of the dune, and repair of the 25th Avenue vehicular access. The Department denied this requested emergency relief for the reasons expressed below. Attached to this certification as **Exhibit C** is the Department's October 12, 2022 response. The Department's EA determination was published in the DEP Bulletin on October 19, 2022.

10. An Emergency Authorization will only be issued where the applicant can demonstrate that a threat to life, severe loss of

property, or environmental degradation exists or is imminent, and can only be prevented/ameliorated through a regulated activity and is likely to occur/persist/worsen before a permit could be issued by DLRP. N.J.A.C. 7:7-21.1. Unlike Individual Permits which take 3 or more months to review and result in detailed authorizations containing robust environmental/engineering reports, DLRP must issue determinations on EA applications within a matter of days. By their nature, these applications do not often contain in-depth technical information and analyses. Thus, DLRP quickly reviews the information presented by the applicant, and expedites its consultations with any subject-matter experts, typically through conversations and without preparation of reports or other written evaluations. Following the receipt of NWW's EA request, the Department reviewed the application, an aerial photograph of the area from October 6, 2022 taken by the Office of Coastal Engineering ("OCE"), photographs taken by NWW of the beach patrol property near 15th Avenue on October 6, 2022, on the ground photographs taken by OCE near 15th Avenue on October 4, 2022, and considered the likely coastal effects of the remnants of Hurricane Ian that might impact the area.[1] DLRP also

[1] See the certification of Erick Doyle, from the OCE, which provides a detailed analysis of the aerial photograph from October 6, 2022, the photographs taken on October 4, 2022, and a detailed overview of the remnants of the coastal effects from Hurricane Ian in this area on October 6, 2022,

consulted with OCE regarding OCE's opinion as to whether a threat to life, severe loss of property, or environmental degradation existed or was imminent. Attached to this certification as **Exhibit D** are the aerial photographs by the OCE from October 6, 2022 and the on the ground photographs taken on October 4, 2022 by OCE. DLRP determined after reviewing this material and discussion with OCE that there was not an imminent threat of the loss of life or property based on the existing conditions. The October 6, 2022 photographs show that after the coastal effects of Hurricane Ian subsided, a dune/beach berm still was in place waterward of the beach patrol building offering adequate shore protection during a future storm. This determination was also informed by the experience of DLRP and OCE staff who are familiar with the size and shape of beach and dune systems that provide protection in towns along New Jersey's coast. As such, dune reshaping and a permanent bulkhead were not necessary to protect the beach patrol building as asserted in NWW's EA request pursuant to N.J.A.C. 7:7-21.1(a).

11. DLRP also denied the EA request because EA measures are only for immediate action and the bulkhead installation could not be conducted immediately as the materials still needed to be ordered. N.J.A.C. 7:7-21.3(d)(1) provides that the regulated

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which supports the Department's determination that an emergency situation did not exist warranting dune reshaping or the installation of a bulkhead.

activities authorized under an emergency authorization shall be commenced within 30 calendar days after the Department's verbal decision to grant the emergency authorization. There is no way that NWW could have met this 30-day deadline of November 11, 2022 to commence building the bulkhead when NWW did not even have the materials for the bulkhead on hand when it sought emergency authorization approval on October 5, 2022. Pursuant to N.J.A.C. 7:7-21.3(d)(1), the emergency authorization is void as of the 30th calendar day after the verbal approval. NWW also indicated in its EA application that "the lack of sand reserves in the lower beach profile also makes it impossible to bulldoze sand to the upper beach profile as an alternative means of re-establishing shore protection." NWW's statement that there was a lack of sand reserves in the lower beach profile raised further concern for DLRP that use of that sand to "reshape" the dune would compromise the lower beach profile. NWW also did not specifically request in the EA to move sand from any other location to reshape the dune near 15th Avenue and DLRP did not believe additional disturbance to the dune was prudent without the necessary detail from NWW as to how exactly that we wanted to complete the dune reshaping. As a result, DLRP denied the EA request for dune reshaping.

12. The Department further explained in its October 12, 2022 response to NWW that the installation of a bulkhead may increase

erosion of the dune system waterward of the structure and to the north and south of the potential bulkhead and could exacerbate erosion in future storms. As such, a permanent bulkhead needs to be reviewed via an Individual Permit application which allows for a more thorough technical review. The Department reminded NWW that NWW has a permit application for a bulkhead in this location that has been pending with the Department that has been administratively deficient since 2020. The Department encouraged NWW to cure the administrative deficiencies in the pending bulkhead permit application so that the Department can proceed with its technical review of the application pursuant to the CZM Rules, the Flood Hazard Area Control Act, and the FWPA regulations, and noted that it is committed to expediting review of the permit once the administrative deficiencies are addressed by NWW.

13. Although the Department has been unable to assign a staff person to perform an official technical review of the bulkhead individual permit application due to the administrative deficiencies, DLRP management has read through the pending permit application and it does not contain the required analysis of alternative shore protection measures under the Coastal Engineering Rule, N.J.A.C. 7:7-15.11. The alternatives analysis follows the rule's hierarchy that requires utilization of non-structural or hybrid shore protection measures if at all

feasible or practicable prior to consideration of structural remedies such as bulkheads. One purpose of this hierarchy is to prevent structural measures like bulkheads from being implemented in locations where they may cause serious erosion, which is why the alternatives analysis is so important in the technical permit review process. This analysis is performed during the technical review of an individual CAFRA permit application and that is why the Department informed NWW that a bulkhead needs to be reviewed through an individual permit application. Installation of the bulkhead without this analysis in a permit application may result in additional irreparable harm in the future if NWW proceeds with its pending permit application for the bulkhead in the same location and the Department determines that a bulkhead is not appropriate and should be removed. Removal of the bulkhead may cause additional harm to the surrounding environment, including delineated freshwater wetlands as discussed further below. This is why it is so critical that NWW continue with its 2020 permit application instead of installing the bulkhead without authorization in violation of the EA and in violation of CAFRA, the CZM Rules, and the Freshwater Wetlands Protection Act.

14. NWW did however conduct an alternatives analysis in its EA application pursuant to the N.J.A.C. 7:7-10.3. DLRP, in consultation with OCE, determined that NWW's dismissal of other

means of shore protection was inadequate. First, NWW considered "backpassing," which is the movement of sand from one area of the beach to another and grading the sand into the dune/berm. This alternative would be preferred by DLRP since it is a non-structural shore protection measure, but NWW indicated that there is a lack of sand reserves in the lower beach profile making it impossible to bulldoze sand to the upper beach profile. NWW however did just this when it moved sand from 11th Avenue to 15th and 16th Avenues and then graded this sand landward into the dune. This was in direct violation of the EA and in violation of CAFRA as NWW does not have a current dune maintenance permit to perform such work.

15. NWW also considered transporting material from sand and gravel mines, but determined that it was too expensive, unfeasible due to a trucking shortage and could damage municipal infrastructure, and would be too time consuming. NWW also considered dredging beach fill from sand reserves nearshore or offshore. NWW found this alternative to be too expensive and time consuming. NWW considered the placement of rock, rubble or concrete as an alternative but found that such an option was also too time consuming and could restrict future engineering options. Finally, NWW considered the placement of sand-filled geotextile tubes. However, NWW again asserted that it did not have an adequate source of beach sand material despite having

ultimately gone ahead and moved sand from 11th Avenue to 15th and 16th Avenues.[2]

16. DLRP, in consultation with OCE, determined the alternatives analysis did not substantiate NWW's assertions about costs or sand availability, and did not establish that a trucking shortage exists that would prevent rock or sediment from being delivered within the same 30-day timeframe as the bulkhead materials. Because the bulkhead could not be implemented immediately, even if DLRP had determined an emergency did exist, the lead-time to install a bulkhead versus the other, less structural options, would have been similar and thus a bulkhead still would not have been appropriate without individual permit review.

17. On October 20, 2022, the Department received a letter from Neil Yoskin, Esq., counsel for NWW, which put the Department on notice that NWW was moving ahead with certain immediate actions starting on October 20, 2022 to alleviate a public emergency. Attached as **Exhibit E** is the October 20, 2022 letter. This letter stated that NWW disagreed with the Department's determination to deny the EA for the dune reshaping and bulkhead because NWW alleged an "imminent threat" exists. The letter

[2] Over the last few years, NWW has typically conducted sand backpassing during the winter months to replenish the beachfront. However, it is notable that NWW now contends in its alternatives analysis that such a measure is too costly and could damage infrastructure.

raised a concern that members of the public could walk on the dune scarp and be injured. This was not part of the justification provided by NWW in its EA request. However, the public should not be permitted to walk on dunes at any time, so this would not be a basis to allow dune disturbance. Instead, NWW could have prevented the public from accessing the scarp through less impactful measures to block access, and utilizing local law enforcement. NWW also does not have a current permit to conduct sand transfers to move sand to the face of the dune to establish a gentler slope and such relief was not specifically requested in the EA. The letter ends by stating NWW "will leave the State to its legal remedies in this regard." As such, the Department has been forced to bring this action to stop NWW from continuing to violate the EA along with Department statutes and rules designed to ensure safe and appropriate shore protection measures.

18. The Mayor of NWW sent a letter to DEP on November 9, 2022 and November 16, 2022 indicating that NWW intends to move forward with construction of at least a 404 linear foot bulkhead in the vicinity of 15th and 16th Avenues. Attached as **Exhibit F** are both letters.

Potential Irreparable Harm to Designated Freshwater Wetlands and Habitat

19. The Department is the lead agency for establishing the extent of State and Federally regulated wetlands and waters. The Department issued NWW a Freshwater Wetlands Letter of Interpretation ("LOI") on July 10, 2019 verifying the boundary of the freshwater wetlands on Block 317.03, Lot 1, which is located directly north of the Beach Patrol Building at 15th Avenue. Attached as **Exhibit G** is the LOI from July 10, 2019 that includes a map of the designated freshwater wetland transition area and the freshwater wetland boundary.

20. Regulated activities proposed within a wetland, wetland transition area or water area, as defined by N.J.A.C. 7:7A-2.2 and 2.3 of the FWPA Rules, require a permit from this office unless specifically exempted at N.J.A.C. 7:7A-2.4. NWW has applied for a FWPA permit #6 and #6a in its 2020 bulkhead permit application because it states that the proposed bulkhead in this area will impact the freshwater wetlands transition area near the Beach Patrol Building.

21. The EA stated that the proposed location of the bulkhead is designed to avoid previously delineated interdunal freshwater wetlands in the back dune north of the project area limit, which is near the Beach Patrol Building and it will also avoid associated freshwater wetland transition area. NWW submitted a hand-drawn map outlining the proposed location of the bulkhead and the boundary line abuts the delineated freshwater wetland

transition line. It is unclear to the Department based off of this hand-drawn map if the bulkhead and work associated with installation will impact the freshwater wetland transition area. This is exactly why NWW needs to complete the permitting process for the bulkhead so that potential impacts to the freshwater transition area are clearly understood and analyzed by the Department and NWW receives any required permits to engage in such disturbance if authorized.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Dated: 12/1/22

Jennifer L. Moriarty
Director Division of Land Resource Protection

MORIARTY EXHIBIT A

the LOMAX Consulting group

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October 5, 2022
Via email

New Jersey Department of Environmental Protection
Division of Land Resource Protection
501 East State Street, Second Floor
Trenton, NJ 08625
ATTN: Ms. Colleen Keller and Ms. Janet Stewart

RE: Coastal Program Emergency Authorization – Shore Protection Measures
25th Avenue Beach Access and Beach Patrol Building/Oceanfront Safety Facility
Block 289.03, Lot 1 (portion thereof) and Block 317.03, Lot 1 (portion thereof)
City of North Wildwood, Cape May County, NJ
TLCG File No.: 22-1093.2

Dear Ms. Keller and Ms. Stewart,

On behalf of the City of North Wildwood (hereafter "City" or "Applicant"), please accept this request for an Emergency Authorization pursuant to the Coastal Zone Management Rules (CZMR) *(N.J.A.C. 7:7 et seq.)* under the authority of the NJ Department of Environmental Protection (NJDEP). This request follows our previous email exchanges in this regard over the past few days during which the low pressure system remnants of Hurricane Ian stalled off the mid-Atlantic coast causing a sustained multi-day period of significant coastal flooding throughout the region and, more specifically, potentially catastrophic beach and dune erosion to the City of North Wildwood oceanfront. Given the absence of a defined beach berm and loss of greater than 75% of the protective dune system in front of the Beach Patrol Building/Oceanfront Safety Facility, Block 317.03, Lot 1 (portion thereof), the City Engineer has determined that a breach condition is imminent requiring that emergency measures be implemented to re-establish reliable shore protection at this location. Additionally, the 25th Avenue beach access, Block 289.03, Lot 1 (portion thereof), continues to sustain significant erosion which has undermined this vehicular beach access and exposed adjoining shore protection structure to further scour and scarping. These emergent conditions were first observed during the weekend (October 1, 2022) and exacerbated through the following days *(see attached photo pages)*.

Please note that, consistent with previous collaborative discussions with the NJDEP and direction to keep all parties informed, this submission will be transmitted to the Bureau of Coastal and Land Use Compliance and Enforcement staff to ensure that they too are properly informed of the imminent threat and the Applicant's intent to implement emergency shore protections measures in the wake of this most recent coastal storm.

Applicant:
City of North Wildwood
901 Atlantic Avenue
North Wildwood, NJ 08260
Attn: Nicholas Long, City Administrator
609-522-6464
nlong@northwildwood.com

It should be noted that, despite the City's $3.7 million investment in 2022 beach renourishment in advance of the summer season via the NJDEP and USACE-approved sand backpassing project, residual sand reserves were sufficiently depleted by the end of the season that little remained to withstand a single coastal storm event. Sand volume placed as part of the backpassing project was shaped into a dune ridge and dry beach area along the oceanfront consistent with the approved design template. *"The final tally of sand moved from Wildwood beaches to the beaches of North Wildwood was provided by the municipal engineer at 361,221 cubic yards making this season's transfer the largest thus far in this "in house" effort to restore a recreational and storm protection shoreline during this period of extensive oceanfront beach erosion manifesting itself in North Wildwood since the late 1990's."* (2022 Spring Report to the City of North Wildwood on the Condition of City Beaches, Stockton University Coastal Research Center, July 25, 2022). The prior season, 357,000 cubic yards of sand was backpassed by the City for renourishment, also at exceptional expense borne by the City. In total, approximately 1,611,372 cubic yards of sand has been backpassed to renourish the City's eroding beaches since 2016. However, due to prevailing coastal processes, these reserves have been lost in quantity from the beach-dune complex annually and have now settled into offshore deposits.

As a result of this most recent coastal storm event and in light of the depleted sand reserves whereby a dune breach is imminent, the City, as owner of the subject properties and steward of the municipal transportation, utility and public safety infrastructure, has given its permission to pursue the prescribed emergency measures below and is hereby seeking an Emergency Authorization for the following activities:

15th – 16th Avenues waterward of the Beach Patrol Building (Block 317.03, Lot 1 (portion thereof))

1) Immediate deployment of Jersey barriers (20' segments) in a 400LF alignment extending from the 15th Avenue northern right-of-way limit line along the landward edge of dune to the 16th Avenue southern right-of-way limit line
2) Remove/relocate existing composite/timber decking walkway from in front of the building to facilitate Jersey barrier deployment
3) Reshape dune remnants, protecting existing dune vegetation to the maximum extent possible, to establish stabilized slopes secured landward by the Jersey barrier wall
4) Installation of 404LF cantilevered steel bulkhead (coated) with timber cap
5) Reconstruct/stabilize vehicular/pedestrian access from 16th Avenue right-of-way to the beach

The above activities are depicted on a hand sketch prepared by Jim Verna III, P.E. of Van Note-Harvey Associates Inc., dated October 4, 2022, as well as separate hand-annotated detail sheets, each dated October 4, 2022, and a cut sheet for Meever USA sheet piles *(attached)*. A line drawing of these proposed measures is in progress and will be transmitted under separate cover for reference, once completed. Please note that the topographic contours on the hand sketch are vestigial to conditions in 2020 and the aerial image is from February 2022; hence, these do not reflect existing conditions. The proposed activities are designed to avoid previously delineated interdunal freshwater wetlands in the back dune north of the project area limit, as well as its associated transition area. Items 1-3 will commence immediately and are expected to be completed over a one-day period. Items 4 and 5 will commence upon receipt of the bulkhead materials delivery and mobilization and are expected to require several weeks to complete this installation and associated restorative actions. The project area limits for this activity are depicted on Figure 1 *(attached)* at the terminus of 15th and 16th Avenues, area delineated by a red boundary.

Before specifying the above emergency mitigative actions, an assessment of alternative measures was completed by the City Engineer. Specifically, the standards applicable to emergency post-storm beach restoration under *N.J.A.C. 7:7-10.3* were evaluated, including NJDEP-preferred options under *(b)*, for feasibility. The following is a summary of that alternatives analysis.

Deposition of clean fill material consistent with grain size compatible with that of the existing beach material proved to be problematic in terms of sourcing, logistics, and secondary impacts. The current oceanfront conditions and profile have, at least for now, severed the route for on-beach access to sand reserves further south of the project area limits. Beach berm erosion has extended a significant portion of the tide cycle to the waterward extent of both the 24th and 26th Avenue piers precluding effective transport of sand which could be harvested from Wildwood beaches *(see attached photo pages)*. Moreover, the existing conditions of the profile at Poplar Avenue have exposed the City of Wildwood's stormwater outfall at this location also precluding a southerly truck route. Because these locations are inundated daily by the tidal cycle, the deposition of sand in these areas to re-establish a trucking route for alongshore transfer of sand is infeasible, at least until the beach profile re-forms through accretion *(see attached photo pages)*. The lack of sand reserves in the lower beach profile also makes it impossible to bulldoze sand to the upper beach profile as an alternative means of re-establishing shore protection. Transport of material from sand and gravel mines was assessed, and it was determined that there are several impediments to pursuing this option. The sand composition available from the proximate mines, as compared to that of the *in situ* beach material, was found to be inconsistent. Additionally, the logistics of pursuing this option were not feasible due to existing trucking shortages as compared to the volume of sand required to address this recurrent erosion. Further, offshore sources will require the City's contractor to complete an intermediate sand transfer from street-legal tri-axle dump trucks to the heavy duty off-highway articulated dump trucks necessary to transit the existing oceanfront conditions. Pursuing this option would require duplicative handling of the fill material, if even suitable material could eventually be sourced within a reasonable proximity. Given the emergent nature of this matter, there is insufficient time to pursue an option that is, at best, inefficient, slow and expensive, but also risks secondary damage to municipal infrastructure, including City streets that were not designed for the volume and frequency of heavy transport that would be required for this option.

While hydraulic beach fill/renourishment could access sand reserves in nearshore or offshore waters, where prior backpassed sand has settled and which are unattainable via typical trucking/backpassing, these dredging projects require scheduling years in advance, and the City does not have ready access to or control the availability a dredge for this purpose. The timeline for such a process does not reconcile with the current situation faced by the City, nor does the City have the funds to pursue such a project without significant State and/or Federal participation.

The placement of rock, rubble or concrete is a very slow process, which again relies upon a trucking industry facing existing labor shortages, as well as the challenges of sourcing these materials locally and the secondary impacts to municipal infrastructure, including City streets that were not designed for the volume and frequency of heavy transport that would be required for this option. Additional design concerns were expressed upon evaluating this option in that the placement of these materials restricts future engineering options, including facilitation of public access. The inability to drive piles for future timber walkover/ADA ramp structures would create challenges to efficient and effective public and Beach Patrol staff access to/from the beach. In addition to ready access of the Beach Patrol building by its staff, this oceanfront safety facility also provides beachgoers with public restrooms. a first aid station, showers/footwash amenities, and shelter via the existing dune walkover/ramp structure at the 15th Avenue right-of-way alignment *(see attached photo pages)*. A breach will destroy this access and the placement of rock, rubble or concrete will complicate or even preclude the replacement of such a facility.

The placement of sand-filled geotextile tubes requires a source for beach sand material, which is not available from the existing beach conditions and is challenging to acquire from offshore sources as was previously described in detail above. To fill these tubes *in situ* would further deplete the City's oceanfront of sand resources, especially given that the prevailing coastal processes trend is one of erosion in this location. While geotextile tubes could serve as a protective measure and means to rebuild the dune features, these applications are only effective when combined with a robust, large-scale hydraulic beach fill project whereby the tube would remain covered for an extended period of time. At present, the State and Federal authorities have not advanced a beach nourishment program of this type in partnership with the City, and it remains unclear if/when the State/Federal Island-wide Dune Construction Project may be implemented from Hereford Inlet south to Cape May Inlet to serve as hurricane and storm damage reduction, including its associated planned cyclical renourishments.

In contrast, a bulkhead, when deployed under certain oceanfront conditions where beach re-nourishment proves to be unreliable and challenging, has proven to be the more efficient and effective means of sustainable shore protection measures. These installations can be implemented rapidly and have longer useful life options where the cost-benefit ratio can be justified and effective shore protection realized. Additionally, the footprint of disturbance for these installations can be minimized to reduce secondary impacts and avoid sensitive areas where sloped angles of repose would otherwise encroach. This option minimizes the number of truck trips required to implement shore protection thereby reducing secondary impacts to the municipal infrastructure. Further, given the minimal footprint, future site improvements, including public accessways and dune construction, can be effectuated over top of and/or on either side of the bulkhead.

<u>25th Avenue Beach Access (Block 289.03, Lot 1 (portion thereof))</u>

1) Immediately reconstruct the beach access via profile grading and deposition of stabilizing material within the residual upper beach berm and back beach limits; relatively minimal volumes of fill material are required to accomplish the necessary grading and restoration
2) Reconstruct the sloped ramps and landings within the access to restore the vehicular and pedestrian use, including pedestrian public access from the boardwalk and the adjoining 26th Avenue pier

The above activities are depicted on a line drawing titled, *"25th Ave and the Beach Adjacent to Amusement Pier, North Wildwood Beach, City of North Wildwood, Cape May County, NJ"*, prepared by Van Note-Harvey Associates Inc., dated October 5, 2022 (attached). Please note that these proposed activities are designed to avoid previously delineated interdunal freshwater wetlands in the back dune north of the project area limit. While the activities are located within the associated transition area, these restorative measures do not extend beyond the pre-existing footprint of disturbance and therefore will not result in adverse impacts to regulated areas *(see attached photo pages)*. Items 1 and 2 will commence immediately upon receipt of Emergency Authorization from NJDEP and are expected to be completed over a one to two-day period. The project area limits for this activity are depicted on Figure 1 (attached) at the terminus of 25th Avenue, area delineated by a red boundary.

Enclosed for review and reference please find the following: 1) a site location map (*"Figure 1 Site Location on Aerial Photographs Depicting the Project Area Limits,"* prepared by The Lomax Consulting Group, dated October 4, 2022); 2) existing conditions photographs depicting post-storm damage and impacted areas; 3) hand sketch prepared by Jim Verna III, P.E. of Van Note-Harvey Associates Inc., dated October 4, 2022, as well as separate hand-annotated detail sheets, each dated October 4, 2022, and a cut sheet for Meever USA sheet piles; and 4) a line drawing titled, *"25th Ave and the Beach Adjacent to Amusement Pier, North Wildwood Beach, City of North Wildwood, Cape May County, NJ"*, prepared by Van Note-Harvey Associates Inc., dated October 5, 2022.

If you have any questions or require additional information, please do not hesitate to contact me. Thank you for your prompt attention to this matter.

Sincerely,
THE LOMAX CONSULTING GROUP, LLC

Peter L. Lomax
Managing Principal

Enclosures

ec: Jennifer Moriarty, Director NJDEP DLRP (w/enclosures)
Becky Mazzei, NJDEP DLRP (w/enclosures)
Kimberly Cahall, Chief Enforcement Officer NJDEP CLUE (w/enclosures)
Michelle Kropilak, Manager NJDEP CLUE (w/enclosures)
Michael Lutz, NJDEP CLUE (w/enclosures)
Mayor Patrick Rosenello, City of North Wildwood (w/enclosures)
Nicholas Long, City Administrator, City of North Wildwood (w/enclosures)
Jim Verna III, PE, Van Note-Harvey Associates, Inc. (w/enclosures)
Neil Yoskin, Esq., Cullen & Dykman LLP (w/enclosures)

BLOCK 289.03, LOT 1 (P/O); BLOCK 317.03, LOT 1 (P/O)
CITY OF NORTH WILDWOOD, CAPE MAY COUNTY, NEW JERSEY *22-1093.2*

FIGURE 1: SITE LOCATION ON AERIAL PHOTOGRAPHS DEPICTING THE PROJECT AREAS LIMITS SOURCE: GIS DATA PROVIDED BY THE NJDEP, BING NEARMAP AND THE COUNTY PLANNING DEPARTMENT	the LOMAX Consulting group	DATE: 2022-10-04	DRAWN BY: EJM
		SCALE: AS NOTED	

\Prj\Act\22-1093.2\St Map\Rs Map\Aerial - Emergency Authorization

SITE PHOTOGRAPHS

PHOTOGRAPH 1. **View north of the dune scarp (right) eroded to a point landward of the pre-existing dune crest between 15th and 16th Avenues in front of the City of North Wildwood Beach Patrol headquarters (left) and upper landing of dune walkover railing (background)**

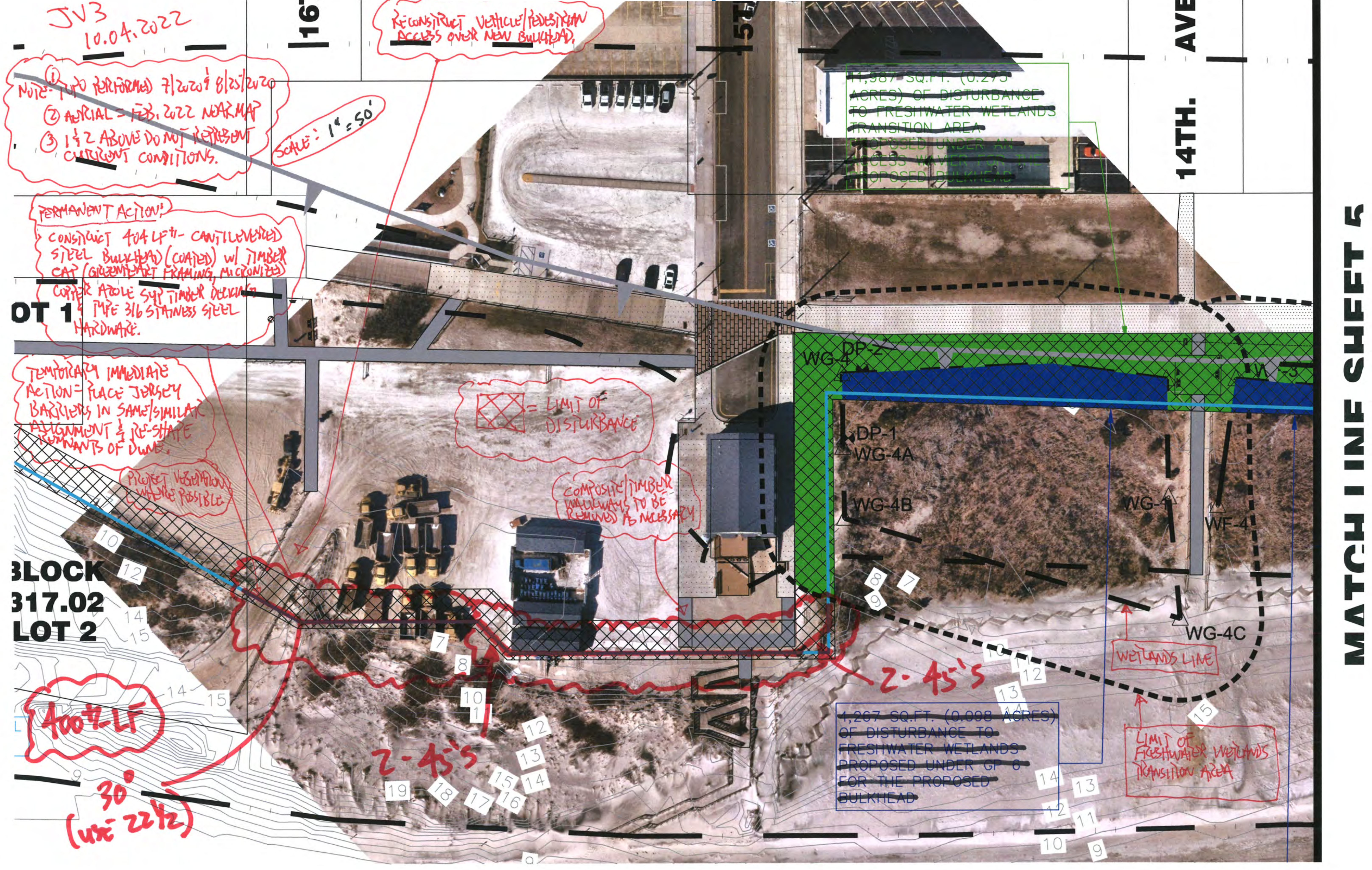
PHOTOGRAPH 2. **View west of the eroded and scoured public accessway at the 25th Avenue beach access terminus.**

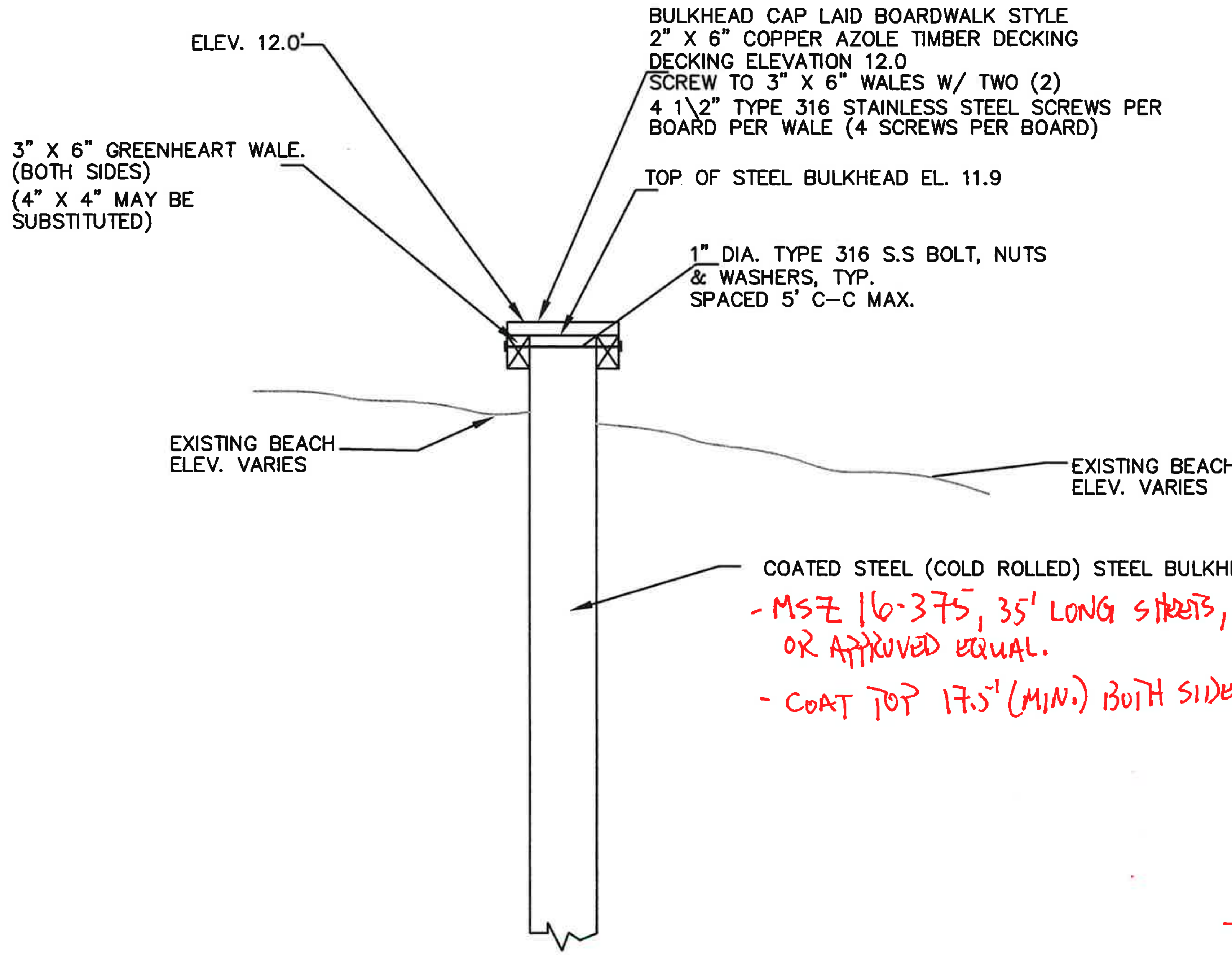
PHOTOGRAPH 3. **View north of the 24th Avenue pier terminus and absence of beach berm waterward of the pier end, which precludes the sand backpassing truck route.**

PHOTOGRAPH 4. **View south of the City of Wildwood exposed stormwater outfall at the Poplar Avenue right-of-way alignment, which precludes the sand backpassing route.**

PHOTOGRAPH 5. **View of the City of North Wildwood Beach Patrol headquarters which serves as a critical oceanfront safety facility with public access amenities. Note: eroded dune scarp is located at the right edge behind the dune fencing.**

PHOTOGRAPH 6. **View of the dune walkover and ADA access ramp in front of the City of North Wildwood Beach Patrol headquarters. Note: eroded dune scarp is located immediately behind the upper staircase landing.**


JV3
10.04.2022
NOTE: ① TOPO PERFORMED 7/2020 & 8/25/2020
② AERIAL - FEB. 2022 NEARMAP
③ 1 & 2 ABOVE DO NOT REPRESENT CURRENT CONDITIONS.
SCALE: 1" = 50'
RECONSTRUCT VEHICLE/PEDESTRIAN ACCESS OVER NEW BULKHEAD.
PERMANENT ACTION:
CONSTRUCT 404 LF± - CANTILEVERED STEEL BULKHEAD (COATED) W/ TIMBER CAP (GREENHEART FRAMING, MICRONIZED COPPER AZOLE SYP TIMBER DECKING) TYPE 316 STAINLESS STEEL HARDWARE.
TEMPORARY IMMEDIATE ACTION = PLACE JERSEY BARRIERS IN SAME/SIMILAR ALIGNMENT & RE-SHAPE REMNANTS OF DUNE.
PROTECT VEGETATION WHERE POSSIBLE
= LIMIT OF DISTURBANCE
COMPOSITE/TIMBER WALKWAYS TO BE REMOVED AS NECESSARY
~~11,987 SQ.FT. (0.275 ACRES) OF DISTURBANCE TO FRESHWATER WETLANDS TRANSITION AREA PROPOSED UNDER AN ACCESS WAIVER FOR THE PROPOSED BULKHEAD~~
~~4,267 SQ.FT. (0.098 ACRES) OF DISTURBANCE TO FRESHWATER WETLANDS PROPOSED UNDER GP 6 FOR THE PROPOSED BULKHEAD~~
WETLANDS LINE
LIMIT OF FRESHWATER WETLANDS TRANSITION AREA
2 - 45's
2 - 45's
400± LF
30°
(use 22½)
16TH
15TH
14TH. AVE
LOT 1
BLOCK 317.02
LOT 2
WG-4
DP-2
DP-1
WG-4A
WG-4B
WG-4C
WF-4
MATCH LINE SHEET 5



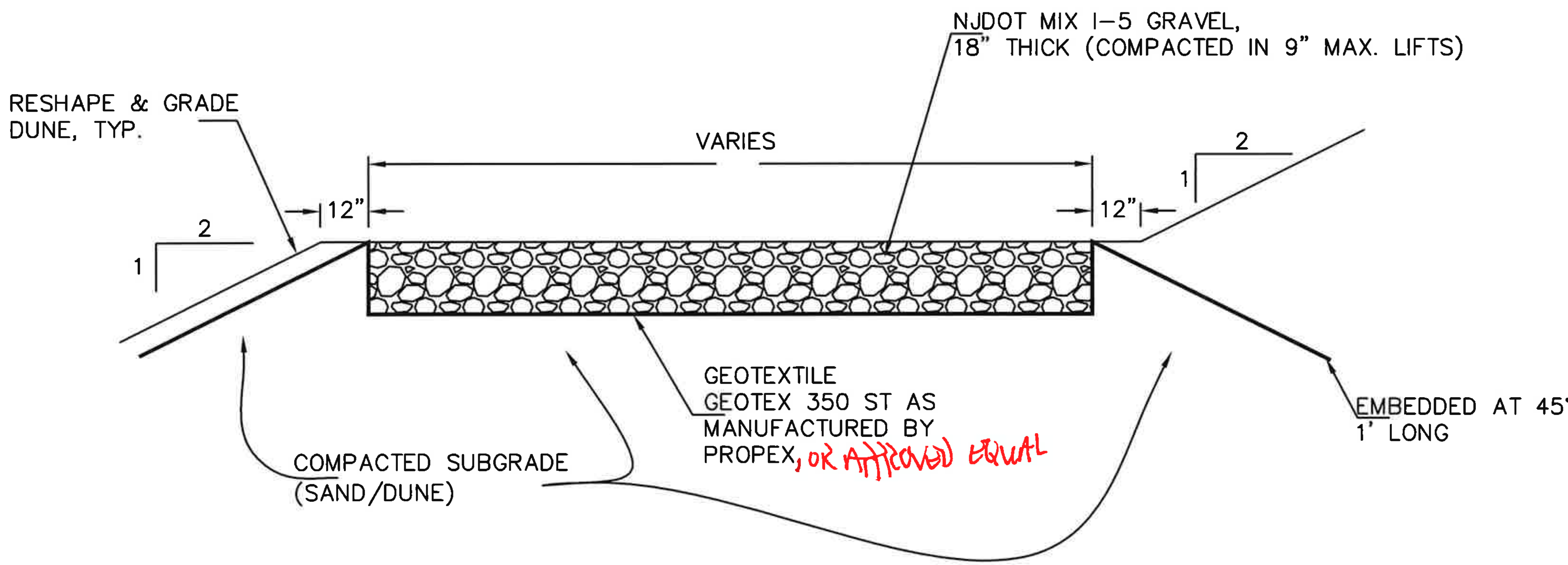
- MSZ 16-375, 35' LONG SHEETS, AS MANUFACTURED BY MEEVER USA, OR APPROVED EQUAL.
- COAT TOP 17.5' (MIN.) BOTH SIDES W/ 16 MILS BLACK COAL TAR EPOXY

JVB
10.04.2022

TYPICAL BULKHEAD DETAIL

N.T.S.

NOTE: CANTILEVERED (NO TIE-BACK SYSTEM)



NOTE:
1. GEOTEXTILE SECTIONS MUST OVERLAP MINIMUM OF 5', TYP.
2. SLOPE: 1V:12H MAX.

PROPOSED VEHICLE ACCESS DETAIL FOR 16TH AVE.

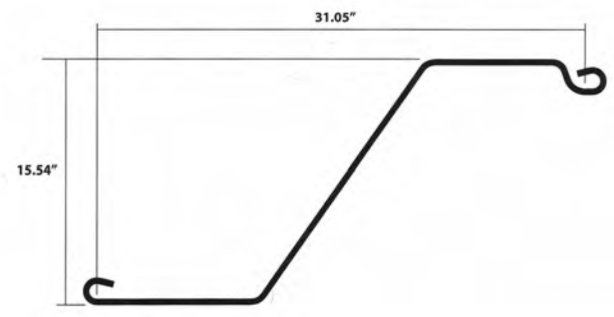
NOT TO SCALE

JV3
10.04.2022

MEEVER USA

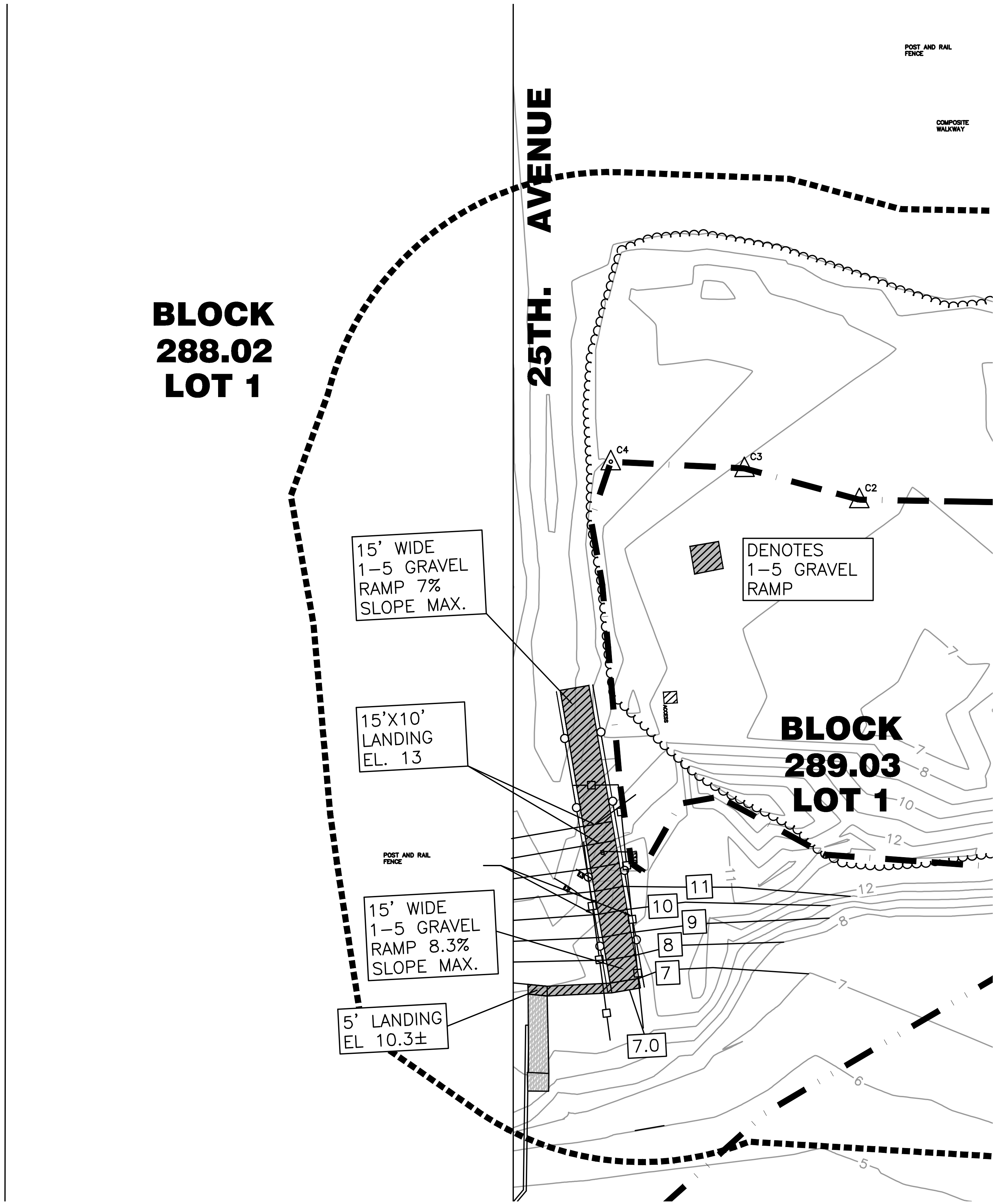
T +1 (866) 313-8770 | E info@meever.us | I www.meever.us

MSZ 16-375 (Cold rolled sheet piles)



Section description	Product group	Shape	Section Modulus	Moment of Inertia	Width	Height	Thickness flange	Thickness web	Weight single	Weight	Coating 2 sides	Coating area
			in^3/ft cm^3/m	in^4/ft cm^4/m	inch mm	inch mm	inch mm	inch mm	lbs/ft kg/m	lbs/ft^2 kg/m^2	ft^2/ft m^2/m	ft^2/ft m^2/m
MSZ 16-375	Cold rolled sheet piles	Z	34.0 1,825	267.9 36,580	31.05 789	15.54 395	0.375 9.5	0.375 9.5	59.7 88.79	23.06 34.31	7.54 2.30	1.43 1.43

Production acc. ASTM standards in A572 GR50 or A328
available from inventory and production
Origin: USA



NOTES:
1. TOPOGRAPHY TAKEN FROM DECEMBER 2021

2. IAN STORM HAS SEVERELY ERODED THE AREA DAMAGING DUNE, BERM, AND BEACH ACCESS

RELEASE 10/05/2022

van note-harvey associates, inc.
consulting engineers, planners & land surveyors
103 College Road East ● Princeton, NJ 08540 ● 609-987-2323
211 Bayberry Drive ● Cape May Court House, NJ 08210 ● 609-465-2600
www.vannoteharvey.com Certificate of Authorization No. 24GA28271300
van note-harvey associates - Since 1894 -

SKETCH SHOWING PROPOSED BEACH ACCES

25TH AVE AND THE BEACH ADJACENT TO AMUSEMENT PIER

NORTH WILDWOOD BEACH
CITY OF NORTH WILDWOOD

CAPE MAY COUNTY, N.J.

DRAWN BY BMP	FIELD BK	ORDER No. 46006	FILE No.	SHEET No.
CHECKED BY RP/JV	PAGE	400-21		1

MORIARTY EXHIBIT B

From:	Moriarty, Jennifer [DEP]
Sent:	Friday, October 7, 2022 11:38 AM
To:	nlong@northwildwood.com; 'Peter Lomax'; Patrick Rosenello
Cc:	Cahall, Kimberly [DEP]; Kropilak, Michele [DEP]; Keller, Colleen [DEP]; Stewart, Janet [DEP]; Reinknecht, Dennis [DEP]; Mazzei, Vincent [DEP]; Cobb, Jessica [DEP]
Subject:	NWW Emergency Authorization
Attachments:	DEP WLM response to 10-03-2022 Mayor Rosenello NWW letter.pdf

Dear Mr. Long:

The Division has reviewed your request to conduct emergency shore protection measures as outlined in your agent Mr. Peter Lomax's letter of October 5, 2022. Given the threat to severe loss of property and the emergent nature of the work at the Beach Patrol Building, the Division is authorizing specific shore protection measures in this Emergency Authorization ("EA") while continuing to review your request to reshape the dune remnants, install 404LF of bulkhead, and reconstruct access at 16th Avenue and 25th Avenue. **Those activities are not authorized by this EA and the City is not authorized to conduct those activities at this time.** The Division anticipates responding to those requests next week and has been in touch with Mr. Lomax about additional information required for our evaluation. As stated in the attached letter issued by WLM earlier today, the Division is concerned that installation of a bulkhead, as opposed to measures that absorb wave energy, will increase erosion. The Division will continue to work with Mr. Lomax to further evaluate.

For the activities specified below, this is your Emergency Authorization; no other documentation will follow. Michele Kropilak, the Division's Enforcement Bureau Chief, and Kimberly Cahall, the Department's Chief Enforcement Officer, are copied on this e-mail. I've also attached a copy of the letter issued by WLM earlier today for ease of reference.

This authorization allows the following activities:

1. <u>15th – 16th Avenues waterward of the Beach Patrol Building (Block 317.03, portion of Lot 1)</u>
    - Immediate deployment of Jersey barriers (20' segments) in a 400 linear foot alignment extending from the 15th Avenue northern right-of-way limit line along the landward edge of dune to the 16th Avenue southern right-of-way limit line
    - Remove/relocate existing composite/timber decking walkway from in front of the building to facilitate Jersey barrier deployment

This emergency authorization is granted in accordance with the provisions of the Coastal Zone Management Rules (N.J.A.C. 7:7-21) and the Freshwater Wetlands Regulations (N.J.A.C. 7:7A-14), and is further subject to the following conditions:

1. The Permittee shall commence the approved emergency activities within 30 calendar days after this authorization of the emergency permit, unless specifically extended by this office. If the emergency activities are not commenced within 30 calendar days of this authorization, this emergency permit is void.

2. No disturbance to dunes is authorized by this emergency authorization.

3. Once commenced, all regulated activities authorized under this emergency permit shall be completed, and this emergency permit shall expire, within 60 calendar days of the Department's approval, unless extended by the Department. If the regulated activities authorized under this emergency permit are not completed by the expiration date, these regulated activities shall cease until the appropriate individual permits or another emergency permit is obtained from the Department for the regulated activities.

3. This Authorization does not alleviate your responsibility to obtain any other local, State, or other Federal authorizations required by law.

4. The permittee is responsible for ensuring that the contractor and/or workers executing the activity(s) authorized by this permit have knowledge of the terms and conditions of the authorization and that a copy of this authorization is at the project site throughout the period the work is underway and available for review by any person.

5. The Permittee shall submit to the Department a complete application for a CAFRA Individual Permit and a Freshwater Wetlands Permit for the completed activities within 90 calendar days of the Department's authorization of the emergency permit. The application shall include the following:

   a. A demonstration that the regulated activities comply with the Coastal Zone Management Rules at N.J.A.C. 7:7 and the Freshwater Wetlands Regulations at N.J.A.C. 7:7A; and
   b. "As-built" drawings, signed and sealed by an engineer, land surveyor or architect, as appropriate, showing the regulated activities that were conducted under the emergency permit.

Should you have any questions, please do not hesitate to contact me.

Jennifer Moriarty (she/her), Director
Division of Land Resource Protection
NJ Department of Environmental Protection
Mail Code 501-02A
501 East State Street
Trenton, NJ 08625-420
Email: jennifer.moriarty@dep.nj.gov
P: (609) 984-3444

MORIARTY EXHIBIT C

From:	Moriarty, Jennifer [DEP]
Sent:	Wednesday, October 12, 2022 3:47 PM
To:	Peter Lomax; nlong@northwildwood.com
Cc:	Patrick Rosenello; Cahall, Kimberly [DEP]; Kropilak, Michele [DEP]; Keller, Colleen [DEP]; Stewart, Janet [DEP]; Reinknecht, Dennis [DEP]; Mazzei, Vincent [DEP]; Cobb, Jessica [DEP]; Jim Verna; Heck, Kelley [DEP]
Subject:	RE: NWW Emergency Authorization
Attachments:	NWW aerial photo October 6, 2022 taken by OCE.png

Dear Mr. Long:

The City of North Wildwood submitted a request for an Emergency Authorization (EA) in the evening hours of October 5, 2022 which identified the emergency as "absence of a defined beach berm and loss of greater than 75% of the protective dune system" due to erosion from coastal effects caused by an offshore storm system (Hurricane Ian) and that a "breach condition was imminent."

The EA seeks 1) immediate installation of jersey barriers at the City's beach patrol building/oceanfront safety facility located along the western dune toe within the area of 15th and 16th Avenues; 2) future installation of a bulkhead in the same location; 3) scarp reshaping of the oceanside of the dune within this area by establishing an angle of repose and "marrying" sand and structure on the landward side; and 4) repair of the 25th Avenue vehicular access, which the City states "continues to sustain significant erosion which has undermined this vehicular beach access and exposed adjoining shore protection structure to further scour and scarping."

For the Division of Land Resource Protection (DLRP) to issue an Emergency Authorization, the applicant must demonstrate that a threat to life, severe loss of property, or environmental degradation exists or is imminent, and can only be prevented/ameliorated through a regulated activity and is likely to occur/persist/worsen before a permit could be issued by DLRP. N.J.A.C. 7:7-21.1.

Upon receipt of the EA, DLRP immediately reviewed the submitted information, aerials of the area in question and photos taken by the Office of Coastal Engineering of the beach patrol property on Thursday, October 6th, the day after the request and after the remnants of any coastal effects of Hurricane Ian had subsided. DLRP immediately issued authorization for the installation of the jersey barriers, which are a temporary in nature.

After a full review of the information submitted and the condition of the subject area prior to, and after the remnants of Hurricane Ian, DLRP has determined the request for the installation of a bulkhead and "reshaping of the dune" to provide an angle of repose to the bulkhead, are not eligible for an Emergency Authorization because it has not been demonstrated that there is an imminent threat to the loss of life or property based on existing conditions. DLRP has an obligation to review the City's request for a bulkhead via a technical Individual Permit review because the bulkhead could increase erosion to the beach/dune system waterward of the structure, and to the north and south of the structure due to end-effect erosion, which could exacerbate, rather than alleviate, the problems faced by the City in future storms. Further, based on the attached aerial, taken on October 6, 2022 after any coastal effects from Ian had subsided, a dune/beach berm still are in place waterward of the beach patrol buildings and would offer shore protection during a storm. Finally, EA are intended for immediate action, and based on the submitted request, the proposed bulkhead installation will not be conducted immediately, but after ordering and receipt of materials. Thus, the request to install a bulkhead and reshape the dune via EA is denied because the standards under N.J.A.C. 7:7-21.1(a) have not been demonstrated.

In this regard, however, the City has a pending permit application for a proposed bulkhead in this location which has been administratively deficient since 2020. A complete technical review of potential alternative shore protection measures, including backpassing for which the City holds a valid permit, must be conducted to determine the necessity of the proposed structure and to determine which solution would have the least coastal impact on the adjacent system (sand volume/transport) as required by the Coastal Zone Management rules and would be conducted during the review of this application. It is DLRP's recommendation that the City cure the administrative deficiencies in its currently pending bulkhead application, so that DLRP can begin the technical review of this proposal. DLRP commits to expediting review of the application once the deficiencies are addressed.

Regarding the City's request to repair the 25th Avenue vehicular access, DLRP also reviewed submitted information and aerials which show that this vehicular access was constructed sometime between 2013 and 2014 without required DLRP authorization. Legalization of this accessway is not available to the City under an EA and the City has not provided information to show that repairing the access is necessary to prevent an imminent threat to life and safety. It appears that there are other vehicular accessways immediately adjacent to the area at 24th Avenue (some that were also constructed without prior DLRP authorization). Thus, DLRP denies the City's request for an EA to reconstruct the accessway.

If the City proceeds with bulkhead installation, any dune disturbance including the requested "reshaping," or proceeds with reconstruction of the 25th Avenue accessway without DLRP authorization, it will be subject to enforcement action including Civil Administrative Penalties.

It should also be noted that, among other items, the beach patrol structures to the south of 15th Avenue were constructed without the required DLRP permits and are included in the Notice of Violation issued to the City in June of 2020.

Should you have any questions, please do not hesitate to contact me.

Thank you,

Jennifer Moriarty (she/her), Director
Division of Land Resource Protection
NJ Department of Environmental Protection
Mail Code 501-02A
501 East State Street
Trenton, NJ 08625-420
Email: jennifer.moriarty@dep.nj.gov
P: (609) 984-3444

From: Moriarty, Jennifer [DEP]
Sent: Friday, October 7, 2022 12:12 PM
To: Peter Lomax <plomax@lomaxconsulting.com>
Cc: nlong@northwildwood.com; Patrick Rosenello <Prosenello@northwildwood.com>; Cahall, Kimberly [DEP] <Kimberly.Cahall@dep.nj.gov>; Kropilak, Michele [DEP] <Michele.Kropilak@dep.nj.gov>; Keller, Colleen [DEP] <Colleen.Keller@dep.nj.gov>; Stewart, Janet [DEP] <Janet.Stewart@dep.nj.gov>; Reinknecht, Dennis [DEP] <Dennis.Reinknecht@dep.nj.gov>; Mazzei, Vincent [DEP] <Vincent.Mazzei@dep.nj.gov>; Cobb, Jessica [DEP] <Jessica.Cobb@dep.nj.gov>; Jim Verna <jverna@vannoteharvey.com>
Subject: RE: NWW Emergency Authorization

Thank you, Peter. We, in coordination with OCE, are reviewing the information submitted yesterday and will have further feedback early next week.

From: Peter Lomax <plomax@lomaxconsulting.com>
Sent: Friday, October 7, 2022 12:03 PM
To: Moriarty, Jennifer [DEP] <Jennifer.Moriarty@dep.nj.gov>
Cc: nlong@northwildwood.com; Patrick Rosenello <Prosenello@northwildwood.com>; Cahall, Kimberly [DEP] <Kimberly.Cahall@dep.nj.gov>; Kropilak, Michele [DEP] <Michele.Kropilak@dep.nj.gov>; Keller, Colleen [DEP] <Colleen.Keller@dep.nj.gov>; Stewart, Janet [DEP] <Janet.Stewart@dep.nj.gov>; Reinknecht, Dennis [DEP] <Dennis.Reinknecht@dep.nj.gov>; Mazzei, Vincent [DEP] <Vincent.Mazzei@dep.nj.gov>; Cobb, Jessica [DEP] <Jessica.Cobb@dep.nj.gov>; Jim Verna <jverna@vannoteharvey.com>
Subject: [EXTERNAL] Re: NWW Emergency Authorization

Ms. Moriarty,

Thank you for your response. Please be advised that I responded (yesterday via email…see attached) to Ms. Stewart's direct email request to me for additional clarification. I am not aware of any other requests since that time. If any additional information is required, we stand ready to respond in order to advance a workable solution that will provide adequate, functional protection to the City, its private and public properties and critical infrastructure which remain under threat due to sustained storm damage and future risk from inadequate remaining sand reserves in this oceanfront extent.

Thank you for your assistance in this matter.

Regards,
Peter

P. Lomax
The Lomax Consulting Group
Sent from my iPhone

On Oct 7, 2022, at 11:38, Moriarty, Jennifer [DEP] <Jennifer.Moriarty@dep.nj.gov> wrote:

Dear Mr. Long:

The Division has reviewed your request to conduct emergency shore protection measures as outlined in your agent Mr. Peter Lomax's letter of October 5, 2022. Given the threat to severe loss of property and the emergent nature of the work at the Beach Patrol Building, the Division is authorizing specific shore protection measures in this Emergency Authorization ("EA") while continuing to review your request to reshape the dune remnants, install 404LF of bulkhead, and reconstruct access at 16th Avenue and 25th Avenue. **Those activities are not authorized by this EA and the City is not authorized to conduct those activities at this time.** The Division anticipates responding to those requests next week and has been in touch with Mr. Lomax about additional information required for our evaluation. As stated in the attached letter issued by WLM earlier today, the Division is concerned that installation of a bulkhead, as opposed to measures that absorb wave energy, will increase erosion. The Division will continue to work with Mr. Lomax to further evaluate.

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    - Remove/relocate existing composite/timber decking walkway from in front of the building to facilitate Jersey barrier deployment

This emergency authorization is granted in accordance with the provisions of the Coastal Zone Management Rules (N.J.A.C. 7:7-21) and the Freshwater Wetlands Regulations (N.J.A.C. 7:7A-14), and is further subject to the following conditions:

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1. This Authorization does not alleviate your responsibility to obtain any other local, State, or other Federal authorizations required by law.

1. The permittee is responsible for ensuring that the contractor and/or workers executing the activity(s) authorized by this permit have knowledge of the terms and conditions of the authorization and that a copy of this authorization is at the project site throughout the period the work is underway and available for review by any person.

1. The Permittee shall submit to the Department a complete application for a CAFRA Individual Permit and a Freshwater Wetlands Permit for the completed activities within 90 calendar days of the Department's authorization of the emergency permit. The application shall include the following:

   a. A demonstration that the regulated activities comply with the Coastal Zone Management Rules at N.J.A.C. 7:7 and the Freshwater Wetlands Regulations at N.J.A.C. 7:7A; and
   b. "As-built" drawings, signed and sealed by an engineer, land surveyor or architect, as appropriate, showing the regulated activities that were conducted under the emergency permit.

Should you have any questions, please do not hesitate to contact me.

Jennifer Moriarty (she/her), Director
Division of Land Resource Protection
NJ Department of Environmental Protection
Mail Code 501-02A
501 East State Street
Trenton, NJ 08625-420
Email: jennifer.moriarty@dep.nj.gov
P: (609) 984-3444

MORIARTY EXHIBIT D

MORIARTY EXHIBIT E

Cullen | Dykman

Cullen and Dykman LLP
229 Nassau Street
Princeton, NJ 08542
T: 609.279.0900
F: 609.497.2377

NEIL YOSKIN
PARTNER
NYoskin@cullenllp.com

October 20, 2022
Via e-mail (Shawn.LaTourette@dep.nj.gov)

Shawn M. LaTourette, Commissioner
New Jersey DEP
Mail Code 401-07
401 East State Street
PO Box 402
Trenton, NJ 08625-0420

RE: City of North Wildwood, Cape May County
Shore Protection Emergency

Dear Commissioner LaTourette:

This office represents the City of North Wildwood. The purpose of this letter is to put the Department on notice that it intends to undertake certain immediate actions beginning today to alleviate a public emergency, the details of which are described below.

As you know from recent correspondence from North Wildwood Mayor Patrick Rosenello, the remnants of Hurricane Ian caused severe damage to critical ocean front shore protection structures in the City. This most recent coastal storm perpetuates long standing emergent conditions that have resulted from the failure of the State and Federal Governments to implement a beach replenishment project which was first committed to in 2013.

The matter of most immediate concern is a large cliff, or scarp, that exists on the dune face between 13th and 16th Avenues. This is without a doubt a public safety hazard. Even though the City has blocked off access from the street, people continue to intrude into the area, and numerous people have been observed scaling the scarp.

On October 5, 2022, the City submitted a request for an Emergency Authorization (EA) to the Department pursuant to N.J.A.C. 7:7-21.2, seeking approval to deploy Jersey barriers extending from the 15th Avenue northern right-of-way limit to the 16th Avenue southern right-of-way limit, to remove and relocate an existing walkway in front of the Public Safety Building to facilitate deployment of the Jersey Barriers, to reshape and regrade the remnant dunes, to install 404 linear feet of bulkhead and to reconstruct access at 16th and 25th Avenues.

By e-mail dated October 7, the Department approved the deployment of the Jersey barriers and relocation of the walkway, while indicating that the request to reshape the remnant dunes and to install the protective bulkhead were still under consideration. Then, by e-mail dated October 12, 2022 the Department denied the request to regrade and reshape the dunes and to install the emergency bulkhead. The e-mail that communicated that decision indicated that the EA was being denied "because it has not been demonstrated that there is an imminent threat to the loss of life or property based on the existing condition."

The City, needless to say, disagrees with this determination and to what appears to be the Department's indifference to the reasonable requirements of protecting public safety, property and infrastructure. The Department's basis for determining whether an "imminent threat" threat exists, which is the threshold measurement by which an EA is issued, seems to mean that a catastrophe must essentially be ready to occur. This standard seems to be acceptable to the Department. It is impossible, however, to predict the precise moment at which a threat ceases being imminent and becomes something more dire. So while reasonable minds may differ, common sense dictates that protective measures should be taken before additional damage or the potential loss of life or property occurs. It is for this reason that the City Council adopted a Resolution on October 18 declaring the matter a public emergency.

The Department's October 12, 2022 e-mail, in denying the requested EA for the bulkhead construction, takes note of the fact that a bulkhead might increase the potential for erosion to the beach/dune system waterward of the structure, and to the north and south of the structure due to end-effect erosion, which could exacerbate rather than alleviate the problem faced by the City in

Cullen | Dykman

future storms. The City is well aware of this possibility, but in the absence of a meaningful beach replenishment program, it faces little choice. If and when the Federal government and the State government carry out their responsibility to restore the City's beach and dune system, then any short term impacts associated with a bulkhead will simply go away, as the bulkhead will be buried within the newly constructed beach/dune system. But until that occurs, the City must take the steps necessary to protect the lives and property of its residents.[1]

The City does not come to this decision lightly, but in light of the urgent and immediate threat posed by the conditions on the beach, this is to notify you that contracts have been let for the regrading and reshaping of the dunes and for construction of the bulkhead. That work will commence this morning and will continue until completed, regardless of whether or not the Department issues the requested Emergency Authorization. We will leave the State to its legal remedies in this regard.

Sincerely,
CULLEN AND DYKMAN LLP

Neil Yoskin

Neil Yoskin

NY/cl
cc (via e-mail):

Mayor and Council, City of North Wildwood
Nick Long, City of North Wildwood
Michael Donahue, Esq.
James Verna, PE
Peter Lomax
Jennifer Moriarty, NJDEP
Dennis Reinknecht, NJDEP

Neil north wildwood new latourette commissioner dep 10-20-22 re NWW

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[1] It is worth pointing out that dunes are protected resources under the Coastal Zone Management Rules. Allowing the scarp to remain as is not only puts the public at risk, but also puts the remnants of the dune system in further jeopardy. The lack of stabilization risks further material losses, which lessens the protective capacity of this remaining sand volume, and additional dune vegetation losses, which translates into diminished root stabilization of the dune and loss of protection habitat.

MORIARTY EXHIBIT F

CITY OF NORTH WILDWOOD

901 Atlantic Avenue
North Wildwood, NJ 08260-5778
(609) 522-2030

Patrick T. Rosenello
Mayor

Nicholas Long
City Administrator

November 9, 2022
Via e-mail (Shawn.LaTourette@dep.nj.gov)

Shawn M. LaTourette, Commissioner
New Jersey DEP
Mail Code 401-07
401 East State Street
PO Box 402
Trenton, NJ 08625-0420

RE: City of North Wildwood Shore Protection Emergency

Dear Commissioner LaTourette:

This is in furtherance of our recent and ongoing communications regarding the above-referenced matter. As you know from those communications, the City still plans to move forward with construction of at least a 404 linear foot bulkhead in the vicinity of 15th and 16th Avenues. As you also know, the shore protection project authorized by Congress for North Wildwood has yet to be implemented. It was as a direct consequence of that inaction that the City has been forced to take the actions necessary to protect its shorefront.

We believe there is a ready solution to this problem. That solution involves the use of the Hereford Inlet Borrow Area. The Borrow Area, which is only a short distance from North Wildwood's beaches, has upwards of 3 million cubic yards of sand available for use. While federal funds currently cannot be employed for the use of the Borrow Area (due to a prohibition under the Federal Coastal Barrier Resources Act), there is no similar state prohibition. It is our understanding that the Department's current shore protection priority list reserves the use of state shore protection funds for only those projects that also involve Federal funding, but it is also our understanding that there is nothing that prevents the State from changing these priorities. In fact, the Borrow Area was used for emergency shore protection in North Wildwood in 2013 and again for periodic shore protection in 2019, when the State re-allocated $5 million to make up for the

Federal funding shortfall that resulted from a change in the interpretation of the Coastal Barrier Resources Act.

The Hereford Inlet Borrow Area is one of the most closely studied water areas along the entire Jersey coast. Stockton University has been monitoring it annually for more than a decade, and has confirmed not only the enormous volume of sand that is present there, but has also confirmed that its use will have no adverse environmental impacts. It is for that reason that DEP approved its use on three separate occasions under the Federal consistency provisions of Section 307 of the Coastal Zone Management Act.

In addition, most of the cost of mobilization has been federally funded as part of the upcoming Avalon/Stone Harbor project this Winter, significantly reducing the cost of a State/local beach fill project for North Wildwood. Therefore, the City of North Wildwood is formally requesting that the NJDEP enter into a State Aid Agreement with the City of North Wildwood and add the City of North Wildwood to the proposed Avalon/Stone Harbor project.

I write this letter with the hope and expectation that you will agree with me both as to the urgency of this matter and as to the appropriateness of using the Hereford Inlet Borrow Area. I look forward to hearing from you in that regard.

Sincerely,

Patrick Rosenello, Mayor
City of North Wildwood

cc (via e-mail): Governor Phil Murphy

CITY OF NORTH WILDWOOD

901 Atlantic Avenue
North Wildwood, NJ 08260-5778
(609) 522-2030

Patrick T. Rosenello
Mayor

Nicholas Long
City Administrator

November 17, 2022
Via e-mail (Shawn.LaTourette@dep.nj.gov)

Shawn M. LaTourette, Commissioner
New Jersey DEP
Mail Code 401-07
401 East State Street
PO Box 402
Trenton, NJ 08625-0420

RE: City of North Wildwood Shore Protection Emergency

Dear Commissioner LaTourette:

This is in furtherance of my most recent letter regarding the above-referenced matter, to which I have not received a response. As you know, the City still plans to move forward with construction of at least a 404 linear foot bulkhead in the vicinity of 15th and 16th Avenues. As you also know, the shore protection project authorized by Congress for North Wildwood has yet to be implemented. It was as a direct consequence of that inaction that the City has been forced to take the actions necessary to protect its shorefront.

It is to our understanding that other nearby municipalities, notably Ocean City, have been approved for State Funded Shore Protection projects, and that a dredge has recently arrived to begin a hydraulic beach fill. While Ocean City is deserving of the project, their immediate need is not as dire as is North Wildwood's. Ocean City suffered storm damage from the remnants of Hurricane Ian, including sloped erosion of up to 50 feet and the scarping of dunes up to 6 feet. Avalon and Stone Harbor faced sloped erosion of up to 60 feet and dune scarping from 10-14 feet. North Wildwood saw the brunt of the storm damage, with our sloped erosion reaching levels of 80 feet and dune scarping up to 14 feet. The erosion from the October storm, merged with the constant deterioration with the beaches, is why we are requesting a new and immediate solution to this ongoing issue.

We believe there is a ready solution to this problem. That solution involves the use of the Hereford Inlet Borrow Area. The Borrow Area, which is only a short distance from North Wildwood's beaches, has upwards of 3 million cubic yards of sand available for use. While federal funds currently cannot be employed for the use of the Borrow Area (due to a prohibition under the Federal Coastal Barrier Resources Act), there is no similar state prohibition. It is our understanding that the Department's current shore protection priority list reserves the use of state shore protection funds for only those projects that also involve Federal funding, but it is also our understanding that there is nothing that prevents the State from changing these priorities. In fact, the Borrow Area was used for emergency shore protection in North Wildwood in 2013 and again for periodic shore protection in 2019, when the State re-allocated $5 million to make up for the Federal funding shortfall that resulted from a change in the interpretation of the Coastal Barrier Resources Act.

The Hereford Inlet Borrow Area is one of the most closely studied water areas along the entire Jersey coast. Stockton University has been monitoring it annually for more than a decade, and has confirmed not only the enormous volume of sand that is present there, but has also confirmed that its use will have no adverse environmental impacts. It is for that reason that DEP approved its use on three separate occasions under the Federal consistency provisions of Section 307 of the Coastal Zone Management Act.

The Coastal Facility Review Act's Shore Protection Fund provisions, at NJSA 13:19-16.1, gives the Commissioner the authority to fund shore protection projects that are not listed in the annual priority list that are "of an emergency nature, in the event of storm, stress or weather or similar act of god". Certainly this is the case with North Wildwood, which continues to suffer from the lack of an actual beach replenishment project. In addition, most of the cost of mobilization has been federally funded as part of the upcoming Avalon/Stone Harbor project this Winter, significantly reducing the cost of a State/local beach fill project for North Wildwood. Therefore, the City of North Wildwood is formally requesting that the NJDEP enter into a State Aid

Agreement with the City of North Wildwood and add the City of North Wildwood to the proposed Avalon/Stone Harbor project.

I write this letter with the hope and expectation that you will agree with me both as to the urgency of this matter and as to the appropriateness of using the Hereford Inlet Borrow Area. I look forward to hearing from you in that regard.

Sincerely,

Patrick Rosenello, Mayor
City of North Wildwood

cc (via e-mail): Governor Phil Murphy

MORIARTY EXHIBIT G

State of New Jersey

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Land Use Regulation
Mail Code 501-02A
P.O. Box 420
Trenton, New Jersey 08625-0420
www.nj.gov/dep/landuse

CATHERINE R. McCABE
Commissioner

July 10, 2019

City of North Wildwood
c/o Mr. Ronald Simone, City Administrator
901 Atlantic Avenue
North Wildwood, NJ 08260

RE: Freshwater Wetlands Letter of Interpretation: Line Verification – Portion of a Property
LUR File No.: 0507-03-0009.2
Activity Number: FWW 180001
Applicant: City of North Wildwood
Portion of Block and Lot: 317.03, 1
City of North Wildwood, Cape May County

Dear Mr. Simone:

This letter is in response to your request for a Letter of Interpretation to have Division of Land Use Regulation (Division) staff verify the boundary of the freshwater wetlands and/or State open waters on a portion of the referenced property.

In accordance with agreements between the State of New Jersey Department of Environmental Protection (NJDEP), the U.S. Army Corps of Engineers (USACE) Philadelphia and New York Districts, and the U.S. Environmental Protection Agency (USEPA), the NJDEP is the lead agency for establishing the extent of State and Federally regulated wetlands and waters. The USEPA and/or USACE retain the right to reevaluate and modify the jurisdictional determination at any time should the information prove to be incomplete or inaccurate.

Based upon the information submitted, and upon a site inspection conducted by Division staff on February 27, 2019 and March 11, 2019, the Division has determined that the wetlands and waters boundary line(s) as shown on two (2) sheets entitled: "PLAN SHOWING FRESHWATER WETLANDS AND/OR STATE OPEN WATER, PORTION OF BLOCK 317.03 LOT 1, CITY OF NORTH WILDWOOD, CAPE MAY COUNTY, N.J." dated October 2, 2018 and prepared by Van Note-Harvey Associates.

1. "NORTH WILDWOOD LIFEGUARD STATION" (Sheet 1 of 1), unrevised; and
2. "LOU BOOTH AMPHITHEATRE AT HEREFORD INLET PARK" (Sheet 1), last revised on May 31, 2019.

The freshwater wetlands and waters boundary line(s), as determined in this letter, must be shown on any future site development plans. The line(s) should be labeled with the above file number and the following note: "Freshwater Wetlands/Waters Boundary Line as verified by NJDEP"

Wetlands Resource Value Classification ("RVC")

The Division has determined that the resource value and the standard transition area or buffer required adjacent to the delineated wetlands are as follows:

Intermediate: WH-1 thru MH-13 and WG-1 thruWG-4C. [50 foot wetland buffer]

The Department has determined that the wetlands labeled as WH-1 thru MH-13 on the provided plan are isolated. RVC may affect requirements for wetland and/or transition area permitting. This classification may affect the requirements for an Individual Wetlands Permit (see N.J.A.C. 7:7A-9 and 10), the types of Statewide General Permits available for the property (see N.J.A.C. 7:7A-5 and 7) and any modification available through a transition area waiver (see N.J.A.C. 7:7A-8). Please refer to the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 et seq.) and implementing rules for additional information.

Wetlands resource value classification is based on the best information available to the Division. The classification is subject to reevaluation at any time if additional or updated information is made available, including, but not limited to, information supplied by the applicant.

General Information

Pursuant to the Freshwater Wetlands Protection Act Rules, you are entitled to rely upon this jurisdictional determination for a period of five years from the date of this letter unless it is determined that the letter is based on inaccurate or incomplete information. Should additional information be disclosed or discovered, the Division reserves the right to void the original letter of interpretation and issue a revised letter of interpretation.

Regulated activities proposed within a wetland, wetland transition area or water area, as defined by N.J.A.C. 7:7A-2.2 and 2.3 of the Freshwater Wetlands Protection Act rules, require a permit from this office unless specifically exempted at N.J.A.C. 7:7A-2.4. The approved plan and supporting jurisdictional limit information are now part of the Division's public records.

Please be advised that any surface water features on the site or adjacent to the site may possess flood hazard areas and/or riparian zones and development within these areas may be subject to the Flood Hazard Area Control Act rules at N.J.A.C. 7:13. The Division can verify the extent of flood hazard areas and/or riparian zones through a flood hazard area verification under the application procedures set forth at N.J.A.C. 7:13-5.1.

This letter in no way legalizes any fill which may have been placed, or other regulated activities which may have occurred on-site. This determination of jurisdiction extent or presence does not make a finding that wetlands or water areas are "isolated" or part of a surface water tributary system unless specifically called out in this letter as such. Furthermore, obtaining this determination does not affect your responsibility to obtain any local, State, or Federal permits which may be required.

Recording

Within 90 calendar days of the date of this letter, the applicant shall submit the following information to the clerk of each county in which the site is located, and shall send proof to the Division that this information is recorded on the deed of each lot referenced in the letter of interpretation:

1. The Department file number for the letter of interpretation;

2. The approval and expiration date of the letter of interpretation;
3. A metes and bounds description of the wetland boundary approved under the letter of interpretation;
4. The width and location of any transition area approved under the letter of interpretation; and
5. The following statement: "The State of New Jersey has determined that all or a portion of this lot lies in a freshwater wetland and/or transition area. Certain activities in wetlands and transition areas are regulated by the New Jersey Department of Environmental Protection and some activities may be prohibited on this site or may first require a freshwater wetland permit. Contact the Division of Land Use Regulation at (609) 292-0060 or http://www.nj.gov/dep/landuse for more information prior to any construction onsite."

Failure to have this information recorded in the deed of each lot and/or to submit proof of recording to the Division constitutes a violation of the Freshwater Wetlands Protection Act rules and may result in suspension or termination of the letter of interpretation and/or subject the applicant to enforcement action pursuant to N.J.A.C. 7:7A-22.

Appeal Process

In accordance with N.J.A.C. 7:7A-21, any person who is aggrieved by this decision may request a hearing within 30 days of the date the decision is published in the DEP Bulletin by writing to: New Jersey Department of Environmental Protection, Office of Legal Affairs, Attention: Adjudicatory Hearing Requests, Mail Code 401-04L, P.O. Box 402, 401 East State Street, 7th Floor, Trenton, NJ 08625-0402. This request must include a completed copy of the Administrative Hearing Request Checklist found at www.state.nj.us/dep/landuse/forms. Hearing requests received after 30 days of publication notice may be denied. The DEP Bulletin is available on the Department's website at www.state.nj.us/dep/bulletin. In addition to your hearing request, you may file a request with the Office of Dispute Resolution to engage in alternative dispute resolution. Please see the website www.nj.gov/dep/odr for more information on this process.

Please contact Natalie Young of our staff by e-mail at Natalie.Young@dep.nj.gov or by phone at (609) 777-0454 should you have any questions regarding this letter. Be sure to indicate the Department's file number in all communication.

Sincerely,

Joslin C. Tamagno,
Environmental Supervisor, ES 4
Bureau of Urban Growth and Redevelopment
Division of Land Use Regulation

c: City of North Wildwood Construction Official
Mr. Ralph Petrella, Jr., Van Note-Harvey Associates, Agent (original)

MATTHEW J. PLATKIN
ATTORNEY GENERAL OF NEW JERSEY
R.J. Hughes Justice Complex
25 Market Street, P.O. Box 093
Trenton, NJ 08625-0093
Attorney for Plaintiff State of New Jersey
Department of Environmental Protection

By: Dianna E. Shinn (242372017)
Deputy Attorney General
(609) 376-2789

SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. * ____-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **CERTIFICATION OF COLLEEN KELLER IN SUPPORT OF PLAINTIFF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S ORDER TO SHOW CAUSE FOR PRELIMINARY INJUNCTION & TEMPORARY RESTRAINTS**

I, COLLEEN KELLER, of full age, certify and say:

1. I am the Assistant Director of the Wetlands and Coastal Resources Element within the Division of Land Resource Protection, Watershed & Land Management at the Department of Environmental Protection ("DEP"). I started my recent position in 2017 and my duties include, but are not limited to managing the two permitting Bureaus within the Division of Land Resource Protection ("DLRP"), specifically the Bureau of Coastal Permitting and the

Bureau of Freshwater Wetlands and Highlands Permitting. My primary responsibilities are to manage staff in the implementation of, and compliance with, the relevant State statutes and rules for the oversight/regulation of the State's wetlands and flood hazard areas, the Coastal Zone and Highlands. I am also the Federal Consistency Coordinator for New Jersey’s Coastal Zone Management Program, coordinating and confirming coastal consistency reviews and decisions regarding consistency with the Coastal Zone Management rules (“CZM Rules”).

2. Before I began this position in 2017, I was the Bureau Manager of the Bureau of Coastal Permitting. In this Bureau Manager position, I managed staff in the implementation of, and compliance with applicable statutes and rules for the protection of New Jersey’s coastal environment. Specifically, I was responsible for oversight of staff’s review and decisions regarding proposed project permit applications for Coastal Area Facility Review Act (“CAFRA”) Individual/General permits, Freshwater wetland permits, jurisdictional determinations and Federal Consistency requests.

3. I have worked for DEP for 24 years, after graduating from the University of Rhode Island with a Bachelor Arts in

Marine Affairs, and a Master's of Science from Antioch University in Resource Management and Administration.

4. I make this certification in support of the Department's request for a preliminary injunction and temporary restraints to halt North Wildwood ("NWW") from moving forward with installing a bulkhead as recently denied by the Department on October 12, 2022 in NWW's Emergency Authorization ("EA") application following the remnants of Hurricane Ian and in violation of numerous Department statutes as NWW does not have an approved permit to conduct such regulated activity.

5. This certification outlines NWW's pending 2020 bulkhead permit application and the deficiency correspondence from the Department to NWW regarding that pending permit application. It also describes the permitting process and why the technical review for a permit authorization is so critical under the Coastal Zone Management Rules ("CZM Rules"). It also describes the DLRP's response to NWW's October 5, 2022 EA request and my communications with NWW surrounding the EA request.

6. Attached to my certification is also a report from Jon Miller, Director of the New Jersey Coastal Protection Technical Assistance Service ("NJCPTAS") and Research Associate of the Stevens Institute of Technology. DLRP

consults with the Steven's Institute to review certain shore protection projects that have been proposed within the coastal environment to receive comment regarding the design, and if it that could cause additional unnecessary impact to the adjacent coastal system from a coastal engineering perspective. The Steven's Institute may provide input, suggested revisions based on the current site characteristics, and technology for potential alternative strategies for coastal defense.

NWW's 2020 Beach Front Bulkhead Project Application

7. On November 20, 2020, the Division of Land Resource Protection's Application Support Unit received a permit application submitted by NWW for the project known as the Beach Front Bulkhead Project to the Department requesting a permit pursuant to the CZM Rules, the Flood Hazard Area Control Act Rules, and the Freshwater Wetlands Protection Act Rules (hereinafter "2020 permit application"). Attached as **Exhibit A** is the November 17, 2020 permit application. The purpose of this project is for NWW to legalize the previously constructed bulkhead installed between 3rd and 5th Avenues and later extended between 5th and 13th Avenues. The project also seeks approval to install a proposed 4,658 linear foot steel bulkhead adjacent to the boardwalk between 13th and 25th Avenues.

This proposed steel bulkhead is part of the same area that NWW requested to install the bulkhead from 15th to 16th Avenues in the EA application from October 5, 2022. The 2020 permit application also indicates that the bulkhead from 13th to 25th Avenues will disturb wetlands between 13th and 15th Avenues. These are the freshwater wetlands located next to the Beach Patrol Building and NWW notes that mitigation will be required since the project will disturb wetlands in excess of .1 acres.

8. In the 2020 permit application, NWW notes that the construction of the 6,902 linear feet of steel bulkhead between 3rd and 25th Avenues is needed to protect NWW's infrastructure and private properties, and to prevent destruction of recreational land including wetlands and dunes as well as protect the beach from erosion. NWW also notes that the project "could be considered necessary to protect public health and safety." <u>See</u> page 9 of the 2020 permit application.

9. On December 3, 2020, the Department sent an email to the contractor preparing the 2020 permit application for NWW indicating that the Department is in receipt of the permit application. However, the application was missing information and was therefore, determined to be administratively incomplete. NWW did not submit the

required property owner's signature of Block 290.01, Lot 1, which is a parcel included in the project. In addition, NWW failed to submit the CAFRA newspaper notice as required. The Department provided NWW with thirty days to submit this missing information. To date, NWW has not submitted this information and as such the 2020 application remains administratively deficient. Attached as **Exhibit B** is a copy of the Department's deficiency notice sent on December 3, 2020.

10. A permit application must first be declared administratively complete before it can be assigned for technical review by the Department. During the technical review process, the Department may also request additional information from the applicant in order for the Department to render a decision on the permit application. This technical review is important to ensure that the principles of the CAFRA, the CZM Rules, and the Freshwater Wetlands Protection Act are complied with.

2022 EA Application

11. Around noon, on October 3, 2022, Peter Lomax of Lomax Consulting emailed the Department indicating that NWW was sustaining significant beach/dune losses as a result of the remnants of Hurricane Ian. Attached as **Exhibit C** is an email chain of correspondence from October 3 through

October 5, 2022 between DEP and Mr. Lomax regarding the storm damage in NWW following Ian, including Mr. Lomax's noon October 3, 2022 email.

12. That same day, I responded to Mr. Lomax's email indicating that any post-storm restoration or installation of any storm protection measures within regulated areas requires an Emergency Authorization ("EA") or a permit from the Department's Division of Land Resource Protection prior to the work. See **Exhibit C.**

13. On the evening of October 3, 2022, I received an email from Mr. Lomax indicating that NWW would be submitting an EA to protect the Beach Patrol Building located at 15th Avenue. Mr. Lomax provided several photos in his email including a view of the dune scarp at 15th Avenue in front of the Beach Patrol Building and a photo of the Beach Patrol Building. See **Exhibit C**.

14. The next day, October 4, 2022, I emailed Mr. Lomax indicating that the Department would expedite review of any submitted EA request. I also referenced the standards applicable to emergency post-storm restoration within the CZM rules, specifically, N.J.A.C. 7:7-10.3(b), which include the placement of clean fill material, alongshore transfer of sand on the beach, placement of rock, and the placement of sand-filled geotextile tubes.

I indicated that these measures should be considered before a proposed bulkhead, which could potentially increase erosion to adjacent areas. I reminded Mr. Lomax that no work should be completed until the Department decides if emergency work is immediately necessary due to the threat of the loss of life or property. See **Exhibit C**.

15. Then in the late evening on October 5, 2022, NWW submitted an EA request, which included among other relief, a request to install a bulkhead within the western dune in the area of 15th and 16th Avenues. I assisted my supervisor, Jennifer Moriarty, in making DEP's decision on NWW's EA application. See **Exhibit A** to the Certification of Jennifer Moriarty for the EA request, which is also been attached as **Exhibit C-1**. I have assisted with the review of EA requests within New Jersey's coastal region for the last 22 of my 24 years at DLRP. To my knowledge, NWW was the only coastal town that requested a bulkhead in an EA request following the remnants of Ian.

16. Immediately upon DEP's receipt of the EA application, I reviewed the submitted information from NWW including the photographs of the area of 15th Avenue. In the first photograph, you can see the dune in front of the Beach

Patrol Building. While there is some erosion of the dune and scarp, the Department determined, and I agree, that this erosion did not present an immediate threat to the loss of life or property, and therefore did not rise to an emergency situation warranting the installation of a bulkhead as proposed by NWW. There was still a significant amount of dune remaining as illustrated in this photograph offering protection to the Beach Patrol Building and the storage sheds in case of any future storms. Photograph 5 in the EA request, is a photograph of the Beach Patrol Building. NWW indicates that there is eroded dune scarp to the right edge behind the dune fencing in this area. However, this is not shown in this photograph and it is the Department's position that this photograph does not show an emergency situation threatening property or life that warrants the installation of a bulkhead pursuant to an EA authorization. Typically, an EA is proposed for emergency work that will be done within 10 days of the issuance date for immediate protection if necessary. A bulkhead would require significantly more time to plan, order and install and therefore, would not be considered an immediate emergency response. Nevertheless, despite determining that a significant amount of dune remained and that an emergency situation had not been demonstrated, out of an abundance of caution, DLRP approved the placement of jersey barriers as requested in the EA as a supplementary shore protection measure in an October 7, 2022 response to the EA application.

17. In the EA application, NWW included a hand drawn illustration of the location of the proposed bulkhead, which is located in the western portion of the dune from approximately 15th to 16th Avenues. The bulkhead appears to originate in the freshwater wetlands transition area to the north of the Beach Patrol Building and then is proposed extending south waterward of the Beach Patrol Building and the storage sheds with a proposed terminus near the unauthorized beach access point at 16th Avenue. This is the same location that DEP authorized the mobilization of jersey barriers on October 7, 2022, as requested by NWW in the EA. The location of the requested bulkhead is almost identical to NWW's request to install a bulkhead in this same exact area in its 2020 permit application.

18. When making decisions on an EA request, DEP needs to determine if there is a threat to life, severe loss of property, or environmental degradation exists or is imminent, and can only be prevented/ameliorated through a

regulated activity and is likely to occur/persist/worsen before a permit could be issued by the Department. N.J.A.C. 7:7-21.1. Based on the photographs submitted by NWW in the EA request, the aerial photograph taken by the Department after Ian, and the photographs taken by OCE following Ian, the Department determined that NWW did not meet any of the requirements for an emergency authorization for installing a bulkhead. See Certification of Erick Doyle. While NWW only focused on severe loss to property in its EA request, the Department does not believe that at the time of the EA request or currently that there is a severe threat of loss to the Beach Patrol Building or any other infrastructure in the area of 15th Avenue to warrant the installation of a bulkhead via emergency authorization in lieu of NWW fixing its deficient 2020 permit application for an identical bulkhead. The Department is committed to reviewing the 2020 permit application expeditiously if it is fixed by NWW. Additionally, the Department found that there was no threat to life or environmental degradation at the time of EA request or currently. While there was some scarp on the dune following Ian, no one should be walking on the dune and NWW has the responsibility of ensuring the same. Additionally, while Ian caused some erosion to the dune, the dune in this area actually held up well to the storm. As noted in my email from October 4, 2022 to Mr. Lomax the installation of a bulkhead may cause erosion to adjacent areas of the proposed bulkhead. This is why the Department stated in its October 12, 2022 denial of the bulkhead in the EA request that a complete technical review of the potential alternative shore protection measures must be conducted to determine if the proposed bulkhead is the solution that would have the least coastal impact on the adjacent system as required by the CZM rules, and that analysis is conducted in the review of NWW's 2020 permit application. The Department cannot proceed to that analysis until NWW fixes its administrative deficiencies in the pending 2020 permit application.

19. A shore protection measure such as a permanent bulkhead when no emergency situation exists pursuant to N.J.A.C. 7:7-21.1 needs to be reviewed pursuant to a CAFRA Individual Permit, similar to the pending 2020 permit application. This ensures such a measure is consistent with the goals of the CZM Rules as outlined at N.J.A.C. 7:7-1.1, along with ensuring consistency with the coastal engineering measures outlined in N.J.A.C. 7:7-15.11. This is why the Department later recommended

to NWW that it should cure its administrative deficiencies in the 2020 permit application so technical review could proceed, which has not happened to date. DEP DLRP and OCE have worked closely with NWW in the past to address its shore protection and beach replenishment concerns through the issuance of backpassing permits to allow the transporting and distribution of sand from the City of Wildwood to NWW. NWW has successfully conducted this backpassing activity for the last few years. NWW has not submitted significant information within the permit application to demonstrate why this is not a suitable alternative to the installation of a bulkhead. Hence, the need for NWW to submit addition information for the full technical review of the pending permit application.

20. On October 20, 2022, I sent an email to NWW's counsel and the Mayor of NWW indicating that if NWW proceeds with unauthorized activities, DEP would pursue immediate enforcement. Attached as **Exhibit D** is my October 20, 2022 email. I re-emphasized that the CZM Rules, N.J.A.C. 7:7-10.3(b), authorize certain emergency post-storm beach restoration activities that are designed to return the beach to its pre-storm conditions. Moreover, N.J.A.C. 7:7-10.3(b) does not contemplate hardening measures, such as the placement of a bulkhead. I also emphasized that

the public should not be accessing or walking in protected dune areas. Additionally, I reminded NWW that it does not have a current beach and dune maintenance permit to conduct post-storm maintenance. See also Exhibit C to the certification of Michele Kropilak.

21. On October 27, 2022, I sent an email to NWW's counsel requesting a meeting to discuss NWW's deficiencies in its pending 2020 permit application. I also requested that NWW prepare an alternatives analysis to the proposed bulkhead in the 2020 permit application because such an analysis is required by the CZM Rules, N.J.A.C. 7:7-15.11, and is missing in the 2020 permit application. Such an analysis will need to be considered by the Department during its technical review of the 2020 permit application. The Department thought requesting this analysis now would assist with speeding up NWW's 2020 permit application. However, to date, NWW has not responded to my email and no meeting has been set up to discuss these deficiencies. Attached as **Exhibit E** is my October 27, 2022 email.

Steven's Institute of Technology Report Regarding Erosion Analysis of the Dune System at 15th Avenue in NWW

22. Attached as **Exhibit F** is a report from Jon Miller, Director of NJCPTAS and Research Associate Professor at

the Stevens Institute of Technology. As described above, DEP consults with the Steven's Institute when additional engineering analysis is required for proposed projects. While DLRP does not traditionally consult with the Steven's Institute on EA requests, the Department reached out to Mr. Miller for his opinion on the recent erosion in the area of 15th Avenue. The Department wanted to make sure that his opinions from his prior letter in July 25, 2022 regarding the status of NWW's beachfront remained the same or if his opinions may have changed after his review of the beach/dune condition in this area following Hurricane Ian.

23. On July 25, 2022, Mr. Miller opined that NWW's shoreline from 13th to 25th Avenues remains healthy and that the dunes are well vegetated. He further opined that that the dune system in this area is adequate to protect upland infrastructure and the need for a continuous bulkhead is not apparent. He noted that the Beach Patrol Building at 15th Avenue is in a vulnerable area to erosion/breaching; however, he opined that other alternatives to a bulkhead should be considered in this area such as raising or relocating the Beach Patrol Building or filling breaks in the existing dune.

24. Following Ian, Mr. Miller's opinion is that Ian was a low-moderate level coastal storm. There were significant dune impacts due to the low nature of the beaches in NWW and the extended duration of the storm. Mr. Miller continues to support his prior opinion that the beaches between 13th and 25th Avenues remain robust enough to withstand immediate threats. Mr. Miller finds that two of the garage structures staged at 15th Avenue are at an increased risk of being undermined with only 72 feet of dune remaining.[1] This failure may be likely over the accumulation of impacts from a series of smaller storms. However, the Beach Patrol Building itself and the other landward garage structures are located landward of the equilibrium of the dune. Therefore, once the dune line straightens the rate of erosion will slow. The Beach Patrol Building is approximately 150 feet from the edge of the scarp of the dune. Mr. Miller finds that, "Although the building may eventually be threatened by an accumulation of storms, the fact that the building is set back 150 feet from the current edge and roughly 75 feet from the equilibrium dune line defining the accelerated erosion regime suggested that failure is not imminent."

---

[1] The garage storage sheds staged at 15th Avenue are illegally located and not approved. NWW has previously been notified to this effect by the Department. See Certification of Michele Kropilak.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Dated: 12/1/22

Digitally signed by Colleen Keller
Date: 2022.12.01 12:50:14 -05'00'

Colleen Keller
Assistant Director
Division of Land Resource Protection
Watershed & Land Management

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NJ Authorization #24GA28271300
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UPLOADED TO NJDEP ONLINE PORTAL

November 20, 2020

New Jersey Department of Environmental Protection
Division of Land Resource Protection
501 East State Street, 2nd Floor
Trenton, New Jersey 08625
Attn: Application Support

**RE: New Jersey Department of Environmental Protection (NJDEP)
Coastal Area Facilities Review Act (CAFRA) Individual Permit (IP) and Freshwater Wetlands (FWW) General Permits 6 (GP6) and 6A (GP6A)
Project: Beach Front Bulkhead
Applicant: City of North Wildwood
c/o Mr. Ronald Simone, City Administrator
901 Atlantic Avenue
North Wildwood, New Jersey 08260
Property Owner: Same
Portions of Block 289.03, Lot 1; Block 290.01, Lot 1; Block 291.01, Lot 1, Block 315.02, Lot 1; Block 316.02, Lot 1; Block 317.02, Lots 1 and 2; and Block 317.03, Lot 1
City of North Wildwood, Cape May County, New Jersey
VNHA #44693-400-21**

Dear Application Support:

On behalf of the City of North Wildwood, Van Note-Harvey Associates (VNHA) hereby submits a combined application for a CAFRA IP, and FWW GP6 and GP6A for the above referenced project. This submission will also address some of the comments made in the Notice of Violation letters dated June 6, 2020 and September 17, 2020.

In support of the application and in accordance with the Coastal Zone Management Rules (N.J.A.C. 7:7) and Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A), please find enclosed for your review (1) copy of a document, entitled "Combined CAFRA Individual Permit, and Freshwater Wetlands General Permits 6 and 6A Application," containing the following:

1. One (1) copy each of the NJDEP application checklists;

2. A completed Property Owner Certification form (Note minimal work is proposed on the Sportland Investments parcel on Block 290.01, Lot 1. A portion of the project is subject to a notice of violation. The form has been provided to Sportland Investments for endorsement, however it has not been returned. Due to the urgency of submitting this application to address the notice of violation, the application form is being submitted with only the City of North Wildwood's signature. We will provide a copy of the fully executed form when received from Sportland Investment.);

3. Verification of Public Notice, which includes the following:

   - One (1) completed Public Notice Form;
   - One (1) copy of the Clerk Notice Letter;
   - One (1) copy of a General Notice Letter;
   - One (1) copy of a certified list of property owners, including easements, within 200 feet of any proposed above ground structure that is part of the proposed development;
   - As the newspaper notice is being published on November 20, 2020, proof of publication will be provided under separate cover;
   - One (1) copy of the certified mail receipts as proof that the following individuals and/or government officials have been notified of this submission: City of North Wildwood Clerk, City of North Wildwood Environmental Commission, City of North Wildwood Construction Official, City of North Wildwood Planning Board, Cape May County Planning Board, Cape Atlantic Soil Conservation District, and all property owners, including easements, within 200 feet within 200 feet of proposed above ground structures;

4. One (1) copy of the City of North Wildwood tax maps, sheets numbered 17, 23, 61, 62, and 63 showing the approximate project location;

5. One (1) copy of portions of the United States Geological Survey (USGS) 2019 Quad Maps of Wildwood and Stone Harbor, New Jersey, showing the approximate project site and State Plane Coordinates;

6. One (1) copy of a Site Location Street Map, showing the approximate project site;

7. One (1) copy of each of the FEMA Flood Insurance Rate Maps (Map Nos. 34009C0306F, Effective 34009C0243F, both with the Effective Date of October 5, 2017) showing the approximate project site;

8. One (1) copy of a set of photographs and associated photo key maps of the project site;

9. One (1) copy of a NJDEP Office of Natural Lands Management Natural Heritage Database submission and subsequent correspondence (once the report is received it will be submitted to you);

10. One (1) copy of construction drawings showing existing conditions at the time of bulkhead construction for the portion of the project seeking after-the-fact approval;

11. One (1) copy of a report entitled: "City of North Wildwood Beach Management Plan for the Protection of Federally and State-Listed Species," dated December 2018;

12. One (1) copy of each of the NJDEP Notice of Violation letters dated June 6, 2020 and September 17, 2020.

13. One (1) copy of a NJDEP Letter of Interpretation for a portion of the Site.

14. One (1) copy of a combined Environmental Impact Statement and CAFRA/FWW Compliance Statement);

15. One (1) set of the plans prepared by VNHA, entitled:

    - "Plan of Proposed and Existing Beach Front Bulkhead," dated November 17, 2020, Sheet Nos. 1 through 3
    - "N.J.A.C. 7:7 and N.J.A.C. 7:7A Permit Plan of Beach Front Bulkhead," dated November 17, 2020, Sheet Nos. 4 and 5

16. One (1) copy of a Property Detail Report for each parcel showing property ownership; and

17. Qualifications of those who prepared this application.

Enclosed with the above-referenced documents, please find a Municipal Voucher in the amount of **$32,000.00** calculated as follows:

- CAFRA IP Review Fee: $3,000.00 x >110 acres = $30,000.00 (maximum fee for CAFRA IP)

- FWW GP 6 and 6A: $1,000.00 x 2 = $2,000.00

Please note that although the project is a major development as it will result in greater than 1 acre of land disturbance, we are requesting a waiver of stormwater review fees because the project is exempt from groundwater recharge, runoff quantity and water quality as the project is within an Urban Redevelopment area, located in a tidal flood hazard area and will result in less than ¼ acre of impervious surface, respectively.

Please return the completed Municipal Voucher to:

Van Note-Harvey Associates
Attn: Jim Verna, III
211 Bayberry Drive, Suite 2E
Cape May Court House, New Jersey 08210

This application was prepared by Erin Conversano and Sarah Wueschinski of VNHA in accordance with N.J.A.C. 7:7 and N.J.A.C. 7:7A.

Should you have any questions/comments or require additional information, please do not hesitate to contact this office.

Very truly yours,

John C. Ryder, P.E., P.W.S.
Vice President

EMC/tes
Y:\VNHADATA\PROJECTS\44693\PERMITS\NJDEP\CAFRA_WFD\SUBMISSION DRAFT\NJDEP COVER LETTER.DOC
Enclosures

ec w/encl: Ron Simone, City Administrator, City of North Wildwood (rsimone@northwildwood.com)
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JV / SLW / EMC

van note - harvey associates

- Since 1894 -

COMBINED ENVIRONMENTAL IMPACT STATEMENT AND COMPLIANCE STATEMENT PURSUANT TO N.J.A.C. 7:7 AND 7:7A

Beach Front Bulkhead Project
City of North Wildwood
Cape May County, New Jersey

Prepared For:
City of North Wildwood
901 Atlantic Avenue
North Wildwood 08260

VNHA #44693-400-21
November 17, 2020

103 College Road East, 3rd Floor, Princeton, NJ 08540
(609) 987-2323 • Fax (609) 987-0005
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INTRODUCTION

This Environmental Impact Statement was prepared by Van Note-Harvey Associates (VNHA), on behalf of the City of North Wildwood (the City), in accordance with the requirements of N.J.A.C. 7:7, Coastal Zone Management (the CZM) Rules, N.J.A.C. 7:13, Flood Hazard Area (FHA) Control Act Rules, and N.J.A.C. 7:7A, Freshwater Wetlands (FWW) Protection Act Rules. Contained herein is a detailed discussion of compliance with CZM, FHA and FWW rules that pertain to the proposed activities. The intent of this application is to obtain approval from the New Jersey Department of Environmental Protection (NJDEP) for the project known as the Beach Front Bulkhead Project (the Project).

The purpose of the Project is to legalize a previously constructed vinyl bulkhead adjacent to JFK Boulevard Beach Drive between 3rd and 5th Avenues and steel bulkhead between 5th and 13th Avenues; and, obtain approvals for a proposed steel bulkhead adjacent to the boardwalk between 13th and 25th Avenues.

Stormwater management addressing groundwater recharge, runoff quantity and water quality is not required per:

- N.J.A.C. 7:8-5.4 (a)2ii groundwater recharge requirement does not apply to projects within the "urban redevelopment area." The Project is located within a designated regional center per NJ GeoWeb and the Policy Map of the State Development and Redevelopment Plan.
- N.J.A.C. 7:8-5.4(a)3iv stormwater runoff quantity in tidal flood hazard areas, is not required as the increased volume of stormwater runoff will not increase flood damages below the point of discharge.
- N.J.A.C. 7:8-5.5 stormwater management measures will not be required for water quality control since the Project will not result in an additional one-quarter acre of impervious surface.

All project components will occur landward of the mean high water line.

The format of this report was prepared in accordance with the NJDEP Coastal Zone Management Rules at N.J.A.C. 7:7. The order of information provided herein is as required by N.J.A.C. 7:7. The below narrative addresses the requirements of a Coastal Area Facility Review Act (CAFRA) Individual Permit (IP). As impact to Flood Hazard Areas (FHA), Riparian Zone, Wetlands and Wetland buffers is required to be addressed under Subchapter 9 – Special Areas, compliance to N.J.A.C 7:13 and N.J.A.C. 7:7A is addressed below under Sections III.Q, R, and S, respectively. The project will also result in disturbance to wetlands and wetland transition areas, therefore a compliance statement addressing the requirements of Freshwater Wetland General Permit 6 and 6A is included below.

I. SITE SUMMARY

A. Project Location / Site Description

The location of the project is depicted on the USGS Site Location Map, Street Map and Tax Maps provided under Attachment 4.

The Project spans across the following parcels (the Site), of which a portion of has already been constructed, and a portion proposed:

Previously constructed bulkhead seeking after-the-fact approval from 3rd Avenue to 13th Avenue

- Block 317.03, Lot 1

Proposed bulkhead from 13th Avenue to 25th Avenue

- Block 289.03, Lot 1
- Block 290.01, Lot 1
- Block 291.01, Lot 1
- Block 315.02, Lot 1
- Block 316.02, Lot 1
- Block 317.02, Lot 1
- Block 317.02, Lot 2
- Block 317.03, Lot 1

The project is located adjacent to JFK Boulevard Beach Drive or the boardwalk and generally runs in the northeast/southwest direction. The Atlantic Ocean and beaches are located east and south of the Site. JFK Boulevard Beach Drive and the boardwalk is located west and north of the Site, followed by hotels, motels, commercial development and residential properties.

According to N.J.A.C. 7:7-1.5 the project is considered a “Linear development” and per N.J.A.C 7:8-1.2 the project is located within an “Urban Redevelopment Area” as the project area is identified as a Designated Center and a portion of it is within an Urban Enterprise Zone as depicted on NJ-GeoWeb and the Policy Map of the State Development and Redevelopment Plan dated August 8, 2019.

Site photographs and a photo key map for the Project are provided under Attachment 5.

B. Vegetation

The vegetation that exists within the project area consists of vegetated wetlands comprised of scrub/shrub and herbaceous species, and vegetated dunes. The location of the existing bulkheads and the location of the proposed bulkhead was/is proposed to minimize disturbance to vegetation to the greatest extent practicable, while also minimizing the disturbance to other environmentally sensitive areas. The majority of the Project is proposed adjacent to actively disturbed areas including the boardwalk and JFK Boulevard Beach Drive.

Any temporary disturbance to vegetation for proposed bulkhead will be restored upon the completion of the Project. The Project will also be restoring dunes and freshwater wetlands with plantings that were disturbed under the after-the-fact permitting.

C. Wildlife

The surrounding scrub/shrub and herbaceous vegetation, freshwater wetland communities, beach and Atlantic Ocean are areas that provide habitat and foraging opportunities for waterfowl, migrating birds, mammals and crustaceans. Additionally, these communities may serve as nesting, feeding, and/or resting locations for resident birds. For further discussion of threatened and endangered species, see below Section III.U.

Construction of the Project is located adjacent to JFK Boulevard Beach Drive, the boardwalk and the beach which at times are heavily used by the local and visiting community. For this reason, the permanent or temporary impacts of the construction activities are unlikely to negatively impact wildlife and/or their associated habitat. Although the adjacent freshwater wetlands, beach and dunes may provide habitat for wildlife, any species that may use these habitats will temporarily relocate to surrounding habitat and will return upon completion of the project.

D. Soils

According to the U.S. Department of Agriculture and Natural Resources Conservation Service, Custom Soil Research Report for Cape May County, approximately 81% of the Project is underlain by Hooksan Sand, beaches, 2 to 15 percent slopes, very frequently flooded (HorDr). The remaining 19% of the Project is underlain by Urban land-Psamments, wet substratum complex, 0 to 2 percent slopes, rarely flooded (USPSBR); and Beaches, 0 to 15 percent slopes, very frequently flooded (BEADV).

The Custom Soil Resource Report for the Project area is provided under Attachment 6 of this application.

E. Hydrology

The Site is relatively flat and ultimately drains to the Atlantic Ocean. Project improvements will help maintain current conditions in the long term by preventing erosion of the beach and infrastructure of the City.

F. Geology

Per the NJDEP online resource NJ-GeoWeb, the Site is underlain by the Unnamed Formation at Cape May (Tc) consisting of interbedded gravel, sand and clay, located within the Coastal Plain Physiographic Province. The bedrock aquifer of the Site is the Holly Beach water-bearing zone.

G. Water Quality

Water quality related to the project area can be described as consistent with that of a developed, mature coastal resort town. Per our knowledge of the project area and information listed on NJ-GeoWeb/NJDEP DataMiner, the Site and any properties immediately adjacent to the Site are not identified as containing historic fill and are not within the NJDEP Site Remediation Program.

H. Aquatic Species

Portions of the project area exist as freshwater wetlands and may contain aquatic species. The project is designed to minimize disturbance to freshwater wetlands and reduce the impact to aquatic species to the greatest extent possible. The project will ultimately prevent further erosion and destruction of the existing wetlands and beach.

I. Size, Nature, and Location of Proposed Development

The City proposes the construction of 496 linear feet of vinyl bulkhead and 6,902 linear feet of steel bulkhead generally between 3rd and 25th Avenues (the Project).

Construction of the bulkheads is required to protect City infrastructure and private properties, and aid in preventing the destruction of recreational land including wetlands, dunes and the beach from continued erosion.

The Project will result in approximately 189,563 square feet (4.352 acres) of land disturbance and 749 square feet (0.0172 acres) of impervious surface. Specific details of the Project are shown on the drawings contained in Attachment 13 and discussed in further detail below in Section II.A.

J. Additional Approvals Required/Received

Construction of the Project will require approvals from various State and County agencies. The list below outlines the anticipated land development approvals required:

- NJDEP CAFRA Individual Permit;
- FWW General Permits 6 and 6A;
- NJDEP Stormwater General Permits; and
- Cape-Atlantic Soil Conservation District Soil Erosion and Sediment Control Plan Certification.

II. PROJECT DESCRIPTION

A. Description of Development

The Project as described in Section I.I above involves the construction of 496 linear feet of vinyl bulkhead and 6,902 linear feet of steel bulkhead. A portion of the Project has already been constructed and seeks after-the-fact approval for the existing bulkhead, and the rest will be for proposed work for a future bulkhead. A detailed description of the Project components is discussed below:

1. Previous Constructed Bulkhead Seeing After-the-Fact Approval

a) Vinyl bulkhead from 3rd to 4th Avenues

- The approximate 229 linear foot vinyl bulkhead between 3rd and 4th Avenues was installed in 2012, waterward of the existing timber bulkhead.
- The vinyl bulkhead was constructed upland of the mean high water line (MHWL) at elevation 1.99 feet.
- The bulkhead was constructed as a linear expansion to the existing timber bulkhead located from 2nd to 3rd Avenue.
- The bulkhead was topped with 2” x 6” timber decking laid boardwalk style.

- The vinyl sheet piles are 16' long.
- A 8" x 8" greenheart wale was installed to the waterward side of bulkhead.
- The elevation of the vinyl bulkhead is +11.7 feet at the top of the timber decking.
- Additional improvements include the construction of an approximate, the removal of the existing ramp and steps, and filling of void between this bulkhead and existing bulkhead with concrete.

b) **Vinyl bulkhead from 4th to 5th Avenues**

- The approximate 267 linear foot vinyl bulkhead between 4th and 5th Avenues was installed in 2017-2018, waterward of the existing timber bulkhead.
- The vinyl bulkhead is located upland of the MHWL.
- The bulkhead was capped with 2" x 6"' copper azole timber decking.
- The vinyl sheet piles are 20' long.
- A 8" x 8" greenheart wale was installed to waterward side of bulkhead.
- The bulkhead was connected to the existing vinyl bulkhead from 3rd to 4th Avenue.
- An 8" x 8" greenheart wale was constructed from 3rd to 5th Avenue, and is discussed above
- The elevation of this bulkhead is +12 feet at the top of the timber decking.
- Beach was restored to existing conditions after construction.

c) **Steel bulkhead from 5th to 7th Avenues**

- The approximate 630 linear foot steel bulkhead 5th and 7th Avenues was installed in 2017-2018 upland of the MHWL.
- The bulkhead was capped with 2" x 6"' copper azole timber decking.
- The steel sheet piles are 35' long.
- The bulkhead was installed within two prior dune areas, one at 5th Avenue and one at 7th Avenue. Dune was restored to existing conditions.

- The elevation of this bulkhead is +12' at the top of the timber decking.

d) **Steel bulkhead from 7th to 13th Avenues**

- The approximate 1,614 linear foot steel bulkhead between 7th and 13th Avenues was installed in late 2019 to March 2020, along the oceanfront within areas of beach, dune, freshwater wetlands and wetland buffer areas.
- All work associated with installation of the steel bulkhead was done upland of the MHWL.
- Work completed near 7th Avenue was done in the dune area.
- The bulkhead between 8th and 10th Avenues was constructed within wetland buffers to minimize disturbance to wetlands.
- The bulkhead between 10th to 13th Avenues was generally constructed within wetlands with the exception of wetland buffer at the beach access points.
- Beach was restored to existing conditions following construction of bulkheads.
- Bulkhead was constructed of coated steel and consisted of 35' long sheets piles.
- Bulkhead was capped with 2" x 6" copper azole timber decking laid boardwalk style.
- The elevation of this bulkhead is +12 feet at the top of the timber decking.

A copy of the construction drawing showing existing conditions at the time of construction are provided under Attachment 8.

2. **Proposed Bulkhead Construction**

a) **Steel bulkhead from 13th to 25th Avenues**

- An approximate 4,658 linear foot steel bulkhead from 13th Avenue to 25th Avenue through/adjacent to the dunes is proposed upland of the MHWL.
- An 8 foot wide timber/composite walkway is proposed parallel to the boardwalk on the landward side of the bulkhead between 22nd and 23rd Avenue, connecting existing composite decks with foot showers.
- Improvements include removal and replacement of ADA compliant beach access walkways at 23rd and 24th Avenues.

- The proposed bulkhead at 13th Avenue will connect to an existing bulkhead and will result in disturbance to wetlands between 13th to 15th Avenues, with the exception of wetland buffer at the beach access points.

The purpose of the Project is to protect the infrastructure of the City, including the roads, walkways, utilities and private property, in addition to preventing further destruction of the beaches, dune system and wetlands from the severe erosion. The Project could be considered necessary to protect public health and safety. An eroding beach is a hazard for walking and can cause people to trip and sustain injuries. Further, if unmitigated erosion continues over a period of time, the street could be impacted. Exposed pipes and jagged concrete would be a health and safety concern, as they could cause injury and exposed pipes could cause damage to infrastructure.

Permanent disturbance is very minimal for installation of the bulkhead while other disturbances are temporary in nature and only during construction of the bulkhead.

Per N.J.A.C. 7:8-5.4 and 5.5 stormwater management is not required since the Project is within an urban redevelopment area, tidal flood hazard area that will not increase flood damages below the point of discharge and proposes less than ¼ acre of impervious surface.

The previously constructed and proposed bulkheads are designed close to JFK Boulevard Beach Drive and the boardwalk to minimize disturbance to environmentally sensitive areas to the greatest extent practicable. There are no prudent or feasible alternatives to the existing bulkheads that would have caused any less disturbance, nor are there any prudent or feasible alternatives to the proposed bulkhead that would cause any less disturbance. An alternative analysis is discussed below under Section II.B. The Project does not propose disturbance to any unique or irreplaceable areas.

The location of the bulkhead at and around 5th Avenue was selected to protect the existing bike path and storm drain infrastructure from the severe vibration and subsequent adverse effects from driving the sheet piling, and also to keep the bulkhead far enough away from the impacts of wave splash over. Waves splashing over the bulkhead cause severe scouring and washout. Such conditions would destroy the bike path and could damage the storm drainage system if the scouring and washout occurs adjacent thereto.

The alignment of the bulkhead at 5th Avenue also took into consideration a proposed extension of the seawall from 3rd to 5th Avenues. The proposed extended seawall will provide coastal protection including but not limited to de-energizing waves.

These same factors were also taken into consideration for the balance of the bulkhead. The bulkhead was constructed as close to the bike path and storm drainage system as possible, without destroying the same during construction, and while providing adequate space and separation should waves come in direct contact with the bulkhead.

Project disturbance to freshwater wetlands, wetland transition area and CAFRA is summarized in the below table and is depicted on the permit plans provided under Attachment 13:

TABLE OF PROPOSED NJDEP REGULATED DISTURBANCES	PROPOSED BULKHEAD	PREVIOUSLY CONSTRUCTED/ EXISTING BULKHEAD	TOTAL
DISTURBANCE TO FRESHWATER WETLANDS UNDER GP 6	9,553 SQ.FT. (0.219 ACRES)	8,498 SQ.FT. (0.195 ACRES)	18051 SQ.FT. (0.414 ACRES)
DISTURBANCE TO FRESHWATER WETLANDS TRANSITION AREAS UNDER GP 6A	847 SQ.FT. (0.019 ACRES)	19,638 SQ.FT. (0.451 ACRES)	20,485 SQ.FT. (0.470 ACRES)
DISTURBANCE TO FRESHWATER WETLAND TRANSITION AREA PROPOSED UNDER AN ACCESS WAVIER	36,843 SQ.FT. (0.846 ACRES)	18,199 SQ.FT. (0.418 ACRES)	55,042 SQ.FT. (1.264 ACRES)
DISTURBANCE TO CAFRA AREA UNDER INDIVIDUAL PERMIT	111,679 SQ.FT. (2.674 ACRES)	77,884 SQ.FT. (1.79 ACRES)	189,563 SQ.FT. (4.352 ACRES)

B. Discussion of Project Alternatives

The following discussion addresses possible alternatives to the Project and addresses their feasibility.

Following is a discussion of alternatives for the Project.

Alternatives include:

1. Placing the bulkhead in a different location

The Project is designed to mainly run adjacent to JFK Boulevard Beach Drive and the boardwalk, only excluding areas where that is impossible due to existing structures, in which case the Project wraps around these structures. It is not possible to construct the Project landward of its proposed location without negatively impacting existing roads, paths, sidewalks, utilities, and private property. If the Project was constructed waterward of the proposed location, it would cause a significant amount of disturbance to the beach, dune and wetland habitats. The current location of the Project is designed to avoid disturbance to these environmentally sensitive areas to the greatest practicable extent. Therefore, construction of the bulkhead at a different location is not a feasible alternative.

2. Constructing bulkhead with fewer linear feet

Creating a shorter bulkhead is not feasible because it would not properly protect the City's infrastructure and private properties, and prevent further destruction of the beach, dunes and/or wetlands from erosion. Therefore, construction of a shorter bulkhead is not a feasible alternative.

3. No build alternative

If the bulkheads were not constructed, the City infrastructure and upland private properties would be left vulnerable to the effects of erosion that has been ongoing for years. The severe erosion has left hazardous conditions behind, creating unsafe conditions to the local and visiting community. For this reason, some of the bulkhead has already been constructed on an emergency need.

The no-build alternative is considered appropriate only when severe environmental impacts will result from a project. The only significant environmental impact that will result from the project is the disturbance to 0.414 acres of freshwater wetlands under FWW GP6, 0.470 acres of wetland transition area under FWW GP6A and 1.264 acres of wetland transition area under an access waiver. All disturbance is located immediately adjacent to JFK Boulevard Beach Drive and the boardwalk in a heavily used area of the City. Disturbance to freshwater wetlands will be mitigated for. Therefore, the no-build alternative preventing construction of the remaining section of the bulkhead is not a feasible alternative.

III. DISCUSSION OF SPECIAL AREAS

The following discussion addresses the Special Areas that are applicable to the Project.

A. N.J.A.C. 7:7-9.2 – Shellfish Habitat

According to Distribution of Shellfish Resources in Relation to the New Jersey Intracoastal Waterway, Longport to Cape May map, dated January 1963, the Project area is mapped as hard clam high value commercial. According to NJDEP NJ-GeoWeb, waters located southeast of the Project area are classified as "Prohibited" (shellfish harvesting not allowed). These waters are identified as having water quality that is impaired due to various non-point sources of pollutants and are not considered ideal shellfish habitat. No in-water work is proposed under other than during storm conditions, as the Project is located landward of the spring high water line (SHWL) and MHWL. The Project was designed to be adjacent to the boardwalk to the greatest extent practicable. For these reasons, the Project is unlikely to have a negative impact on shellfish habitat.

B. N.J.A.C. 7:7-9.3 – Surf Clam Areas

According to NJDEP NJ-GeoWeb, the Project is not located within a coastal water. According to N.J.A.C. 7:7-9.3, surf clam areas are coastal waters which can be demonstrated to support significant commercially harvestable quantities of surf clams (*Spisula solidissima*), or areas important for recruitment of surf clam stocks, including areas where fishing is prohibited for research sanctuary or conservation purposes. Thus, the Project will not have a negative impact on any surf clam areas.

C. N.J.A.C. 7:7-9.4 – Prime Fishing Areas

According to NJDEP Specific Sport Ocean Fishing Grounds Map, the Project is not within a prime fishing area. Therefore, the Project activities will not negatively impact recreational or commercial fishing.

Furthermore, the alignment of the previously constructed bulkhead at and around 5th Avenue was selected in order to protect the existing bicycle path and storm drainage infrastructure, and took into consideration the proposed extension of the seawall south to 5th Avenue. As a byproduct of constructing at this location, another public water front activity, fishing, is created during high tide conditions. Refer to Photo #6 provided under Attachment 5 showing the local community fishing at this location,

D. N.J.A.C. 7:7-9.5 – Finfish Migratory Pathways

According the New Jersey Anadromous Fish Inventory, dated January 6, 1977, Mill Creek at the Magnolia dam is a confirmed alewife (*Alosa pseudoharengus*) spawning run which is approximately 14 miles northeast of the Project site at its closest point. According to the Estimated Range of Atlantic Sturgeon (*Acipenser oxyrinchus*) map provided on the NOAA Fisheries Greater Atlantic Region website, the project area is identified as being an accessible waterway for the Atlantic Sturgeon. As the Project is located above the MHWL, no impact to finfish migratory pathways is anticipated.

E. N.J.A.C. 7:7-9.6 – Submerged Vegetation Habitat

Per The New Jersey Submerged Aquatic Vegetation Distribution Atlas Final Report, dated December 15, 1979, from Cape May north to Great Bay, where marshes generally extend all the way to the barrier islands, only the algal species, almost exclusively, *Ullva lactuca*, are found in the shallows of the myriad of bays, sounds, and channels. However, the extensive protected shallows behind the barrier beaches provide an ideal environment for vast Submerged Aquatic Vegetation (SAV) beds. New Jersey SAV is characterized by less diversity of vascular species than that found in the less saline Maryland regions of the Chesapeake Bay.

According to the New Jersey Submersed Aquatic Vegetation Distribution – 1979 map for Wildwood published by the NJDEP, no SAV beds are located in the area of the proposed Project and therefore no adverse impact to SAVs is proposed.

F. N.J.A.C. 7:7-9.7 – Navigation Channels

The Site is located on the Atlantic side of North Wildwood. The Project does not propose any work that would affect a navigation channel and will have no adverse effects to navigation channels.

G. N.J.A.C. 7:7-9.8 – Canals

The Project does not propose any activities within a canal.

H. N.J.A.C. 7:7-9.9 – Inlets

Hereford Inlet is located approximately 0.25 miles northeast of the Site at its closest point. Therefore, the Project does not propose any disturbance to Hereford Inlet.

I. N.J.A.C. 7:7-9.12 – Submerged Infrastructure Routes

There is no proposed disturbance to any submerged infrastructure routes for the proposed bulkhead construction, although there may be some modification to utilities during construction of the Project. Specifically, at the Sportland Pier (Block 290.01, Lot 1), the existing utilities will need to be cut off going into the pier, the bulkhead installed, core the bulkhead at select locations and reinstall the utilities.

J. N.J.A.C. 7:7-9.15 – Intertidal and Subtidal Shallows

The intertidal and subtidal shallows zone is the area from the spring high water line to a depth of 4 feet below the mean low water line. The spring high water and mean low water at the Site are approximately 2.43 feet above sea level and -2.86 feet below sea level, respectively. As the Project is upland of elevation 2.43, the Project will not be within the intertidal and subtidal shallows zone.

K. N.J.A.C. 7:7-9.16 – Dunes

The previously constructed steel bulkhead from 5th to 7th Avenue was installed within a prior beach and dune area, and the previously constructed steel bulkhead from 7th to 13th Avenue was installed within a prior dune and freshwater wetlands area. Per N.J.A.C. 7:7-

9.16, an acceptable activity includes shore protection structures which meet the coastal engineering rule at N.J.A.C. 7:7-15.11. The Project is designed to be in compliance with N.J.A.C. 7:7-15.11, which is discussed in Section VIII.B below. Furthermore, the Project is designed to reduce its impact on dunes, as well as other environmentally sensitive areas. As discussed above in Section II.B, there is no feasible alternative that would result in less disturbance to beach, dune and/or freshwater wetland habitat. The current location of the Project is designed to avoid disturbance to the greatest practicable extent.

L. N.J.A.C. 7:7-9.17 - Overwash Areas

An overwash area is an area subject to accumulation of sediment that is deposited landward of the beach or dune by the rush of water over the crest of the beach berm or dune. As the City's Atlantic coastline has been experiencing severe erosion since at least 1991 to present day, the overwash areas have been encroaching closer to the City's roads and recreational amenities generally from 3rd to 13th Avenues.

The location of the previously constructed bulkhead at 5th Avenue was selected in order to project the existing bicycle path and storm drainage infrastructure from the severe vibration and subsequent adverse effects from driving the sheet piling during construction and also to keep the bulkhead far enough away from the infrastructure that it is protected during storm events from wave splash over. Waves splashing over the bulkhead cause severe scouring and washout. Such conditions would destroy the bike path and could damage the storm drainage system if the scouring and washout occurs adjacent thereto. The alignment of the bulkhead also took into consideration the proposed extension of the seawall south to 5th Ave. Seawalls are intended to provide coastal protection including but not limited to de-energizing waves (knocking the waves down before they crash into a vertical wall resulting in splash over and severe scouring and washout). Since the seawall was proposed to 5th Avenue, adequate space between the bulkhead and the critical infrastructure is required since it was extremely probable waves would be crashing directly into the new bulkhead.

Portions of the Project exist within overwash areas. As discussed under Section II.B above there is no feasible alternative to the Project in an area other than the overwash area at 5th Avenue while taking into account the location of existing dunes, wetlands and/or the proposed seawall, and the severe erosion the City's coastline was experiencing. Although the location of the bulkhead will disturb the beach and dune systems, it is minimized to the greatest extent practicable. The City will be restoring the beach/dune systems under a separate project, therefore significant adverse long-term impacts on the natural functioning of the beach and dune system is not anticipated.

Since the Project is a shore protection structure, it is an acceptable activity as long as the coastal engineering rule at N.J.A.C. 7:7-15.11(g) is met. See Section VIII.B below for compliance to Coastal Engineering.

M. N.J.A.C. 7:7-9.18 - Coastal High Hazard Areas

Coastal high hazard areas are flood prone areas subject to high velocity waters (V zones) as delineated on the FEMA FIRM Flood Insurance Rate Map numbers 34009C0243F and 34009C0306F, effective date October 5, 2017. The Project is located in the following zones:

- From 3rd to 5th Avenues, the Project is located within flood zone AE, elevation 10 with the exception of a small area at 3rd Avenue which is within flood zone VE, elevation 11.
- From 5th to 7th Avenues, the Project is located within flood zone VE, elevation 11.
- From 7th to 13th Avenues, the Project is located within flood zone AE, elevation 10.
- From 13th to 15th Avenues, the Project is located within flood zone AE, elevation 11.
- From 15th to 25th Avenue, the Project is located within zone VE, elevation 12.

The majority of the Project is located within FEMA flood zone VE, elevations 11 and 12 feet. The limit of moderate wave action generally runs along JFK Boulevard Beach Drive from 3rd to 15th Avenues and then west of the boardwalk from 16th Avenue to the Project terminus.

As the area directly waterward of the boardwalk from 15th to 25th Avenues, and the area directly waterward of the current elevated beach area from 5th to 7th Avenues, are within flood zone VE, the proposed Project had/has to be constructed within a coastal high hazard area otherwise it will not serve the purpose of protecting the upland improvements include the boardwalk, commercial and private properties, utilities, etc. The Project is not a residential development or commercial development but rather public development since the activities are located on a beach or dune. The Project is located within a highly developed portion of the City, and the purpose of the Project is to protect the beach and city infrastructure from erosion, thus protecting people and property from the negative impacts of flooding and coastal storms.

A FEMA FIRM map for the Project area is provided under Attachment 4 and is depicted on the plans provided under Attachment 13.

N. N.J.A.C. 7:7-9.19 – Erosion Hazard Areas

Erosion hazard areas are shoreline areas that are eroding and/or have a history of erosion, causing them to be highly susceptible to further erosion, and damage from storms. The Atlantic coastline of the City has been experiencing severe erosion since at least 1991, therefore, the Project is located within an Erosion hazard area. The City is experiencing lack of beaches, lack of beaches at high tide, narrow beaches, foreshore extended under the boardwalk, low dunes or no dunes, escarped foredunes, exposed bulkheads and high long-term erosion rates. The purpose of the Project is to protect the City's infrastructure and the surrounding commercial and private properties from the impacts of the continued erosion. As the Project complies with the location on linear development rule and coastal engineering rule for shore protection structures, it is an acceptable activity. See Sections VII.A and VIII.B below for compliance to location of linear development and coastal engineering, respectively.

O. N.J.A.C. 7:7-9.20 - Barrier Island Corridor

All Project components are located on the oceanfront barrier island corridor. All work is related to the construction of the bulkheads to protect the barrier island corridor from further erosion and destruction. All work is proposed adjacent to JFK Boulevard Beach Drive and the boardwalk to the greatest extent possible. As the Project complies with the requirements for impervious cover and vegetative cover, it is an acceptable activity. See Section VI below.

P. N.J.A.C. 7:7-9.22 - Beaches

The previously constructed bulkhead from 3rd to 7th Avenues was constructed within a prior beach and/or dune area, the previously constructed bulkhead from 7th to 13th Avenue was constructed within a prior freshwater wetland/wetland buffer and/or beach areas and the proposed bulkhead will be constructed within beaches, wetland buffers and/or adjacent to dunes. As the Project has no prudent or feasible alternative in an area other than a beach, will not cause significant adverse long term impacts to the natural functioning of the beach and dune system, is a shore protection structure and is a linear development, it is an acceptable activity. See Section II.B above for an analysis of project alternatives, and Sections VII.A and VIII.B below for compliance to location of linear development and coastal engineering, respectively.

The alignment of the bulkhead was chosen to minimize disturbance to the beach to the greatest extent practicable.

Q. N.J.A.C. 7:7-9.25 - Flood Hazard Areas

The FEMA Flood Insurance Rate Map (FIRM) mapping identifies the Site predominated within FEMA flood zone AE, elevations 10 and 11 feet, with the exception of the stretch of proposed bulkhead from 15th to 25th Avenues, which is located within the FEMA flood zone VE, elevation 12 feet.

The Project will not prevent or restrict potential water-dependent use in the FHA within 100 feet from the Hereford Inlet as the Project is located 0.25 miles away from the inlet, and is therefore allowed under N.J.A.C. 7:7-9.25(e).

N.J.A.C 7:7-9.25(f) requires that development in flood hazard areas shall conform with the applicable design and construction standards of The Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., implementing rules at N.J.A.C. 7:13, except in lands regulated under the Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq., pursuant to N.J.S.A. 58:16A-60; the Uniform Construction Code, N.J.A.C. 5:23; and the Federal flood reduction standards, 44 C.F.R. Part 60.

N.J.A.C. 7:7-9.25(h), compliance with endangered or threatened wildlife or plant species habitats requirements is addressed below in Section III.U below.

The overall Project will result in an increase in site impervious coverage of approximately 0.0172 acres and site disturbance of approximately 4.352 acres.

No activities are proposed in a channel, in the riparian zone, or in a floodway.

1. Project Design and Construction Techniques

a) Design Techniques

See Section II.A above for a description of existing and proposed design techniques for the Project.

b) Construction Techniques

Construction techniques for the existing and proposed construction are governed by a Soil Erosion and Sediment Control (SESC) Plan developed in accordance with "Standards for Soil Erosion and Sediment Control in New Jersey" and approved by the Cape Atlantic Conservation District. SESC measures will include:

- Removal of vegetation will be the minimum practicable to achieve the approved project design.
- Proper land grading techniques will be conducted to protect against soil loss from erosion, enhance establishment of permanent vegetative cover and help properly manage stormwater runoff, all of which will reduce site discharge of pollutants.
- A stabilized construction access point will be established.
- For proposed construction at both piers at 22nd Avenue and 23rd to 24th Avenues, a section of the pier will be removed, then all utilities to the piers will be cut. Bulkhead will then be cored to reinstall/reconnect the utilities, then section of the pier removed adjacent to the boardwalk will be replaced/reconstructed.
- For proposed construction at both piers, crane will be situated on the beach on each side of the pier to drive the sheet piling. This is the reason the LOD for the Project is larger near the piers.
- For installation of the existing bulkhead between 3rd and 5th Avenues, the crane operated from the street.

2. Riparian Zone Disturbance and Compliance with N.J.A.C. 7:13-11.2 (Reference FHA IP Checklist, Item 8iii)

The Project is not located within a riparian zone, see Section III.R below. No riparian zone disturbance is proposed for the Project.

3. Analysis of Potential Temporary and/or Permanent Adverse Environmental Impacts (Onsite or Offsite) on Regulated Waters, Channels, Riparian Zones, Fishery Resources, and Threatened & Endangered Species and their Habitat

a) **A justification for the proposed regulated activity or project, including an explanation of why any proposed regulated activity or project and its location is the most appropriate for the site, and how the proposed location and design minimizes adverse environmental impact(s) to the resources.**

See Section II.A above providing a description of development.

b) **An analysis of alternatives to the proposed regulated activity or project, including a no-build alternative.**

See Section II.B above for a discussion of project alternatives.

c) **A description of all measures to be taken to reduce any potential adverse environmental impact(s) to the resources.**

See Sections II.A and B. above justifying the Project location and how it minimized impact to environmentally sensitive areas.

d) **A plan to mitigate the effects of all adverse environmental impacts.**

A restoration/mitigation plan will be provided under separate cover for disturbance to wetlands, dunes and/or beach as required.

e) **Any monitoring or reporting methods that will be used.**

Monitoring or reporting methods for any restoration/mitigation will be provided under separate cover. However, no mitigation is anticipated for disturbance to FHA.

4. **Mitigation**

Per N.J.A.C. 7:13-13, FHA mitigation compensates for the loss or disturbance of riparian zones. The Project does not propose loss or disturbance of riparian zones. Therefore, mitigation is not required for FHA compliance.

5. **Area Specific Requirement for Individual Permits, Requirements for a Regulated Activity in a Channel at N.J.A.C. 7:13-11.1**

The Project is not located within a channel.

6. **Area Specific Requirement for Individual Permits, Requirements for a Regulated Activity in a Riparian Zone at N.J.A.C. 7:13-11.2**

The Project is not located in a Riparian Zone.

7. **Area Specific Requirement for Individual Permits, Requirements for a Regulated Activity in a Floodway at N.J.A.C. 7:13-11.3**

Per N.J.A.C. 7:13-2.3, the Atlantic Ocean and other non-linear tidal waters such as bays and inlets do not have a floodway. Thus, the Project is not located in a floodway.

8. **Area Specific Requirement for Individual Permits, Requirements for a Regulated Activity in a Flood Fringe at N.J.A.C. 7:13-11.4**

Per N.J.A.C. 7:13-2.3, the Atlantic Ocean and other non-linear tidal waters such as bays and inlets do not have a floodway. Therefore, the entire flood hazard area along these tidal waters is considered to be a flood fringe.

As the Project is located in a tidal FHA, the Project is not subject to the flood storage volume displacement limits of N.J.A.C. 7:13-11.4.

9. **Area Specific Requirement for Individual Permits, Requirements for a Regulated Activity in or Along a Regulated Water with Fishery Resources at N.J.A.C. 7:13-11.5**

The Project is not located within a channel and/or riparian zone of a regulated water containing fishery resources, and the Project does not propose construction of a bridge or culvert in or along waters with fishery resources. Therefore, requirements for a regulated activity in or along a regulated water with fishery resources do not apply. See Section IX.A below for a discussion on impact to marine fish and fisheries.

10. **Area Specific Requirement for Individual Permits, Requirements for a Regulated Activity in or Affecting a present or Documented Habitat for Threatened or Endangered Species at N.J.A.C. 7:13-11.6**

The Project will not destroy, jeopardize, or adversely modify a present or documented habitat for threatened or endangered species, and will not jeopardize the continued existence of any local population of a threatened or endangered species. See Sections III.U and V below for a discussion of Endangered or Threatened Wildlife or Plant Species Habitats and Critical Wildlife Habitats.

11. **Area Specific Requirement for Individual Permits, Requirements for Stormwater Management at N.J.A.C. 7:13-12.2**

Stormwater management addressing groundwater recharge, runoff quantity and water quality is not required per:

- N.J.A.C. 7:8-5.4 (a)2ii groundwater recharge requirement does not apply to projects within the "urban redevelopment area." The Project is located within a designated regional center per the Policy Map of the State Development and Redevelopment Plan.
- N.J.A.C. 7:8-5.4(a)3iv stormwater runoff quantity in tidal flood hazard areas, is not required as the increased volume of stormwater runoff will not increase flood damages below the point of discharge.
- N.J.A.C. 7:8-5.5 stormwater management measures will not be required for water quality control since the Project will not result in an additional one-quarter acre of impervious surface.

All Project components will occur landward of the mean high water line. Therefore, the applicant is not required to address stormwater management and the requirements at N.J.A.C. 7:8 are satisfied.

12. **Area Specific Requirement for Individual Permits, Requirements for Excavation, Fill and Grading Activities at N.J.A.C. 7:13-12.3**

Excavation, fill and grading will be required to construct the Project. The Project complies with requirements of N.J.A.C. 7:13-12.3 as follows:

- The overland flow of stormwater will not be impeded and floodwaters can freely enter and exit the disturbance area.
- There are no slopes greater than 50%.
- The excavation, fill and/or grading will not endanger the integrity of any existing structure.
- All excavated material will be lawfully disposed of.

13. **Area Specific Requirement for Individual Permits, Requirements for a Structure at N.J.A.C. 7:13-12.4**

The Project proposes the construction of a bulkhead within the FHA. The Project complies with requirements of N.J.A.C. 7:13-12.4 as follows:

- The structures will resist impact from water and debris during the flood hazard area design flood.
- The structures will resist uplift, floatation, collapse and displacement due to hydrostatic and hydrodynamic forces resulting from the flood hazard area design flood.
- The structures will resist overturning and sliding pressure, as well as pressure from the freeze/thaw cycle of the soil; and,
- The structures are not located adjacent to a channel.

The Project is located primarily within the Zone AE and partially within the VE flood plain. The existing and proposed bulkheads are located primarily below ground; however, a portion does extend above ground as discussed in more detail in Section IX.F below. Also, see Section III.M above for a discussion of coastal high hazard areas.

14. **Area Specific Requirement for Individual Permits, Requirements for Retaining Walls and Bulkheads at N.J.A.C. 7:13-12.13**

The bulkhead will extend above ground as discussed in Section IX.F below and as depicted on Sheet 3 of the plans.

- The bulkhead consists of vinyl or steel sheeting, and is anchored with greenheart wales as depicted on the plans.
- The bulkhead is designed to withstand displacement, overturning, and failure due to undermining and/or pressure from soil, water, and frost.

- The Project is not located within a regulated water or within 25 feet of any top of bank. Furthermore, the retaining bulkhead is designed to be resistant to erosion as well as the possibility of a shifting bed and/or bank over time.

Refer to the permit plans provided under Attachment 13 providing an engineering certification the above requirements are satisfied.

R. N.J.A.C. 7:7-9.26 - Riparian Zones

The Project runs parallel to the Atlantic Ocean and the next closest body of water is Hereford Inlet, which is located 0.25 miles away from the Project at its closest point. Per N.J.A.C. 7:7-9.26(b)1, there is no riparian zone along the Atlantic Ocean. Therefore, the Project will have no impact on riparian zones.

S. N.J.A.C. 7:7-9.27 - Wetlands and N.J.A.C. 7:7-9.28 - Wetlands Buffers

The previously constructed steel bulkhead from 8th to 13th Avenues was installed along the oceanfront within a prior freshwater wetlands and wetland transition areas. The proposed bulkhead from 13th to 15th, from 20th to 22nd, and at 25th Avenues will disturb wetlands and wetland transition area.

Per NJ GeoWeb 1970 Black and White Imagery, the Project is not within coastal wetlands. Note the portion between 3rd and 21st Avenue there is no 1970 black and white imagery map. Based on this and prior conversations with NJDEP, any wetlands not located within a 1970 black and white imagery map are to be identified as FWW.

Installation of the bulkheads is in compliance with N.J.A.C. 7:7-9.27 because of the following:

- The use of the bulkhead is water dependent;
- The Project has no prudent or feasible alternative on a non-wetland site, see Section II.B above for discussion of possible alternatives;
- The Project will result in minimum feasible alteration or impairment of natural tidal circulation; and
- The Project will result in minimum feasible alteration or impairment of natural contour or natural vegetation of the wetlands.

Freshwater Wetland Compliance Statement Pursuant to 7:7A

This statement addresses compliance with the permitting requirements outlined in the applicable Freshwater Wetlands General Permit (FWWGP) checklists and follows the requirements set forth in the Freshwater Wetland Protection Act Rules (N.J.A.C. 7:7A).

An intermediate resource value, isolated freshwater wetland exists on a portion of the Site adjacent to the Beach Patrol Building at 15th Avenue verified under NJDEP File No. 0507-03-0009.2 FWW 180001. Additionally, the wetland at the Lou Booth Amphitheatre site was also verified as intermediate resource value and isolated. Upon review of NJ-GeoWeb Landscape Project Version 3.3, the T&E species identified within the wetlands subject of this application are similar to those at the location of the Beach Patrol Building and Lou Booth Amphitheatre.

Also, based on the T&E species and their associated habitats identified in the "City of North Wildwood Beach Management Plan For the Protection of Federally and State-Listed Species" discussed above under Section III.U below, it is our opinion these T&E species are not wetland dependent species.

Therefore, for the above reasons, we believe the wetlands between 8th and 25th Avenues as depicted on the plans provided under Attachment 13 are of intermediate resource value.

A copy of the NJDEP Letter of Interpretation for the Beach Patrol Building and Lou Booth Amphitheatre are provided under Attachment 11.

Please also note that the wetlands generally between 8th and 13th Avenues no longer exist under current conditions due to the severe erosion occurring along the coastline.

1. A Description of The Characteristics of The Site and The Location of All Proposed Regulated Activities, Potential Impacts from The Construction Process, And, As Applicable, Any Monitoring or Reporting Methods That Will Be Used

a) Site and Project Description

See Introduction above for Site and Project introduction.

b) Potential Impacts from the Construction Process

See Section III.Q.1.b above for construction techniques.

c) Monitoring and Reporting Methods

Monitoring and/or reporting methods for any restoration/mitigation required for disturbance to freshwater wetlands will be provided under separate cover.

2. The Total Area, In Acres, Of Wetlands and State Open Waters on The Site Before the Regulated Activity Is Performed, And the Total Area, In Acres, Of Wetlands and State Open Waters (Sow), On the Site That Will Remain After the Regulated Activity Is Performed

As freshwater wetlands on the Site have only been partially delineated, this is not possible.

However, the Project will result in a total disturbance of approximately 0.414 acres to FWW under GP6. Refer to the Permit Plans provided under Attachment 13 for a breakdown of disturbance to freshwater wetlands for the installation of the previously constructed and proposed bulkhead. The Project will not disturb SOW.

3. Statement of Compliance with General Permit 6 (Non-Tributary Wetlands) At N.J.A.C. 7:7A-7.6

a) **General Permit No. 6 authorizes regulated activities in freshwater wetlands and/or State open waters, if the freshwater wetlands and/or State open waters are not part of a surface water tributary system discharging into an inland lake or pond, or a river or stream, provided all applicable requirements at N.J.A.C. 7:7A-5.7 and 20.3 are met.**

The regulated activities are proposed in freshwater wetlands that are not part of a surface water tributary system discharging into an inland lake, pond or river/stream. Note that the wetlands adjacent to the Beach Patrol Building at 15th Avenue have already been verified as non-tributary.

Note that any disturbance to the wetland transition area for disturbance to wetlands subject of GP6 is allowed under an access transition area waiver, and is therefore not included under GP6A.

b) **The activities shall disturb no more than one acre of a freshwater wetland and/ or State open water, which is not a water of the United States.**

The Project will result in approximately 0.414 acres of freshwater wetland disturbance that is not a water of the U.S. and no disturbance to SOW is proposed.

c) **The activities shall disturb no more than one-half acre of a freshwater wetland and/ or State open water that is a water of the United States. Mitigation shall be performed for all permanent loss and/or disturbance to wetlands and/or State open water that are waters of the United States.**

The Project will result in approximately 0.414 acres of freshwater wetlands disturbance that is not a water of the U.S. No disturbance to SOW is proposed.

d) **Activities under General Permit No. 6 will not take place in the following:**

i. **Exceptional Resource Value wetlands:**

As stated above, based on available information, we believe the wetlands subject of this application are of intermediate resource value. Therefore, the proposed activities will not take place in exceptional resource value wetlands.

ii. **State open water that is a special aquatic site;**

The Project does not propose any activities within SOW.

iii. **USEPA priority wetlands; or**

Per Priority Wetlands List for the State of New Jersey dated May 1989, no activities are proposed within USEPA priority wetlands.

iv. **A State open water that is larger than one acre.**

The Project does not propose any activities within SOW.

e) **Mitigation shall be performed for all permanent loss and/or disturbance of 0.1 acres or greater of freshwater wetlands or State open waters that are also waters of the United States. Mitigation shall be performed for permanent loss and/or disturbance of less than 0.1 acres of freshwater wetlands or State open waters that are also waters of the United States unless the applicant demonstrates to the Department that all activities have been designed to avoid and minimize impacts to wetlands.**

Mitigation will be required as the Project will disturb wetlands in excess of 0.1 acres. A proposal for restoration/mitigation will be provided under separate cover.

4. **Statement of Compliance with General Permit (GP) No. 6a (Transition Areas Adjacent To Non-Tributary Wetlands) At N.J.A.C. 7:7A-7.6a**

a) **General permit 6A authorizes regulated activities in transition areas adjacent to freshwater wetlands, if the freshwater wetlands are not part of a surface water tributary system discharging into an inland lake or pond, or a river or stream, provided all applicable requirements at N.J.A.C. 7:7A-5.7and 20.3 are met.**

The regulated activities are proposed in freshwater wetlands that are not part of a surface water tributary system discharging into an inland lake, pond or river/stream.

b) **The activities disturb no more than one-half acre of a transition area. If the activity authorized under general permit 6 eliminates a wetland in its entirety, authorization under general permit 6A is not required for activities in the associated transition area.**

The total amount of wetland transition area disturbed by the Project is 0.470 acres. The Project does not propose eliminating a wetland in its entirety under GP6.

c) **Activities do not take place in a transition area adjacent to the following.**

i. **An exceptional resource value wetland, as described at N.J.A.C. 7:7A-3.2.**

Based on available information, it is our opinion the wetlands of the subject application are of intermediate resource value.

Therefore, no activities are proposed within a transition area adjacent to an exception resource value wetland.

ii. **USEPA priority wetlands.**

Per Priority Wetlands List for the State of New Jersey dated May 1989, no activities are proposed within a wetland transition area adjacent to a USEPA priority wetland.

5. **Listing of And Statement of Compliance with Conditions That Apply to All General Permits at N.J.A.C. 7:7A-5.7**

a) **The activities proposed under GPs comply with the following:**

i. **The conditions set forth in General Permit No. 6 and 6A.**

See Sections S.3 and 4 above for compliance to the conditions set forth in GP6 and GP6A respectively.

ii. **The standard conditions set forth for all general permits.**

See Section S.5.b below for compliance to the conditions for all general permits.

iii. **The conditions for all general permits at N.J.A.C. 7:7A-20.2.**

The Applicant understands the standard conditions for all general permits.

iv. **The limits pursuant to the use of multiple general permits in N.J.A.C. 7:7A-5.4.**

The Project complies with the limits on the use of multiple general permits.

v. **If required under a particular general permit, mitigation pursuant to N.J.A.C. 7:7A-11.**

Mitigation will be required and will be addressed under separate cover.

vi. **Any additional conditions imposed under N.J.A.C. 7:7A-5.7(f).**

It is understood that the Department may establish additional conditions on a case-by-case basis.

b) **Explanation of how the Proposed Activities Comply with the Conditions that Apply to all General Permits:**

Activities under a general permit shall be associated with a proposed project. The Department shall not authorize activities under a general permit for eliminating a natural resource in order to avoid regulation.

i. **The proposed activities are not for the purpose of eliminating a natural resource in order to avoid regulation.**

The regulated activity shall not occur in the proximity of a public water supply intake.

ii. **According to NJ-GeoWeb well head protection areas (community) layer, the nearest public water supply is located approximately 5.7 miles southwest of the Project at its closest location.**

The activities shall not destroy, jeopardize, or adversely modify a present or documented habitat for threatened or endangered species; and shall not jeopardize the continued existence of any local population of a threatened or endangered species.

See Section III.U above for a discussion on Project impact to T&E species and/or habitat. The Project will not destroy, jeopardize, or adversely modify a present or documented habitat for threated or endangered species.

iii. **The activity will not occur in a component of either the Federal or State Wild and Scenic River System; nor in a river officially designated by Congress or the State Legislature as a "study river" for possible inclusion in either system while in the river is in an official study status; except that the activity may occur in these waters if approved by the National Park service in accordance with 40 CFR 233.**

The Site is not within a component of either the Federal or State Wild and Scenic River System; nor in a river officially designated by Congress or the State Legislature as a "study river."

iv. **The activity shall not adversely affect properties which are listed or are eligible for listing on the New Jersey or National Register of Historic Places.**

See Section III.T above for a discussion on Project impact to historic and archaeological resources. The Project will not adversely affect properties which are listed or are eligible for listing on the New Jersey or National Register of Historic Places. If any are encountered, the NJDEP shall be immediately notified.

v. **Any discharge of dredged or fill material shall consist of clean, suitable material free from toxic pollutants (see 40 CFR 401) in toxic amounts, and shall comply with all applicable Department rules regarding use of dredged or fill material.**

Discharge of dredged material is not proposed for the Project. Fill material will consist of clean, suitable material free from toxic pollutants in toxic amounts, and will comply with all applicable Department rules regarding use of fill material.

vi. **Any structure or fill authorized shall be maintained as specified in the construction plans.**

The proposed structures and fill will be maintained as specified in the plans accompanying this application.

vii. **The activity will not result in a violation of the FHA Control Act, N.J.S.A. 58:16A-50 or implementing rules at N.J.A.C. 7:13.**

Compliance to the FHA is addressed above under Section III.Q Accordingly, the Project will not result in a violation of the FHA Control Act Rules.

viii. **If activities under the general permit meet the definition of "major development" at N.J.A.C. 7:8-1.2, then the project of which the activities are a part shall comply in its entirety with the Stormwater Management Rules at N.J.A.C. 7:8.**

Compliance to Stormwater Management is addressed below under Section IX.C. The Project has been designed in accordance with the requirements of N.J.A.C. 7:8.

ix. **If activities under the general permit involve excavation or dredging, the applicant shall use an acceptable disposal site for the excavated or dredged material. No material shall be deposited or dewatered in freshwater wetlands, transition areas, State open waters or other environmentally sensitive areas.**

Dredging is not proposed. Any excess excavated material will be disposed of in accordance with applicable regulations. No material will be deposited or dewatered in wetlands, transition areas, SOW, or other environmentally sensitive areas.

x. **The amount of rip-rap or other energy dissipating material shall not exceed the minimum necessary to prevent erosion, as calculated under the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.**

Rip-rap or other energy dissipating materials are not proposed under this Project.

xi. **Best Management Practices, as defined at N.J.A.C. 7:7A-1.3, shall be followed whenever applicable.**

Where applicable, Best Management Practices shall be implemented and followed in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey," the Cape Atlantic Soil Conservation District, Freshwater Wetland Protection Act Rules and the Flood Hazard Area Control Act Rules.

xii. If the general permit activities are subject to the Department's Water Quality Management Planning rules at N.J.A.C. 7:15, the activities shall be consistent with those rules and with the applicable approved Water Quality Management Plan (208 Plan) adopted under the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A-1, et seq.

The Project is not subject to the Department's Water Quality Management Planning Rules.

xiii. The timing requirements at C below shall be met.

The timing requirements are not applicable as no disturbance within a stream channel is proposed.

xiv. With the exception of activities associated with general permits 1, 6, 6A, and 16, activities authorized under a general permit shall not take place in a vernal habitat, as defined at N.J.A.C. 7:7A-1.3, or in a transition area adjacent to a vernal habitat.

The Project does not propose activities within vernal habitat.

xv. In order to protect the fishery resources and/or the spawning of the fish population, any activity which may introduce sediment into a stream or cause a stream to become turbid shall not be performed during the time periods listed in Table 5.7.

The Project does not propose any work in a stream.

xvi. The Department may reduce, extend, or otherwise modify the timing requirements listed if one or more requirements at N.J.A.C. 7:7A-5.7(d) are satisfied.

The applicant does not wish to reduce, extend or otherwise modify the time requirements for fishery resources should they apply to the Project.

xvii. If any activity will take place in a non-delegable water, as defined at N.J.A.C. 7:7A-1.3, and the activity requires approval from the USACE under the Federal 404 program, the activities authorized under the general permit shall not begin until the permittee obtains the required Federal 404 program approval.

No activities are proposed in non-delegable waters.

xviii. **In addition to the conditions that apply to every authorization pursuant to a general permit, the Department shall establish additional conditions in a specific authorization pursuant to a general permit, on a case by case basis in accordance with N.J.A.C. 7:7A-20.3.**

It is understood that the Department may establish additional conditions on a case-by-case basis.

6. Statement Regarding Contaminated or Toxic Substances on The Site

To the best of the applicant's knowledge, the location of regulated activities is not contaminated with toxic substances.

7. Documentation of The Creation of The Property

To the best of our knowledge no part of the Site is not part of a subdivision.

8. Ownership History of The Property from June 30, 1988 (Provided without the benefit of a Title Search):

To the best of our knowledge the City of North Wildwood has owned its properties since 1988 and Sportland Investments has owned Block 290.01, Lot 1 since September 24, 1984. Refer to Attachment 14 for property detail report showing property ownership information.

9. Listing of Contiguous Lots in Common Ownership with The Site and Ownership History of Said Lots from June 30, 1988 (Provided without the benefit of a Title Search)

The lots associated with this application, excluding Block 290.01, Lot 1 are owned by The City of North Wildwood, the Applicant. Contiguous lots adjacent to the Project that are owned by the Applicant include Block 288.02, Lot 1. Sportland Investments owns Block 290.01, Lot 1. Sportland Investments does not own any contiguous lots. Refer to Attachment 14 for property detail report showing property ownership information.

10. Statement Regarding Existence of Swamp Pink in The Municipality Which the Site Is Located

The City of North Wildwood is not a known location for Swamp Pink.

11. Statement Regarding Existence of The Bog Turtle in The Municipality Which the Site Is Located

The City of North Wildwood is not listed as a known location for Bog Turtles.

12. Statement Regarding Wild and Scenic River Designation

The Site is not within an area designated a Wild and Scenic River; nor in a river officially designated by Congress or the State Legislature as a "study river."

T. N.J.A.C. 7:7-9.34 - Historic and Archeological Resources

The boardwalk adjacent to the Project from 16th Avenue to 25th Avenue is identified as a historic property per NJ-GeoWeb. Buccaneer Motel, designated as an Eligible Individual historic property, is located approximately 150 feet west of the Project at its closest point. An archaeological site grid, designated as Identified, is located approximately 0.43 miles southwest of the Project at its closest point. The Project's location is not identified as a historic property, within a historic district or within an archeological site grid per NJ-GeoWeb or the New Jersey Department of Environmental Protection Historic Preservation Office, New Jersey and National Register of Historic Places, last updated September 30, 2020. Based on this information, the Project will not negatively impact historical resources but rather protect the historic boardwalk. If any historical resources are encountered, the NJDEP will be immediately notified.

U. N.J.A.C. 7:7-9.36 - Endangered or Threatened Wildlife or Plant Species Habitats

To determine the presence of threatened and endangered (T&E) wildlife species located on or adjacent to the Site, VNHA reviewed NJDEP NJ-GeoWeb online mapping application, containing Landscape Project Version 3.3 data, which identifies species based on habitat patches connected to rare wildlife throughout the State of New Jersey. In addition, VNHA requested a NJDEP Natural Heritage Program (NHP) Report for the Project area, see Attachment 7. The NJDEP Landscape Project and the NJDEP Natural Heritage Program identified Rank 3, 4 or 5 species in the immediate vicinity, or within one (1) mile of the Project Area, as shown below on Table 1.

VNHA also reviewed the NJDEP NJ-GeoWeb online mapping application, containing the Natural Heritage Grid Map, which provides a general portrayal of the geographic location of rare plant species and rare ecological communities throughout New Jersey. Two species were identified in the Natural Heritage Grid ID 6,811.00 within the portion of the Project between 3rd and 5th Avenues for both known location within 1.5 miles and at a precise location, as shown below on Table 2. No natural heritage priority sites, vernal pools or vernal pool habitat were identified as being on the Project Site, in the immediate vicinity or within one (1) mile of the Project Site.

Table 1 **Species Identified Onsite or within the Immediate Vicinity**			
Species	**Scientific Name**	**Rank**	**Feature Type**
Black Skimmer	*Rynchops niger*	4	Foraging
Least Tern	*Sternula antillarum*	4	Foraging
Least Tern	*Sternula antillarum*	4	Nesting Colony
Migratory Raptor Concentration Site	--	4	Concentration Site
Piping Plover	*Charadrius melodus*	5	Nesting Area
Red Knot	*Calidris canutus*	4	Non-breeding Sighting
Species Identified within One (1) Mile			
Black Skimmer	*Rynchops niger*	4	Foraging
Black-crowned Night-heron	*Nycticorax nycticorax*	3	Foraging
Cattle Egret	*Bubulcus ibis*	3	Foraging
Least Tern	*Sternula antillarum*	4	Foraging
Least Tern	*Sternula antillarum*	4	Nesting Colony
Migratory Raptor Concentration Site	--	4	Concentration Site
Osprey	*Pandion haliaetus*	3	Foraging
Osprey	*Pandion haliaetus*	3	Nest
Piping Plover	*Charadrius melodus*	5	Nesting Area
Piping Plover	*Charadrius melodus*	5	Non-breeding Sighting
Red Knot	*Calidris canutus*	4	Non-breeding Sighting
Yellow-crowned Night-heron	*Nyctanassa violacea*	3	Foraging
Yellow-crowned Night-heron	*Nyctanassa violacea*	3	Nesting Colony
Atlantic Sturgeon	*Acipenser oxyrinchus*	5	Migration Corridor – Adult Sighting

The portion of the Project between 3rd and 5th Avenues is within the natural heritage grid map for species within 1.5 miles and location known precisely.

Table 2 **Rare Plant Species and Rare Ecological Communities within the Immediate Vicinity**		
Species	**Scientific Name**	**Status**
Spurred Butterfly-pea	*Centrosema virginianum*	State Endangered
Sea-beach Evening-primrose	*Oenothera humifusa*	State Endangered

Based on NJ-GeoWeb, potential threatened and endangered species/habitats, rare plant species and rare ecological communities were identified within the Project area and immediate vicinity. As noted in the "City of North Wildwood Beach Management Plan", dated December 2018 piping plover, least tern, black skimmer, American oystercatcher and the red knot are known species to occur on the City's beaches. Seabeach amaranth, Seabeach knotweed, Seabeach sandwort, Seabeach evening primrose and Seabeach purslane are species that may occur on the City's beaches. A copy of the plan is provided under Attachment 9.

Piping plovers are small, territorial shorebirds present on the New Jersey shore between March and August. Nests consist of a shallow scrape in the sand located above the high tide line. Historically, from 1988-1996 between one (1) and five (5) pairs of piping plovers nested on the City's oceanfront beach. Nesting began on the City's Inlet Beach in 2002, with an average of one (1) to four (4) pairs per season. Plovers last nested on the Inlet Beach in 2015.

Least terns are small, colonial beach-nesting sea birds, present on the New Jersey shore between April and September. Nests consist of a shallow scrape in the sand located above the high tide line. Historically, from 1988-1995 least terns nested on the City's oceanfront beach, ranging from 60 to 200 individuals. Since 2002, terns have nested on the City's Inlet Beach, with a high of 490 individuals. Least terns last nested in the City in 2015.

Black skimmers are colonial beach-nesting sea birds that may potentially nest on the City's beaches. Historically, "Champagne Island", within the Hereford Inlet System, and northwest of the City's "Protected Zone" hosted a significant colony of nesting skimmers until 2008. The City's beaches have also been used as an important staging area for black skimmers during fall migration (September through October).

American oystercatchers are territorial shorebirds, nesting on New Jersey beaches from April through August. They make their nests on beaches by scraping a shallow depression in the sand just above the high tide line, but also nest on back-bay islands. Since 2002, one (1) to three (3) pairs of oystercatchers have regularly nested on the City's Inlet Beach. One pair last nested in 2017.

Red knots are long distance migrants that breed in the Arctic and winter as far south as Tierra del Fuego at the southern tip of South America. While small numbers of red knots may be present in New Jersey year-round, most are seasonal visitors to New Jersey beaches, stopping during spring (mid-May through early June) and fall (late-July through November) migration periods to rest and refuel. Currently, the City is identified as an important migratory staging area for the red knot for feeding and roosting activities.

Seabeach Amaranth is an annual plant, visible on New Jersey's Atlantic coastal beaches between May and November. Seabeach amaranth is usually found growing in nearly pure sand. The species requires sparsely vegetated upper beach habitat that is not flooded during the growing season.

Seabeach Knotweed is an annual plant of sandy beaches.

Seabeach Sandwort is a perennial plant of beach and salt marsh habitats.

Seabeach Evening Primrose is a perennial plant of beach and dune habitats.

Seabeach Purslane is an annual plant of beach habitats.

The Project consists of a linear bulkhead that did not and will not result in a significant increase in impervious surfaces or permanent land disturbance. Any disturbance for construction of the bulkheads will be temporary in nature, minimized to the greatest extent practicable and conditions will be restored upon Project completion.

Construction of the Project is mainly located adjacent to JFK Boulevard Beach Drive, the boardwalk and the beach which at times are heavily used by the local and visiting community. Based on the desired habitat of the T&E species, and the Project location permanent and/or temporary impacts of the construction activities are unlikely to negatively impact the T&E species listed above and/or their associated habitat. In addition, any species using such habitat are likely to be temporary relocated to surrounding habit and will return upon completion of the Project. However, any timing restrictions set forth by the reviewing agencies to protect T&E species will be followed, as required.

V. N.J.A.C. 7:7-9.37 - Critical Wildlife Habitats

Critical wildlife habitats are special areas known to serve an essential role in maintaining wildlife, particularly in wintering, breeding and migrating. A portion of the Project area is identified as a migratory raptor concentration site. According to NJ-GeoWeb Landscape Project Version 3.3 the migratory raptor concentration site is associated with land use identified as recreational land and herbaceous wetlands. This land area generally runs adjacent to JFK Boulevard Beach Drive from 3rd to 15th Avenues and generally within the dune and wetland complexes from 15th to 23rd Avenues. Project activities will result in minimal permanent disturbance for the bulkhead itself and may result in temporary disturbance during construction to potential habitat from 3rd to 21st Avenues and will occur only during the raptor migration period. If during raptor migration, it is likely the species will relocate to nearby areas. No disturbance to the seawall is proposed for the Project.

Although the Project may have some impact, it is unlikely that it will result in permanent adverse impacts to migrating raptors.

W. N.J.A.C. 9:7-9.38 – Public Open Space

Public open space constitutes land areas owned or maintained by State, Federal, county and municipal agencies or private groups (such as conservation organizations and homeowner's associations) and used for or dedicated to conservation of natural resources, public recreation, visual or physical public access or, wildlife protection or management. As the Project is proposed mostly on lands owned by the City and exists as beach, dunes, wetlands or wetland buffer, public open space will be impacted for construction of the bulkhead. The only permanent impact to the public open space is for the actual bulkhead itself which is approximately 0.0172 acres. During construction beach access and the beach will be temporarily closed generally within 200 feet of the active work area each day. As portions of the Project are completed, the area will reopen to the public.

Public open space is not anticipated to be adversely impacted by the Project. Construction of the Project will benefit the public's safety, health and welfare as it will alleviate erosion of the beach and protect flora and fauna species and their habitat. The Project will also facilitate continuous use or access of these lands.

X. N.J.A.C. 7:7-9.39 – Special Hazard Areas

As discussed above under Section II.A there are no known actual or potential hazards to public health and welfare, or to public or private property.

Y. N.J.A.C. 7:7-9.48 – Lands and Waters Subject to Public Trust Rights

According to NJ-GeoWeb Tidelands region Atlantic South map number 056-1962, the Project area is not within lands and waters subject to public trust rights as the Project is not within an area now or formerly below the mean high water line. Thus, the Project does not impact lands and waters subject to public trust rights.

IV. DISCUSSION OF STANDARDS FOR BEACH AND DUNE ACTIVITIES AT N.J.A.C. 7:7-10

As the Project does not propose routine beach maintenance, emergency post-storm restoration, dune creation and maintenance, and/or construction of a boardwalk, these standards do not apply.

If required, the dunes will be restored per the standards at N.J.A.C. 7:7-10.4.

V. DISCUSSION OF GENERAL WATER AREAS AT N.J.A.C. 7:7-12

General Water Areas are not applicable to the Project, as it is located entirely above the spring high water line.

VI. DISCUSSION OF REQUIREMENTS FOR IMPERVIOUS COVER AND VEGETATIVE COVER FOR GENERAL LAND AREAS AND CERTAIN SPECIAL AREAS AT N.J.A.C. 7:7-13

Per N.J.A.C. 7:7-13.1(d), the impervious cover and vegetative cover rules do not apply to a linear development, which is a development with the basic function of connecting two points, such as a road, drive, public walkway, railroad, sewerage pipe, stormwater management pipe, gas pipeline, water pipeline, or electric, telephone or other transmission line. As the Project meets the definition of a linear development, the Project is not subject to the impervious cover and vegetative cover limits.

VII. DISCUSSION OF GENERAL LOCATION RULES AT N.J.A.C. 7:7-14

The following discussion addresses the General Location Rules that are applicable to the Project.

A. N.J.A.C. 7:7-14.1 – Rule on Location of Linear Development

The Project proposes the construction of a bulkhead generally adjacent to JFK Boulevard Beach Drive and the boardwalk.

The Project complies with Requirements for the location of linear development as follows:

- There is no prudent or feasible alternative alignment/location for the Project components which would have less impact on sensitive areas and marine fish or fisheries. The Project is designed to be outside of environmentally sensitive areas to the greatest extent practicable. The Project is not anticipated to negatively impact marine fish or fisheries.

- The Project is not within a unique or irreplaceable area, therefore, the Project will not result in permanent or long-term loss to these areas.

- The Project was designed to minimize adverse environmental impacts to the maximum extent practicable by avoiding disturbance to dunes, wetlands, wetland buffers and the beach to the greatest extent practicable. Permanent disturbance to wetlands, dunes and/or beaches will be restored/mitigated for as required. See Section X below for a discussion on mitigation. All temporary disturbances to dunes, wetlands, wetland buffers and the beach will be restored upon the Project's completion. Beach and dune areas as well as vegetation were destroyed by erosion. Any naturally destroyed areas will not be restored, as these areas are impossible to exist due to natural conditions. Any restoration could be limited to the landward side of the bulkhead. The purpose of the Project is to protect further damage and destruction due to erosion.

- The Project was designed to generally run adjacent to JFK Boulevard and Beach Drive and the boardwalk with the exception of segments that went around existing structures such as piers. Thus, the alignment is located on or in existing transportation corridors and alignments, to the maximum extent practicable.

B. N.J.A.C. 7:7-14.2 - Basic Location Rule

The Project complies with requirements for the basic location rule as follows:

- The City's Atlantic coastline has been undergoing severe erosion since at least 1991 creating unsafe conditions on the beach. An eroding beach is a hazard for walking and can cause people to trip and sustain injuries. Further, if unmitigated erosion continues over a period of time, the street could be impacted. Exposed pipes and jagged concrete would be a health and safety concern, as they could cause injury and exposed pipes could cause damage to infrastructure. Since the purpose of the Project is to prevent erosion damage, the Project could be considered necessary to protect public health and infrastructure. The Project will promote the public health, safety, and welfare to the community.

- The Project will result in conditions that will protect both public and private property, wildlife and marine fisheries.

- The Project has been designed to preserve, protect and enhance the natural environment to the extent practicable.

C. N.J.A.C. 7:7-14.3 Secondary Impacts

No negative secondary impacts are anticipated from construction of the Project. The purpose of the Project is to protect the City's infrastructure, commercial and private properties and prevent further erosion of the beach, dunes and/or wetlands. With this Project the City will be providing and maintaining safe conditions for both the local and visiting community.

VIII. DISCUSSION OF USE RULES AT N.J.A.C. 7:7-15

The following discussion addresses the Use Rules that are applicable to the Project.

A. N.J.A.C. 7:7-15.3 Resort/Recreational Use

As the Project area is located adjacent to the beach, boardwalk, sidewalks and/or paths and traverse natural habitats, it may provide recreational opportunities to its users. As discussed above under Section II.A the Project resulted or will result in permanent disturbance for construction of the bulkhead. Any restriction of public access is temporary. Construction of the bulkhead only restricted or will restrict public access to these potential recreational areas within a 200 foot radius of construction each day. Limits of closure change by day as construction of the bulkhead progressed or progresses. Therefore, there will be no long-term impacts on the recreational use of the area. The proposed improvements will improve recreational access and uses in the City by preventing continued erosion of the beach and protecting city infrastructure including the boardwalk, paths and sidewalks.

B. N.J.A.C. 7:7-15.11 Coastal Engineering

Coastal engineering measures include structural shore protection and storm damage reduction measures to manage water areas and protect the shoreline from the effects of erosion, storms, and sediment and sand movement, which is the Project. The purpose of the Project is to protect the City's infrastructure and prevent the beach and shoreline from the effects of further erosion. As a portion of the bulkhead was constructed based on emergency needs, non-structural shore protection and/or storm reduction measures were not sufficient and are not sufficient for protection the City's coastline from the continued erosion.

A portion of the bulkhead is located in a V zone and thus is subject to wave runup forces. Both the previously constructed and proposed portions of the bulkhead were/are designed and certified by a professional engineer to withstand the forces of wave runup as depicted on the plans provided under Attachment 13.

IX. DISCUSSION OF RESOURCE RULES AT N.J.A.C. 7:7-16

The following discussion addresses the Resource Rules that are applicable to the Project.

A. N.J.A.C. 7:7-16.2 – Marine Fish and Fisheries

As the Project is proposed upland of the MHWL no impact to marine fish and fisheries is anticipated. See Section III.D above for additional discussion on impacts to alewife and Atlantic sturgeon migratory pathways.

B. N.J.A.C. 7:7-16.3 – Water Quality

Per N.J.A.C. 7:8-5.5 stormwater management measures will not be required for water quality control since the Project will not result in an additional one-quarter acre of impervious surface. Additionally, per N.J.A.C. 7:8-5.2, linear development projects are exempt from stormwater runoff quality requirements. Therefore, the applicant is not required to address water quality for the construction of the Project.

C. N.J.A.C. 7:7-16.6 – Stormwater Management

Although the Project meets the definition of a "major development" at N.J.A.C. 7:8, stormwater management is not required for the Project per:

- N.J.A.C. 7:8-5.4 (a)2ii groundwater recharge requirement does not apply to projects within the "urban redevelopment area." The Project is located within a designated regional center per the Policy Map of the State Development and Redevelopment Plan.
- N.J.A.C. 7:8-5.4(a)3iv stormwater runoff quantity in tidal flood hazard areas, is not required as the increased volume of stormwater runoff will not increase flood damages below the point of discharge.
- N.J.A.C. 7:8-5.5 stormwater management measures will not be required for water quality control since the Project will not result in an additional one-quarter acre of impervious surface.

D. N.J.A.C. 7:7-16.7 Vegetation

As discussed above under Sections I and II.A a portion of the Project area exists as vegetated wetlands and dunes. The location of the Project was selected adjacent to JFK Boulevard Beach Drive and the boardwalk to preserve this vegetation to the maximum extent possible. Any areas of temporary disturbance will be restored upon the Project's completion with native coastal species.

E. N.J.A.C. 7:7-16.9 – Public Access

As discussed above under Section III.W Public Open Space and VIII.A Resort/Recreational Use the Project is located mainly adjacent to JFK Boulevard Beach Drive and the boardwalk on land owned by the City. Any restriction to public access will occur within 200 feet of active construction and is temporary. Limits of closure change by day as construction of the bulkhead progresses. As the Project does not propose any change to the existing public access points to the beach there will be no long-term impacts to public access.

In fact, the Project will promote unhindered access to the waterfront and other public areas by protecting the existing roads, boardwalks and path that provide access to/from the beach. The Project will also aid in preventing further erosion and destruction of the beach, dunes and/or wetlands which ultimately enhances the public's health, safety, and welfare.

F. N.J.A.C. 7:7-16.10 Scenic Resources and Design

The elevation of the timber decking of the bulkhead from 3rd to 4th Avenues is 11.7± feet, from 4th to 5th Avenues is 12± feet and from 5th to 25th Avenues is 12.0± feet. The bulkhead extends approximately 2 to 6 feet above ground surface throughout the Project length which is below the allowed 15 feet maximum. Note the dune system generally from 12th to 25th Avenues exceeds the height of the bulkhead. The color of the timber decking was chosen to help make the bulkhead visually compatible with its surroundings. Therefore, the bulkhead will not drastically change the scenic view of the surrounding area. The existence of the bulkhead will actually increase the scenic value of the surrounding area, as the Project will protect further erosion and destruction of the beach, dunes and/or wetlands.

X. DISCUSSION OF MITIGATION AT N.J.A.C. 7:7-17

Construction of the Project will result in 0.394 acres of disturbance to freshwater wetlands. No disturbance to coastal wetlands, shellfish habitat, submerged vegetation habitat, intertidal and subtidal shallows and tidal waters, or riparian zone is proposed, therefore mitigation for these areas is not required. A mitigation proposal for disturbance to freshwater wetlands will be provided under separate cover.

XI. COMPLIANCE WITH CAFRA RULES AT N.J.S.A. 13:19-10

The Project has been reviewed and found to be in compliance with Section 10 of CAFRA as follows:

A. N.J.S.A. 13:19-10a

Conforms to all applicable air, water, and radiation emission and effluent standards and all applicable water quality criteria and air quality standards.

The Project will conform to all applicable air, water and radiation standards. The impacts to air and water will be minimized, during construction activities, by using properly maintained and operated equipment. These impacts will also be maintained through implementation of an approved Soil Erosion and Sediment Control plan. At the completion of the Project, no unusual or significant impacts to air quality or water quality are anticipated over that which currently exists. Impacts to air quality are in keeping with the impacts expected for activities approved under the City Zoning Ordinance.

B. N.J.S.A. 13:19-10b

Prevents air emissions and water effluents in excess of the existing dilution, assimilative, and recovery capacities of the air and water environments at the site and within the surrounding region.

As discussed above, the Project will prevent air emission and water effluents in excess of the existing dilution, assimilative and recovery capacities at and in the vicinity of the Site.

C. N.J.S.A. 13:19-10c

Provides for the collection and disposal of litter, recyclable material and solid waste in such a manner as to minimize adverse environmental effects and the threat to the public health, safety, and welfare.

Any collection and disposal of litter, recyclable material and solid waste encountered during construction will be handled in a manner as such to minimize adverse environmental effects. The Project will help to reduce negative environmental impacts, and will aid in the protection of public health, safety, and welfare.

D. N.J.S.A. 13:19-10d

Would result in minimal feasible impairment of the regenerative capacity of water aquifers or other ground or surface water supplies.

The Project does not propose the use of or impact to water aquifers, and does not demand the use of ground/surface water supplies.

E. N.J.S.A. 13:19-10e

Would cause minimal feasible interference with the natural functioning of plant, animal, fish, and human life processes at the site and within the surrounding region.

The Project site is mainly adjacent to an intensely developed portion of the City to the greatest extent practicable. The majority of the disturbance will be temporary in nature and will be restored upon completion of the Project.

The purpose of the Project is to protect the City's infrastructure and protect the dunes, beach and freshwater wetlands from further erosion and destruction, thus protecting the natural functioning of plant, animal, fish, and human life processes at the site and within the surrounding region.

Therefore, the Project has been designed to minimize any interference with the natural function of plant, animal, fish and human life processes at the site and within the surrounding region to the greatest extent practicable.

Refer to Section III.U and V for a discussion of Threatened and Endangered Species and Critical Wildlife Habitat, respectively.

F. N.J.S.A. 13:19-10f

Is located or constructed so as to neither endanger human life or property nor otherwise impair the public health, safety, and welfare.

The Project is located adjacent to existing structures and within a busy area of the City consisting of private properties and commercial development. The Project is proposed to improve the quality of public health, safety, and welfare through the protection of City infrastructure and private properties and will prevent further erosion of the beach, dunes and wetlands. Construction activities will be conducted in accordance with all governing requirements, such as Cape Atlantic Soil Conservation District and the NJDEP.

G. N.J.S.A. 13:19-10g

Would result in minimal practicable degradation of unique or irreplaceable land types, historical or archeological areas, and existing public scenic attributes at the site and within the surrounding region.

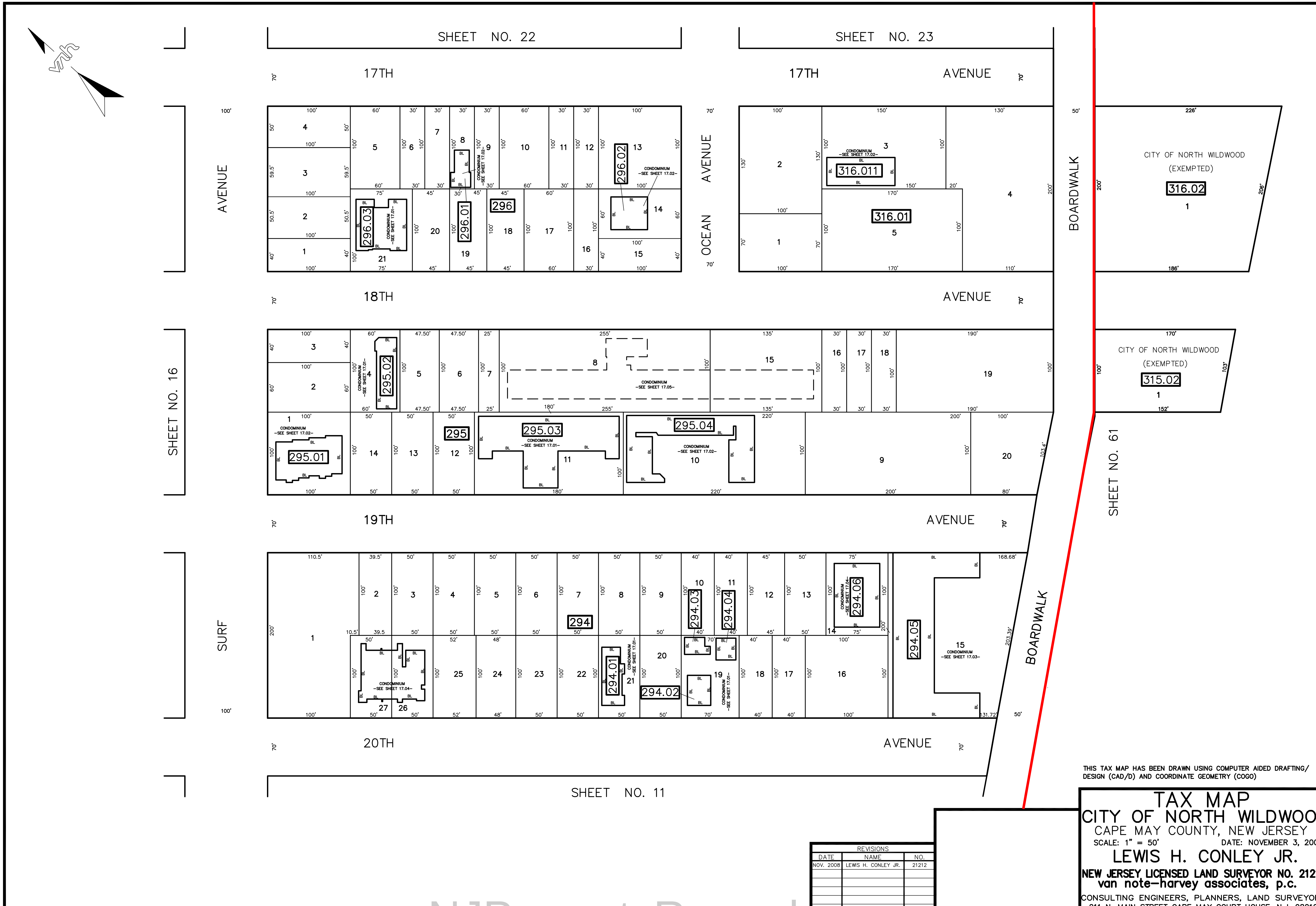
The Project is not proposed within an area containing unique or irreplaceable land types or any known historical or archeological areas, and will not impact the existing public scenic attributes. A majority of the Project is located adjacent to the JFK Boulevard Beach Drive and the boardwalk. See Section IX.F above for a discussion on the impact to Scenic Resources. Overall, the Project is not anticipated to adversely impact any unique, historic, or scenic attributes.

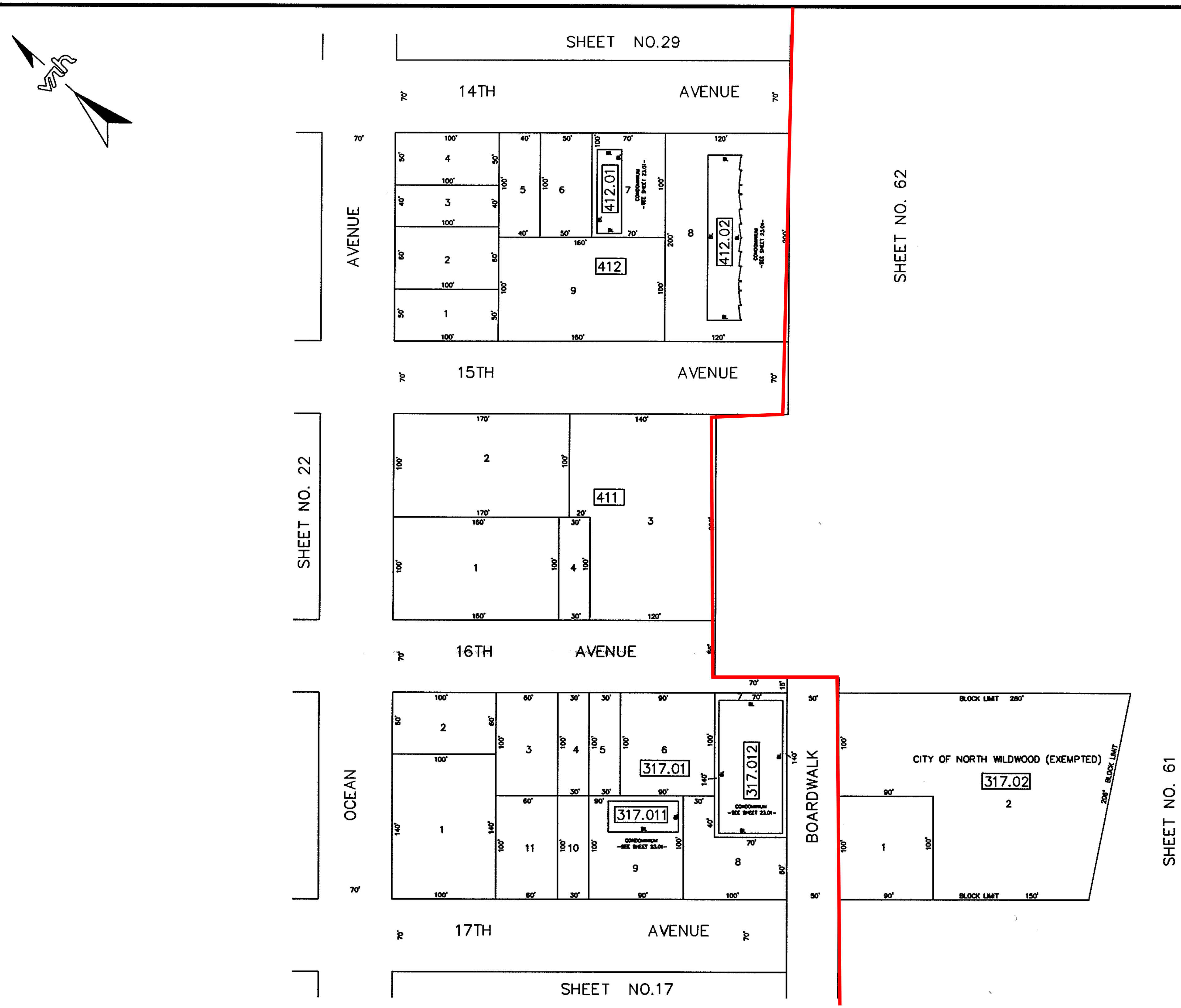
XII. CONCLUSION

Salient points to consider when reviewing this application:

- Proposed is a linear project to protect City infrastructure and prevent the further erosion of the beach, dunes and wetlands by reconstructing and extending the bulkhead from 3rd to 25th Avenues.
- Extensive erosion over time can lead to exposed utilities and jagged asphalt/concrete, resulting in unsafe and hazardous conditions to the community. The Project will prevent the creation of such conditions, thus improving the health and welfare of the general public.
- Project improvements will result in minimal adverse impacts to sensitive environmental resources. Restoration/mitigation will be provided for these disturbances as required.
- The Project has been designed to comply with the requirements of N.J.A.C. 7:7, N.J.A.C. 7A, N.J.A.C. 7:8, and N.J.A.C. 7:13 to the greatest extent practicable.
- The Project has been designed to minimize the amount of new impervious surfaces to the greatest extent practicable. Of the 4.352 acres of land disturbance required to complete the Project, only approximately 749 square feet of new impervious will result.
- Alternatives to the Project are not feasible or reasonable as the purpose of the Project.

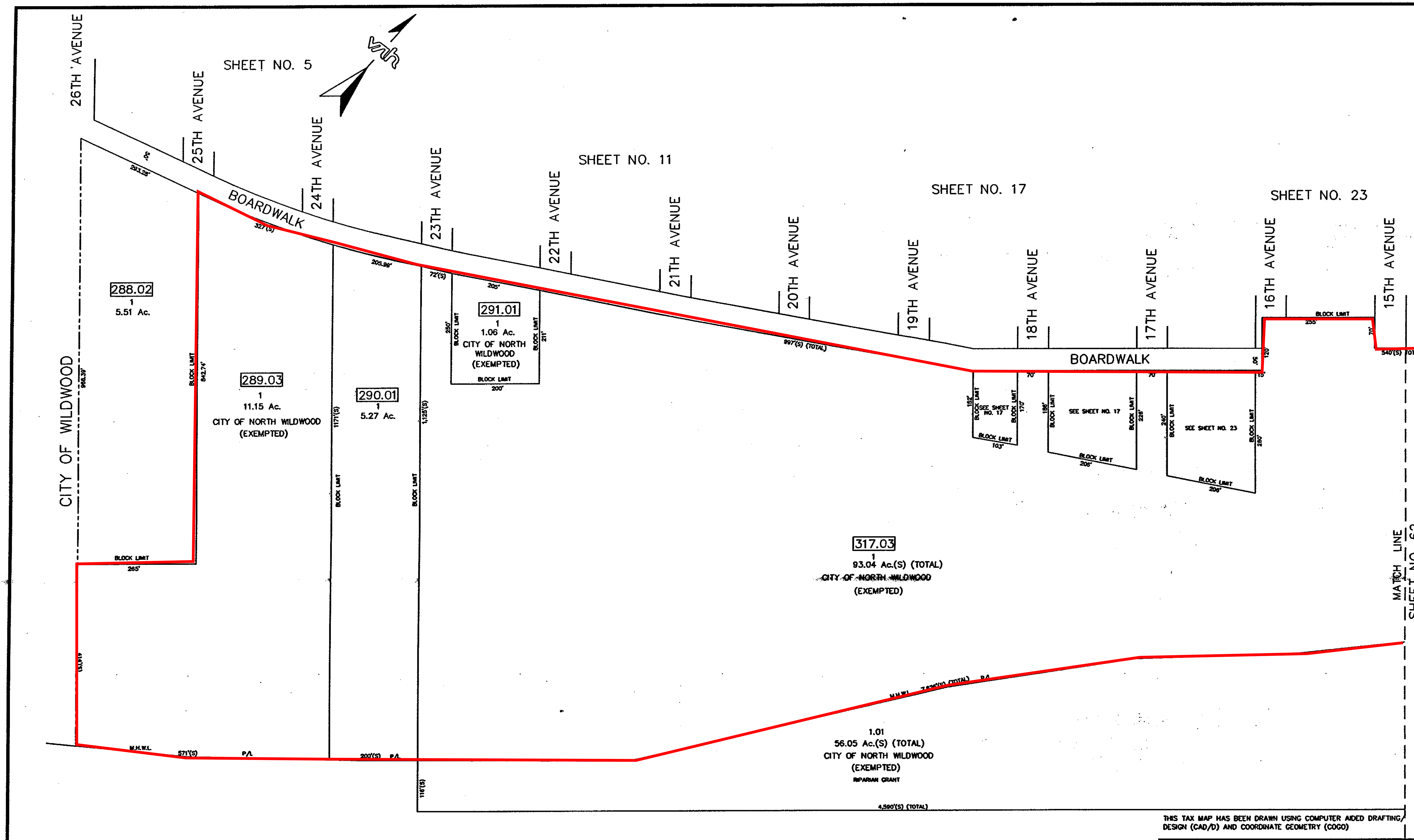
Y:\vnhadata\PROJECTS\44693\Permits\NJDEP\CAFRA_WFD\Submission DRAFT\Attachment 12 - Environmental Impact Statement and Compliance Statement\CAFRA Compliance Statement-v4 (002).doc


SHEET NO. 22
SHEET NO. 23
17TH AVENUE
18TH AVENUE
19TH AVENUE
20TH AVENUE
OCEAN AVENUE
SURF AVENUE
BOARDWALK
SHEET NO. 16
SHEET NO. 61
SHEET NO. 11
296
296.01
296.02
296.03
316.011
316.01
316.02
CITY OF NORTH WILDWOOD (EXEMPTED)
315.02
295
295.01
295.02
295.03
295.04
294
294.01
294.02
294.03
294.04
294.05
294.06
CONDOMINIUM -SEE SHEET 17.01-
CONDOMINIUM -SEE SHEET 17.02-
CONDOMINIUM -SEE SHEET 17.03-
CONDOMINIUM -SEE SHEET 17.04-
CONDOMINIUM -SEE SHEET 17.05-
THIS TAX MAP HAS BEEN DRAWN USING COMPUTER AIDED DRAFTING/DESIGN (CAD/D) AND COORDINATE GEOMETRY (COGO)
REVISIONS
DATE NAME NO.
NOV. 2008 LEWIS H. CONLEY JR. 21212
TAX MAP
CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, NEW JERSEY
SCALE: 1" = 50'
DATE: NOVEMBER 3, 2003
LEWIS H. CONLEY JR.
NEW JERSEY LICENSED LAND SURVEYOR NO. 21212
van note-harvey associates, p.c.
CONSULTING ENGINEERS, PLANNERS, LAND SURVEYORS
211 N. MAIN STREET CAPE MAY COURT HOUSE, N.J. 08210



THIS TAX MAP HAS BEEN DRAWN USING COMPUTER AIDED DRAFTING/DESIGN (CAD/D) AND COORDINATE GEOMETRY (COGO)

TAX MAP
CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, NEW JERSEY
SCALE: 1" = 50' DATE: NOVEMBER 3, 2003
LEWIS H. CONLEY JR.
NEW JERSEY LICENSED LAND SURVEYOR NO. 21212
van note-harvey associates, p.c.
CONSULTING ENGINEERS, PLANNERS, LAND SURVEYORS
211 N. MAIN STREET CAPE MAY COURT HOUSE, N.J. 08210



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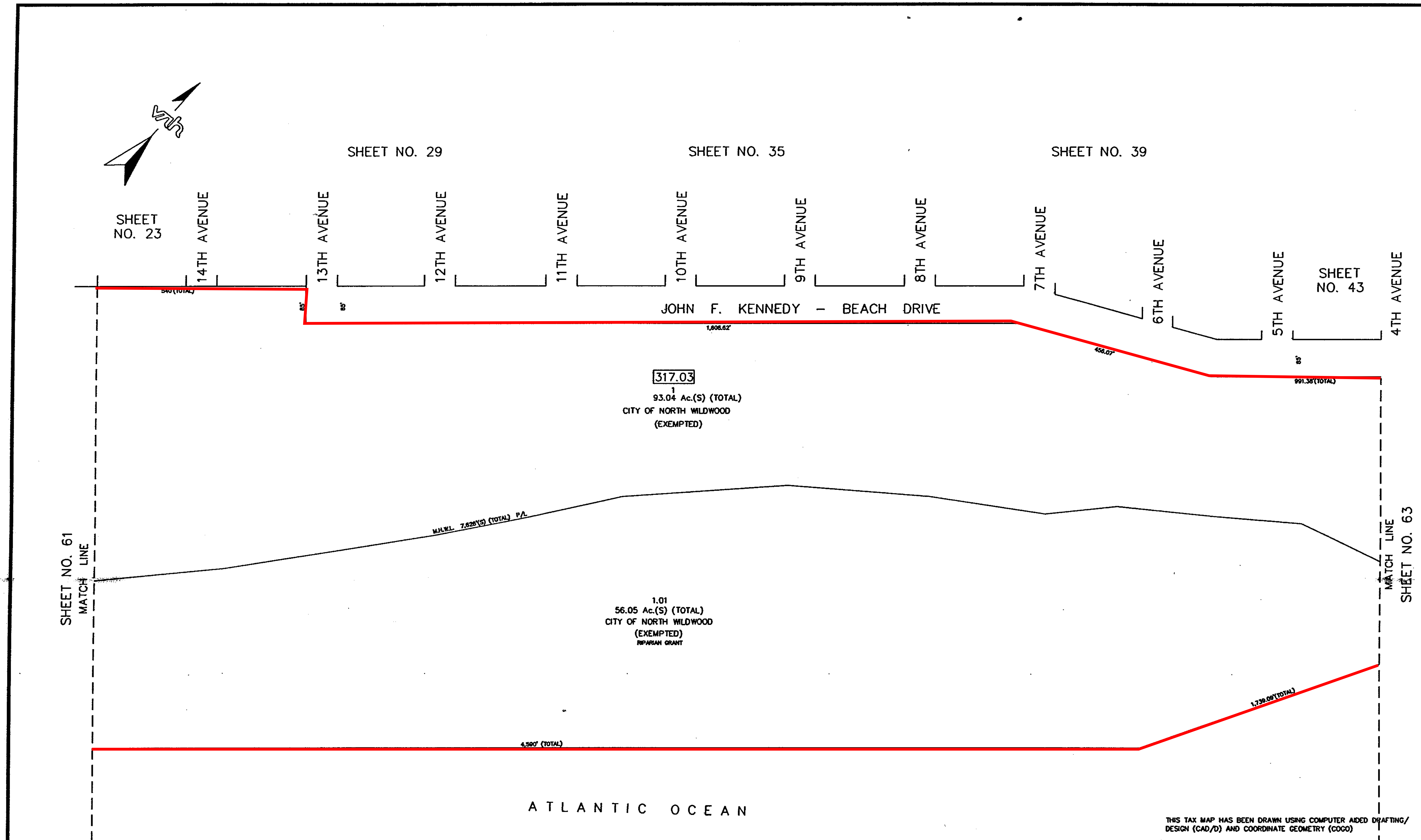
REVISIONS		
DATE	NAME	NO.

TAX MAP
CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, NEW JERSEY

SCALE: 1" = 100' DATE: NOVEMBER 3, 2003

LEWIS H. CONLEY JR.
NEW JERSEY LICENSED LAND SURVEYOR NO. 21212
van note–harvey associates, p.c.
CONSULTING ENGINEERS, PLANNERS, LAND SURVEYORS
211 N. MAIN STREET CAPE MAY COURT HOUSE, N.J. 08210



THIS TAX MAP HAS BEEN DRAWN USING COMPUTER AIDED DRAFTING/ DESIGN (CAD/D) AND COORDINATE GEOMETRY (COGO)

REVISIONS		
DATE	NAME	NO.

TAX MAP
CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, NEW JERSEY

SCALE: 1" = 100' DATE: NOVEMBER 3, 2003

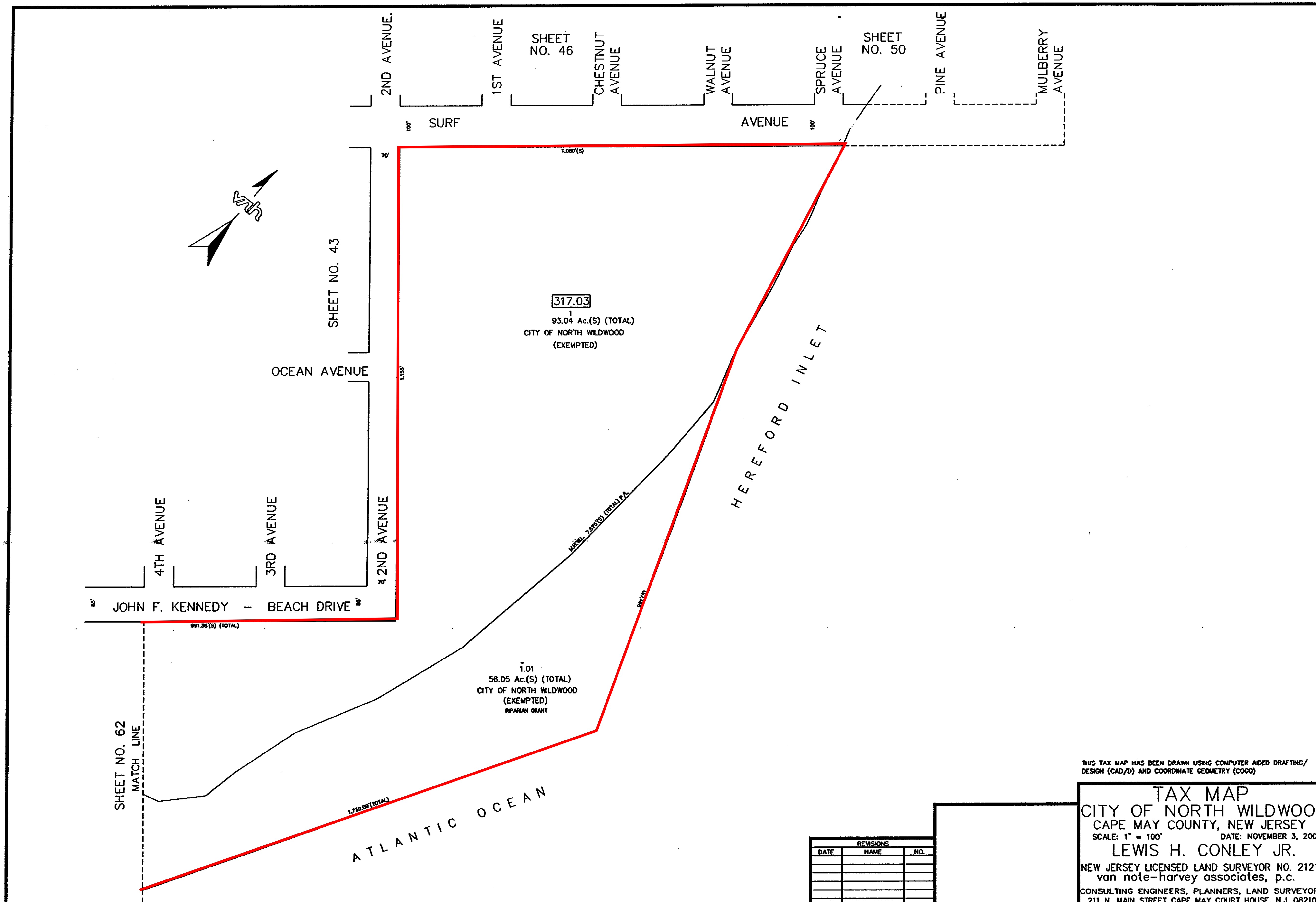
LEWIS H. CONLEY JR.

NEW JERSEY LICENSED LAND SURVEYOR NO. 21212

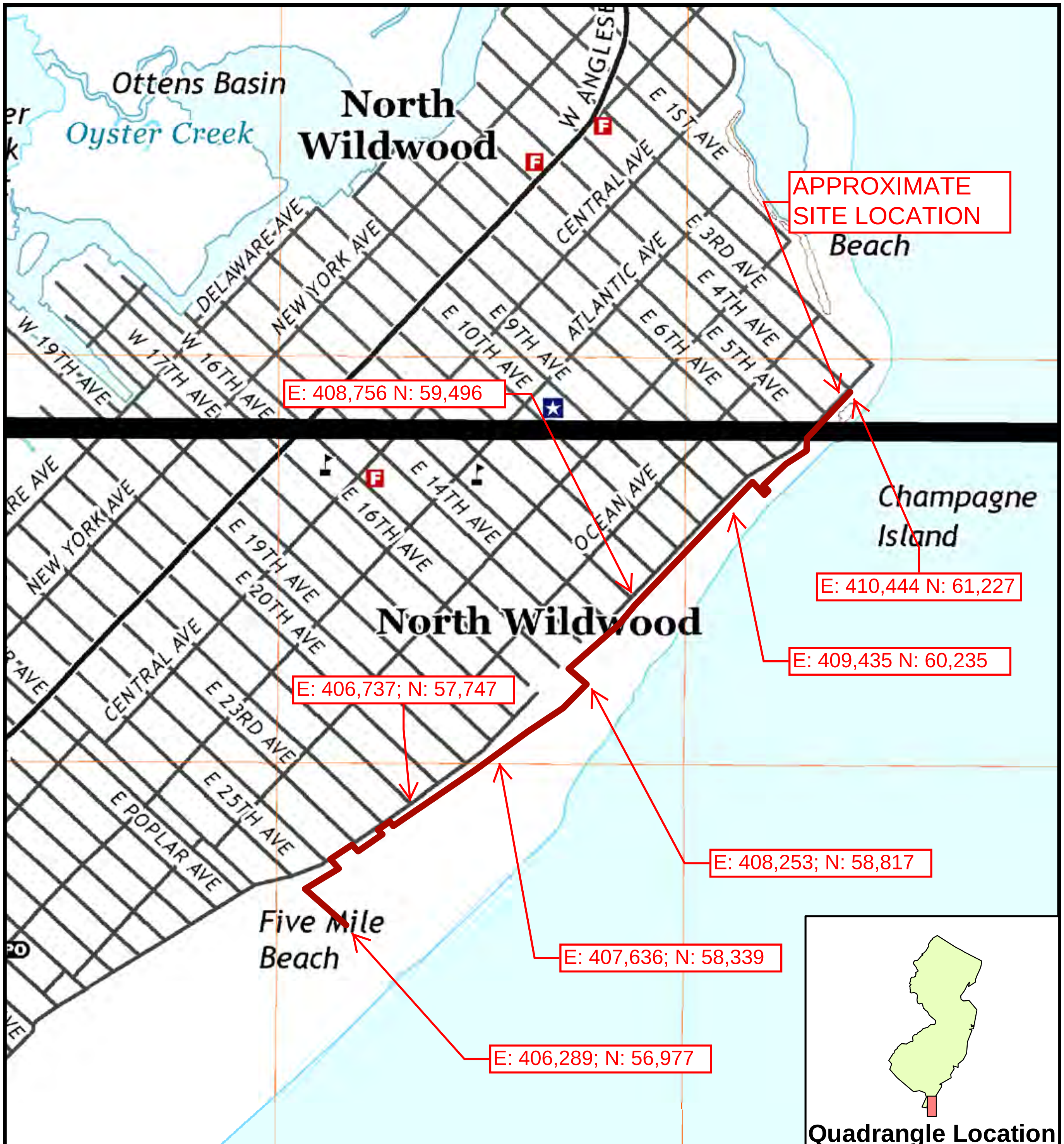
van note–harvey associates, p.c.

CONSULTING ENGINEERS, PLANNERS, LAND SURVEYORS

211 N. MAIN STREET CAPE MAY COURT HOUSE, N.J. 08210



2ND AVENUE
1ST AVENUE
SHEET NO. 46
CHESTNUT AVENUE
WALNUT AVENUE
SPRUCE AVENUE
SHEET NO. 50
PINE AVENUE
MULBERRY AVENUE
SURF
AVENUE
SHEET NO. 43
OCEAN AVENUE
317.03
1
93.04 Ac.(S) (TOTAL)
CITY OF NORTH WILDWOOD
(EXEMPTED)
HEREFORD INLET
4TH AVENUE
3RD AVENUE
2ND AVENUE
JOHN F. KENNEDY – BEACH DRIVE
1.01
56.05 Ac.(S) (TOTAL)
CITY OF NORTH WILDWOOD
(EXEMPTED)
RIPARIAN GRANT
SHEET NO. 62
MATCH LINE
ATLANTIC OCEAN
THIS TAX MAP HAS BEEN DRAWN USING COMPUTER AIDED DRAFTING/DESIGN (CAD/D) AND COORDINATE GEOMETRY (COGO)
REVISIONS
DATE
NAME
NO.
TAX MAP
CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, NEW JERSEY
SCALE: 1" = 100'
DATE: NOVEMBER 3, 2003
LEWIS H. CONLEY JR.
NEW JERSEY LICENSED LAND SURVEYOR NO. 21212
van note–harvey associates, p.c.
CONSULTING ENGINEERS, PLANNERS, LAND SURVEYORS
211 N. MAIN STREET CAPE MAY COURT HOUSE, N.J. 08210



USGS 2019 QUAD MAP - WILDWOOD
& STONE HARBOR, NJ
BEACH FRONT BULKHEAD
Prepared for
THE CITY OF NORTH WILDWOOD

CITY OF NORTH WILDWOOD CAPE MAY COUNTY, NJ

0 750 1,500 3,000 Feet

van note-harvey
associates, inc.

Since 1894

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211 Bayberry Drive • Cape May Court House, NJ 08210 • 609-465-2600

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Certificate of Authorization
No. 24GA28271300

November 19, 2020
VNHA PROJECT #: 44693-400-21

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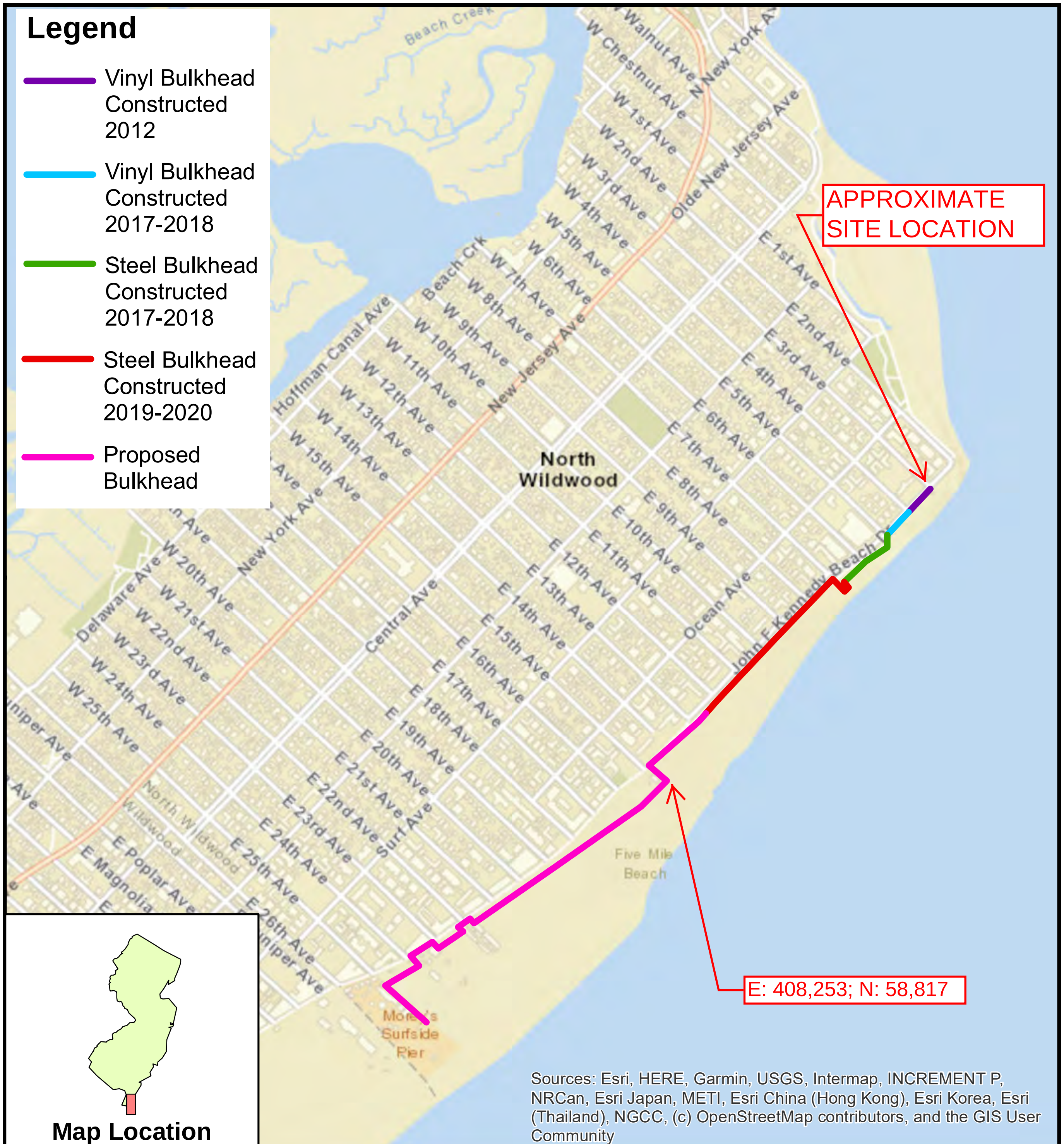

STREET MAP
of
BEACH FRONT BULKHEAD
Prepared for
THE CITY OF NORTH WILDWOOD

CITY OF NORTH WILDWOOD CAPE MAY COUNTY, NJ

0 750 1,500 3,000 Feet

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Certificate of Authorization No. 24GA28271300

November 19, 2020
VNHA PROJECT #: 44693-400-21

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NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was New Jersey State Plane (FIPS 2900) zone. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was developed from high-resolution orthophotography provided by the State of New Jersey. This information was derived from digital orthophotos produced at a scale of 1:2400 with a 1-foot pixel resolution from photography dated 2012.

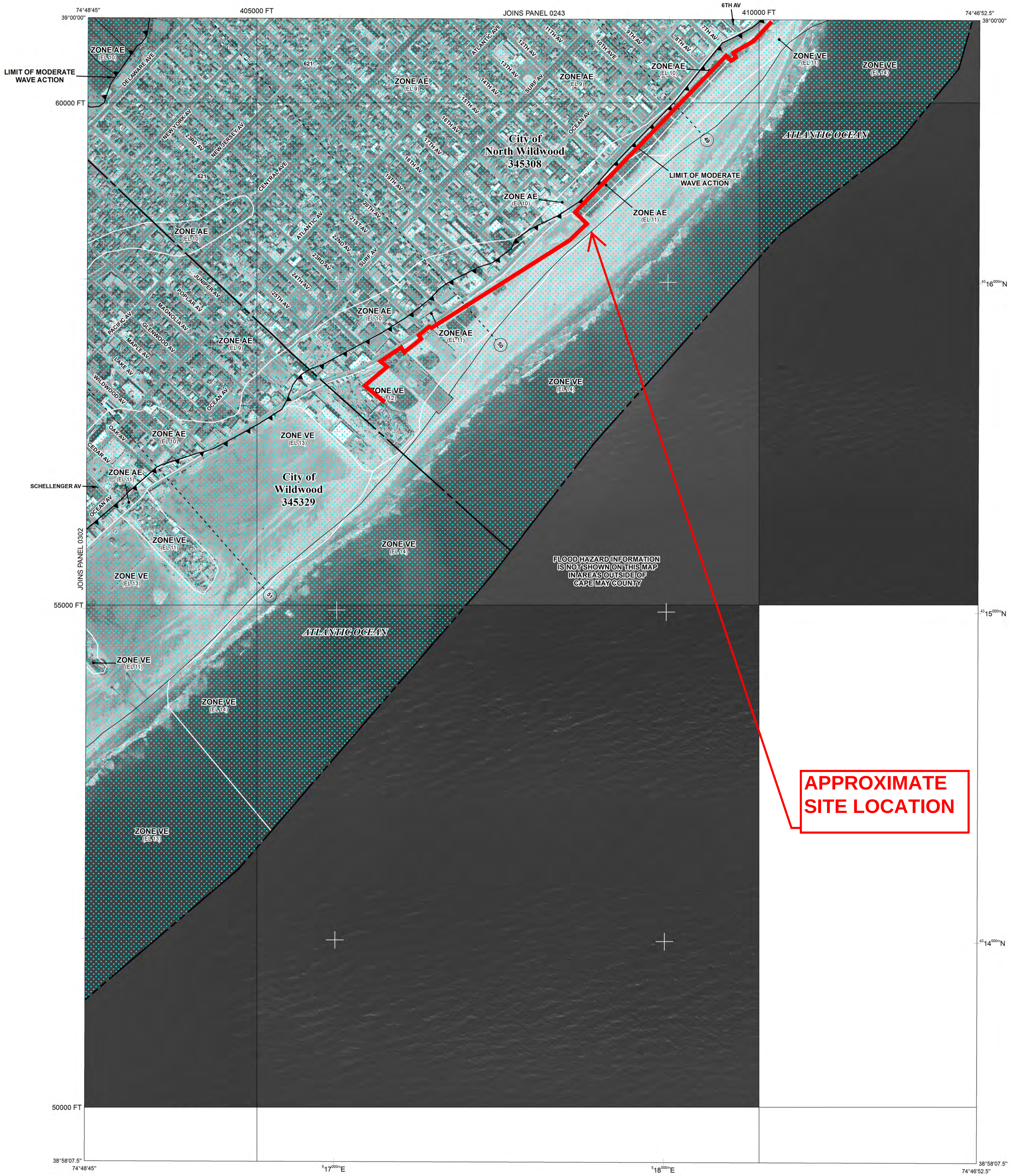
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/national-flood-insurance-program.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Limit of Moderate Wave Action

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)—(A)	Cross section line
(23)- - -(23)	Transect line
	Culvert, Flume, Penstock or Aqueduct
	Road or Railroad Bridge
	Footbridge
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
$^{24}76^{000m}$N	1000-meter Universal Transverse Mercator grid values, zone 18
600000 FT	5000-foot grid values: New Jersey State Plane coordinate system (FIPSZONE 2900), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
October 5, 2017

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0306F

FIRM
FLOOD INSURANCE RATE MAP

CAPE MAY COUNTY, NEW JERSEY (ALL JURISDICTIONS)

PANEL 306 OF 311

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
NORTH WILDWOOD, CITY OF	345308	0306	F
WILDWOOD, CITY OF	345329	0306	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 34009C0306F

EFFECTIVE DATE OCTOBER 5, 2017

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was New Jersey State Plane (FIPS 2900) zone. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was developed from high-resolution orthophotography provided by the State of New Jersey. This information was derived from digital orthophotos produced at a scale of 1:2400 with a 1-foot pixel resolution from photography dated 2012.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/national-flood-insurance-program.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) LEGEND

11-16-1990 CBRS Area

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER NOVEMBER 16, 1990, IN DESIGNATED CBRS AREAS.

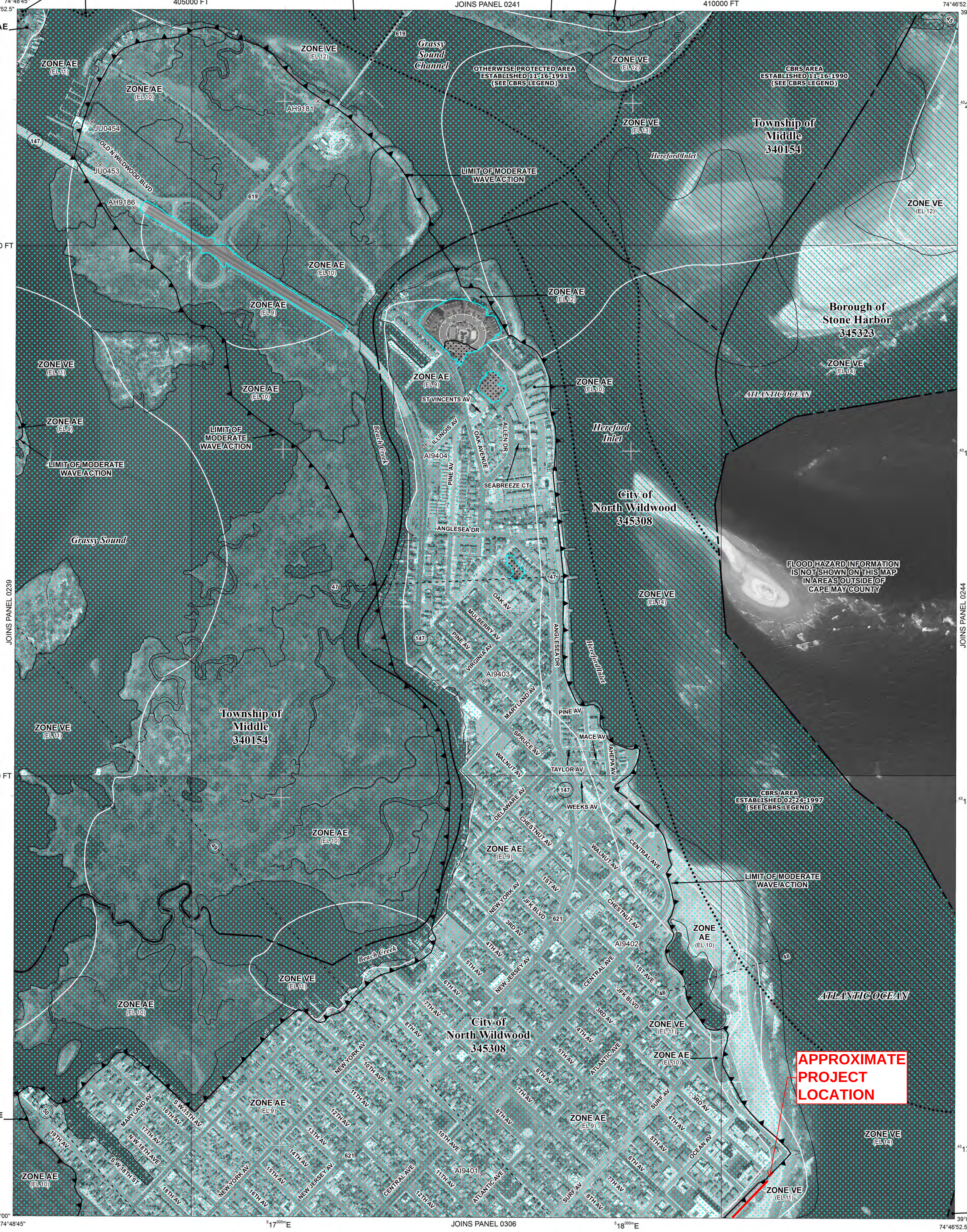
2-24-1997 CBRS Area

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER FEBRUARY 24, 1997, IN DESIGNATED CBRS AREAS.

11-16-1991 Otherwise Protected Area (OPA)

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER NOVEMBER 16, 1991, IN DESIGNATED OPAs WITHIN THE CBRS.

Boundaries of the John H. Chafee Coastal Barrier Resources System (CBRS) shown on this FIRM were transferred from the official CBRS source map(s) for this area and are depicted on this FIRM for informational purposes only. The official CBRS maps are enacted by Congress via the Coastal Barrier Resources Act, as amended, and maintained by the U.S. Fish and Wildlife Service (FWS). The official CBRS maps used to determine whether or not an area is located within the CBRS are available for download at http://www.fws.gov. For an official determination of whether or not an area is located within the CBRS, or for any questions regarding the CBRS, please contact the FWS field office for this area at 609-646-9310.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
	Limit of Moderate Wave Action
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - 23	Transect line
	Culvert, Flume, Penstock or Aqueduct
	Road or Railroad Bridge
	Footbridge
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
$^{24}76^{000m}$N	1000-meter Universal Transverse Mercator grid values, zone 18
600000 FT	5000-foot grid values: New Jersey State Plane coordinate system (FIPSZONE 2900), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
October 5, 2017

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0243F

FIRM

FLOOD INSURANCE RATE MAP

CAPE MAY COUNTY, NEW JERSEY
(ALL JURISDICTIONS)

PANEL 243 OF 311

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MIDDLE, TOWNSHIP OF	340154	0243	F
NORTH WILDWOOD, CITY OF	345308	0243	F
STONE HARBOR, BOROUGH OF	345323	0243	F

\- NOTE -
THIS MAP INCLUDES BOUNDARIES OF THE COASTAL BARRIER RESOURCES SYSTEM ESTABLISHED UNDER THE COASTAL BARRIER RESOURCES ACT OF 1982 AND/OR SUBSEQUENT ENABLING LEGISLATION.

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
34009C0243F

EFFECTIVE DATE
OCTOBER 5, 2017

Federal Emergency Management Agency

PHOTOGRAPH KEY MAP 1
of
BEACH FRONT BULKHEAD
Prepared for
THE CITY OF NORTH WILDWOOD

CITY OF NORTH WILDWOOD CAPE MAY COUNTY, NJ

0 187.5 375 750 Feet

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Since 1894
consulting engineers, planners & land surveyors
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211 Bayberry Drive • Cape May Court House, NJ 08210 • 609-465-2600
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No. 24GA28271300

November 19, 2020
VNHA PROJECT #: 44693-400-21

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PHOTOGRAPH KEY MAP 2
of
BEACH FRONT BULKHEAD
Prepared for
THE CITY OF NORTH WILDWOOD

CITY OF NORTH WILDWOOD | CAPE MAY COUNTY, NJ

0 187.5 375 750 Feet

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Certificate of Authorization
No. 24GA28271300

November 19, 2020
VNHA PROJECT #: 44693-400-21

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PHOTOGRAPH KEY MAP 3
of
BEACH FRONT BULKHEAD
Prepared for
THE CITY OF NORTH WILDWOOD

CITY OF NORTH WILDWOOD CAPE MAY COUNTY, NJ

0 187.5 375 750 Feet

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Certificate of Authorization No. 24GA28271300

November 19, 2020
VNHA PROJECT #: 44693-400-21

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Beach Front Bulkhead Project
City of North Wildwood, Cape May County, New Jersey

Photo #1 – View of landward side of vinyl bulkhead at 3rd Avenue looking southwest.

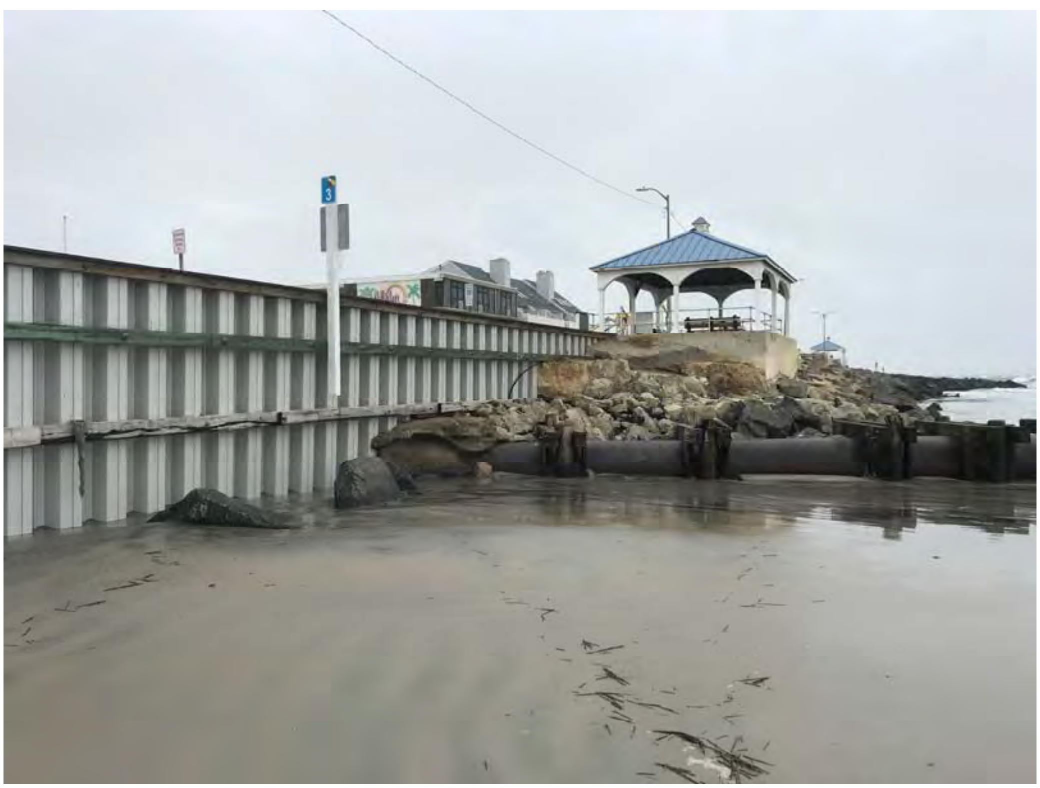

Photo # 2 – View of waterward side of vinyl bulkhead at 3rd Avenue looking northeast.

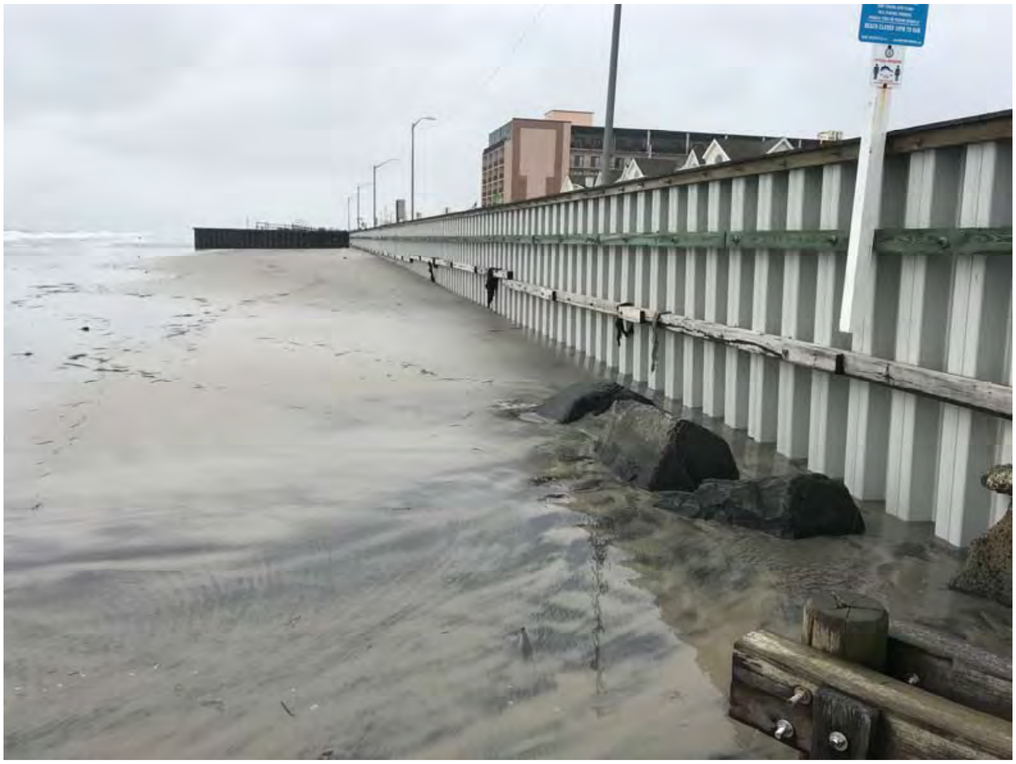

Photo #3 – View of waterward side of vinyl bulkhead at 3rd Avenue looking southwest.

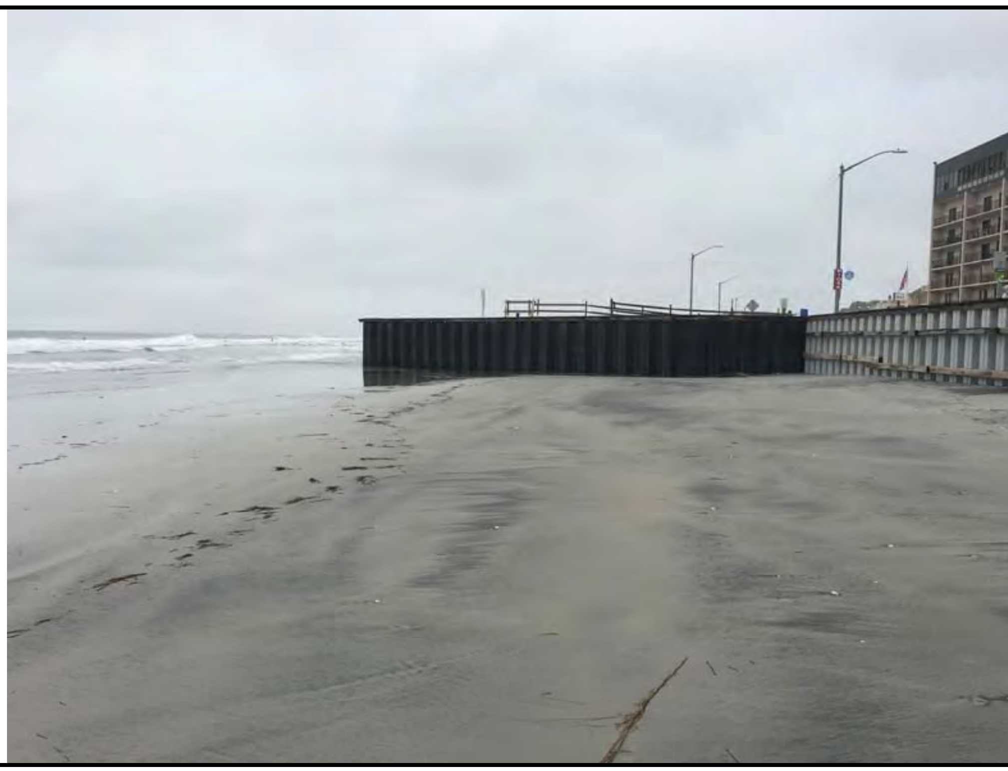

Photo #4 – View of waterward side of vinyl bulkhead and steel bulkhead, and former dune area at 4th Avenue looking southwest.

Beach Front Bulkhead Project
City of North Wildwood, Cape May County, New Jersey

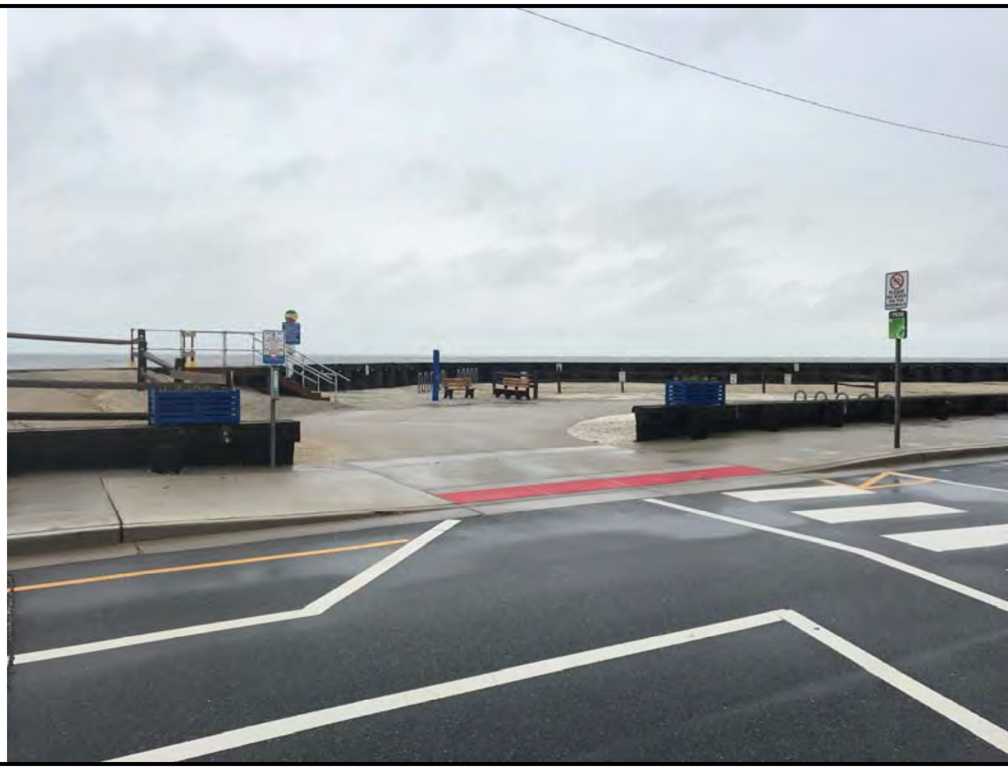

Photo #5 – View of beach access at the 5th Avenue.

Photo #6 – View of the local community fishing at the steel bulkhead at 5th Avenue at the location of the former beach.

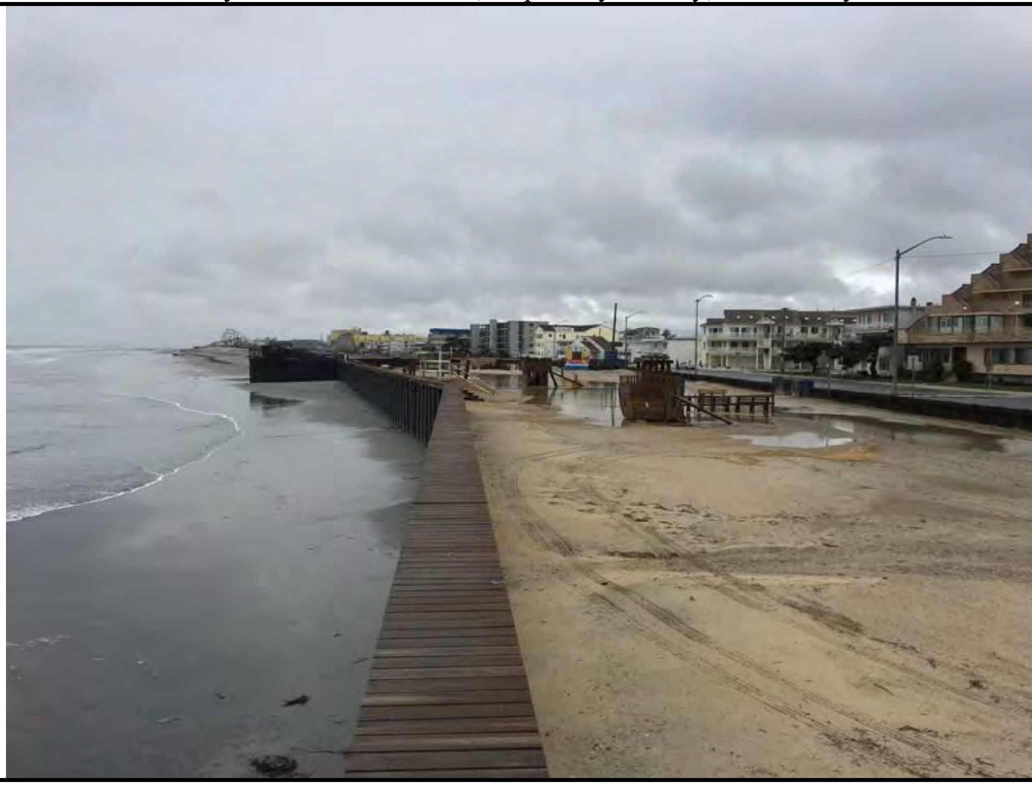

Photo # 7 – View of timber cap and steel bulkhead at 6th Avenue looking southwest.

Photo #8 - View of steel bulkhead at 7th Avenue looking northeast showing erosion and flooding on landward side of the bulkhead.

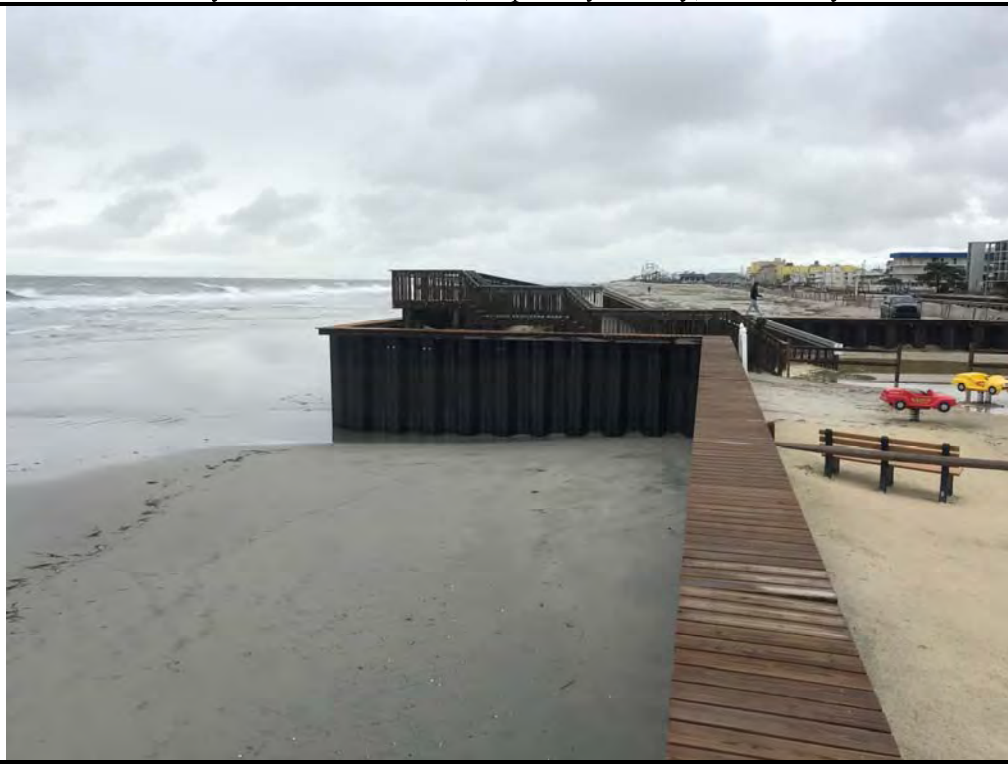

Photo #9 – View of timber cap and steel bulkhead looking southwest toward 7th Avenue.

Photo #10 – View of timber cap and steel bulkhead at 7th Avenue looking southwest.

Photo #11 – View of waterward side of steel bulkhead at 7th Avenue looking northeast.

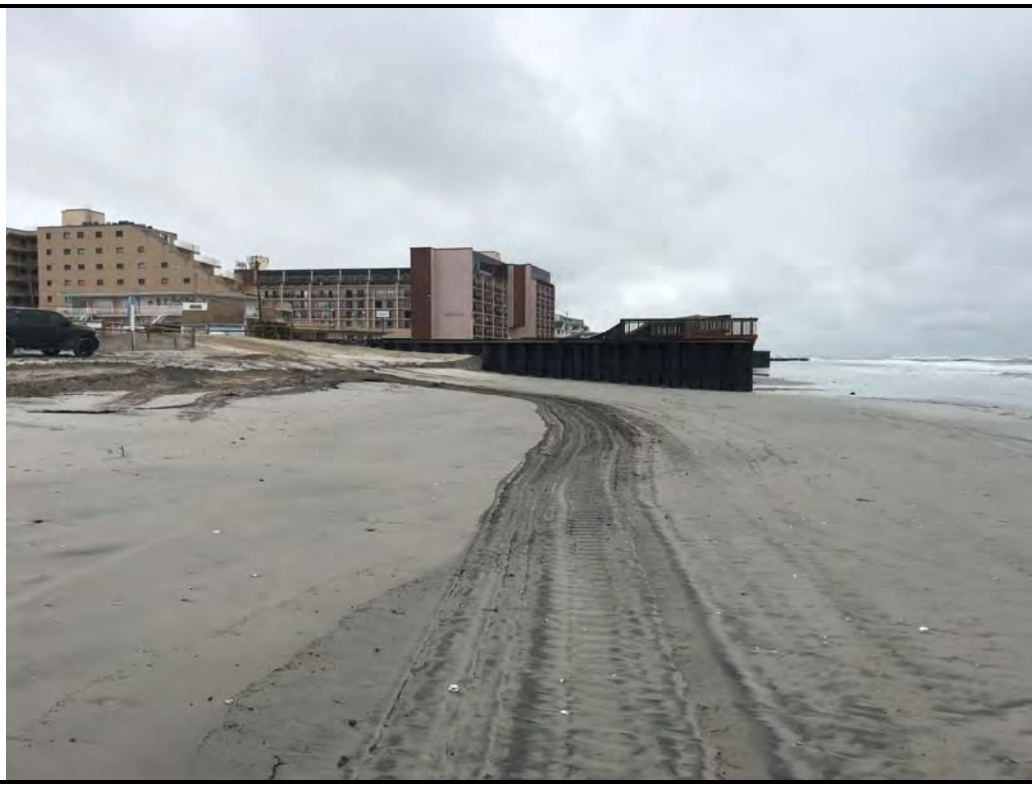

Photo #12 – View of steel bulkhead at 8th Avenue looking northeast.

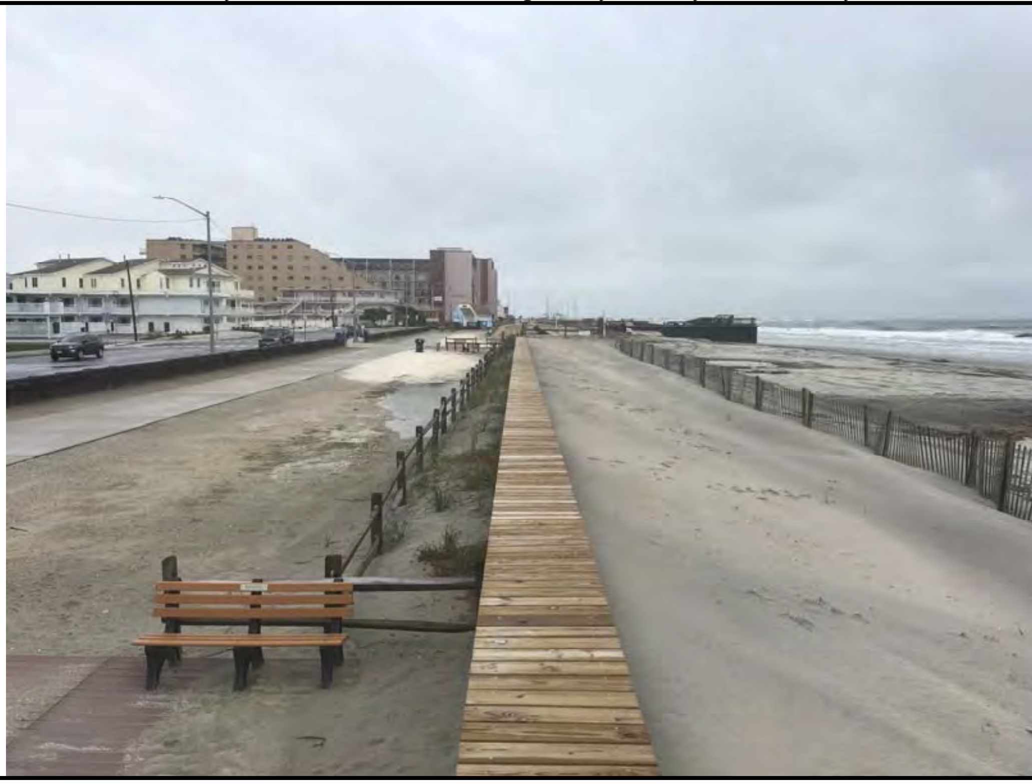

Photo #13 – View of timber cap and steel bulkhead at 9th Avenue looking northeast showing location of former wetlands/dune.

Photo #14 – View of typical beach access over steel bulkhead at 10th Avenue looking southwest.

Photo #15 – View of timber cap and steel bulkhead at 12th Avenue looking southwest.

Photo #16 – View of steel bulkhead and location of former wetland at 13th Avenue looking northeast.

Beach Front Bulkhead Project
City of North Wildwood, Cape May County, New Jersey

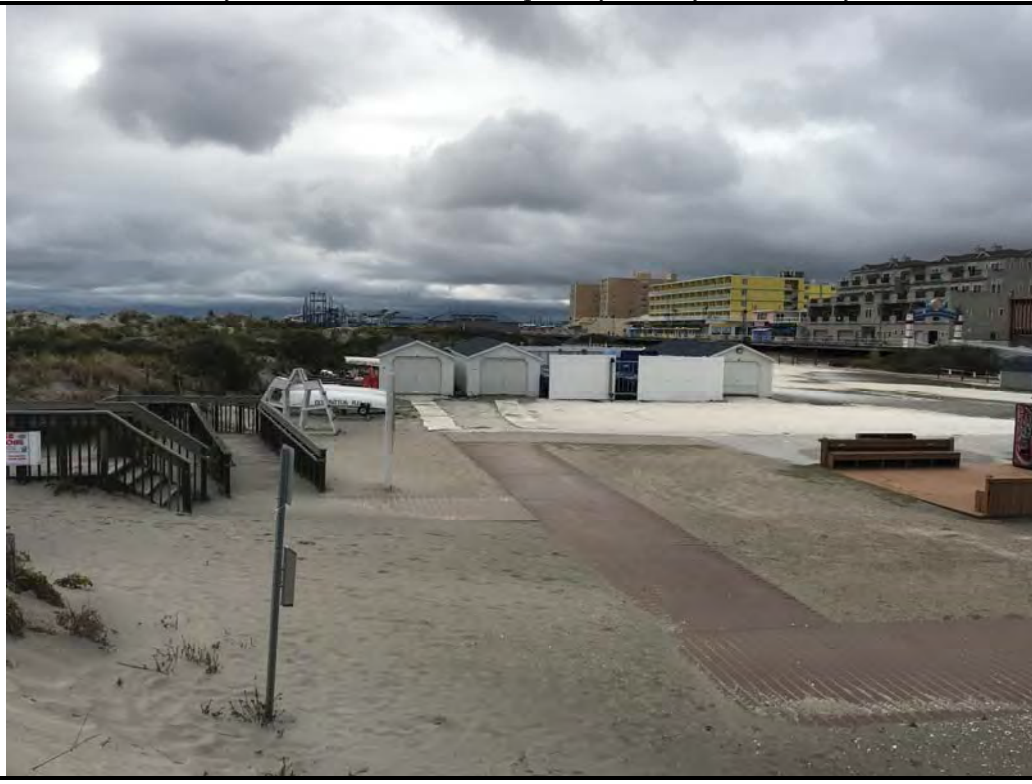

Photo #17 – View of proposed location for steel bulkhead at 15th Avenue looking southwest near the Beach Patrol Building.

Photo #18 – View of typical beach and dune erosion at 15th Avenue looking southwest.

Photo #19 – View of proposed bulkhead location at 16th Avenue looking northeast at the Beach Patrol Building.

Photo #20 – View proposed bulkhead location at 19th Avenue looking southwest towards the Seaport Pier.

Photo #21 – View of typical beach and dunes at 19th Avenue looking northeast.

Photo #22 – View of proposed bulkhead location at 24th Avenue looking southeast.

Beach Front Bulkhead Project
City of North Wildwood, Cape May County, New Jersey

Photo #23 – View of proposed steel bulkhead location at 24th Avenue looking southwest.

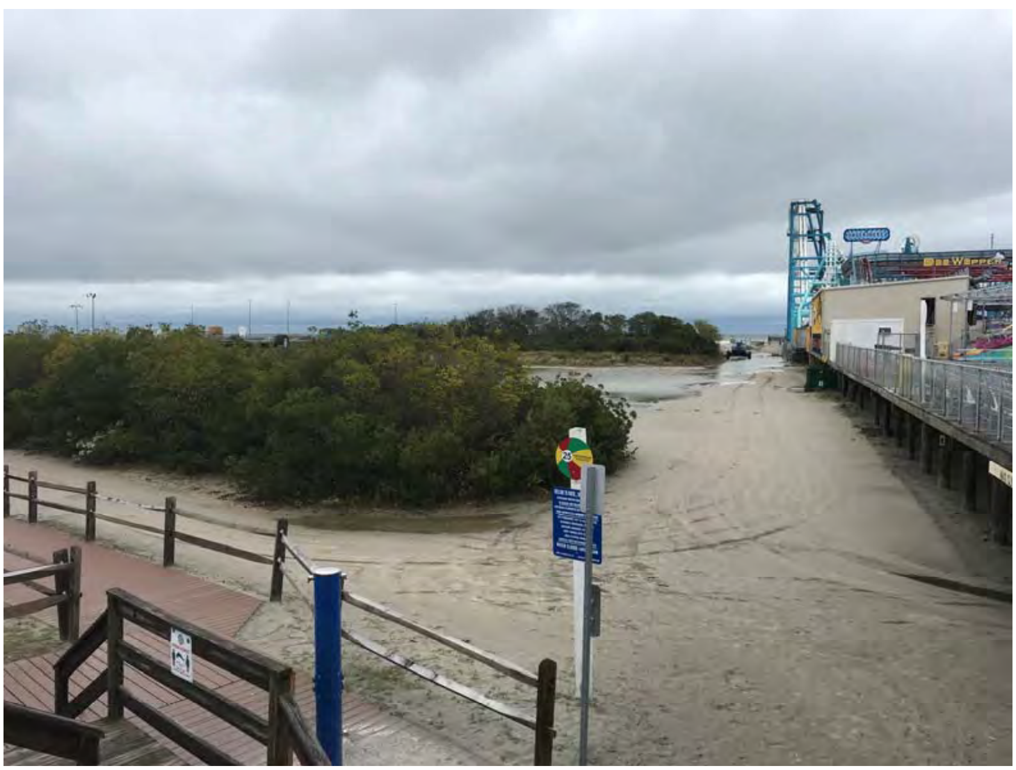

Photo #24 – View of proposed steel bulkhead location at 25th Avenue looking southeast.

LEGEND

- WETLANDS LINE
- LIMIT OF WETLANDS TRANSITION
- WETLANDS POINT ID
- DATA POINTS
- ZONE VE (EL. 11) F.I.R.M. ZONE
- LIMWA LINE
- F.I.R.M. ZONE LIMIT LINE

NOTES:

1 LOCATIONS AND ELEVATIONS SHOWN HEREON WERE TAKEN FROM GPS OBSERVATIONS PERFORMED 07/2020 & 08/25/2020 REFERENCING NATIONAL GEODETIC SURVEY CONTINUOUSLY OPERATING REFERENCE STATION (NGSCORS) CORS ID NJCM PID DI3828. VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NAVD88) (GEOID12B)

2 WETLANDS POINTS:
POINTS:
WG–1 THRU WG–4, WF–1 THRU WF–4, WE–1 THRU WE–4, WD–1 THRU WD–4
WC–1 THRU WC–4, WB–1 THRU WB–4, AND WA–1 THRU WA–4
WERE FILED DELINEATED AND LOCATED OCTOBER 2013 BY VANNOTE HARVEY ASSOCIATES.
WETLAND BOUNDARY LINE "C" AND LINE "A" WERE ESTABLISHED USING TOPOGRAPHY PER NOTE NO. 1 (AND NEAR MAP AERIAL IMAGERY DATED MARCH 2020)

POINTS:
WG–4A THRU WA–4–C, WA–1A, AND WA–1B
WERE FIELD DELINATED AND LOCATED AUGUST 2018 BY VAN NOTE HARVEY ASSOCIATES

3 REFER TO FEMA FLOOD INSURANCE RATE MAP(S) (F.I.R.M.) NUMBER 34009C0306F EFFECTIVE DATE OCTOBER 5, 2017 AND MAP NUMBER 34009C0243F EFFECTIVE DATE OCTOBER 5,2017 FOR F.I.R.M. LIMIT LINES, ZONES AND LIMIT OF MODERATED WAVE ACTION LINE (LIMWA).

4 TAX MAP INFORMATION
BLOCK 317.03 LOTS 1, 1.01
BLOCK 289.03 LOT 1
BLOCK 290.01 LOT 1
BLOCK 291.01 LOT 1
BLOCK 315.02 LOT 1
BLOCK 316.02 LOT 1
BLOCK 317.02 LOT 1
SHEETS 17, 23, 62 AND 63

LOCAL RANGE OF TIDES

5.45

2.43 (SPRING HIGH WATER = SHW)
1.99 (MEAN HIGH WATER = MHW)
–2.86 (MEAN LOW WATER = MLW)
–3.02 (MEAN LOWER LOW WATER = MLLW)

TIDAL INFORMATION U.S. DEPT. OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (N.O.A.A.) NATIONAL OCEAN SERVICE TIDAL STATION ID#8536110 CAPE MAY NEW JERSEY. TIDAL EPOCH DATED JANUARY 1983 – DECEMBER 2001

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

11/17/2020
DATE OF SIGN.

RALPH PETRELLA JR.
N.J. PROFESSIONAL ENGINEER & LAND SURVEYOR LIC. NO. GB 23226

van note-harvey associates, inc.
consulting engineers, planners & land surveyors
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PLAN OF PROPOSED AND EXISTING

BEACH FRONT BULKHEAD

15TH AVE TO 26TH AVE
CITY OF NORTH WILDWOOD

CAPE MAY COUNTY, N.J.

DRAWN BY BMP	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY RP/JWV	PAGE	44693–400–21		1

M:\44000PROJECTS\44693 EMERGENCY BULKHEAD EXTENSION\44693 NWW BEACH BULKHEAD SIGNED PLANS 11–17–2020.DWG

LEGEND

WETLANDS LINE

WETLANDS TRASITION AREA (50')

WE-1 WETLANDS POINT ID

DP-1 DATA POINTS

ZONE VE (EL. 11) F.I.R.M. ZONE

LIMWA LINE

F.I.R.M. ZONE LIMIT LINE

NOTES:

1 LOCATIONS AND ELEVATIONS SHOWN HEREON WERE TAKEN FROM GPS OBSERVATIONS PERFORMED 07/2020 & 08/25/2020 REFERENCING NATIONAL GEODETIC SURVEY CONTINUOUSLY OPERATING REFERENCE STATION (NGSCORS) CORS ID NJCM PID DI3828. VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NAVD88) (GEOID12B)

2 WETLANDS POINTS:
POINTS:
WG-1 THRU WG-4, WF-1 THRU WF-4, WE-1 THRU WE-4, WD-1 THRU WD-4
WC-1 THRU WC-4, WB-1 THRU WB-4, AND WA-1 THRU WA-4
WERE FILED DELINEATED AND LOCATED OCTOBER 2013 BY VANNOTE HARVEY ASSOCIATES.
WETLAND BOUNDARY LINE "C" AND LINE "A" WERE ESTABLISHED USING TOPOGRAPHY PER NOTE NO. 1 (AND NEAR MAP AERIAL IMAGERY DATED MARCH 2020)

POINTS:
WG-4A THRU WA-4-C, WA-1A, AND WA-1B
WERE FIELD DELINATED AND LOCATED AUGUST 2018 BY VAN NOTE HARVEY ASSOCIATES

3 REFER TO FEMA FLOOD INSURANCE RATE MAP(S) (F.I.R.M.) NUMBER 34009C0306F EFFECTIVE DATE OCTOBER 5, 2017 AND MAP NUMBER 34009C0243F EFFECTIVE DATE OCTOBER 5,2017 FOR F.I.R.M. LIMIT LINES, ZONES AND LIMIT OF MODERATED WAVE ACTION LINE (LIMWA).

4 TAX MAP INFORMATION
BLOCK 317.03 LOTS 1, 1.01
BLOCK 289.03 LOT 1
BLOCK 290.01 LOT 1
BLOCK 291.01 LOT 1
BLOCK 315.02 LOT 1
BLOCK 316.02 LOT 1
BLOCK 317.02 LOT 1
SHEETS 17, 23, 62 AND 63

LOCAL RANGE OF TIDES

2.43 (SPRING HIGH WATER = SHW)
1.99 (MEAN HIGH WATER = MHW)
5.45
-2.86 (MEAN LOW WATER = MLW)
-3.02 (MEAN LOWER LOW WATER = MLLW)

TIDAL INFORMATION U.S. DEPT. OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (N.O.A.A.) NATIONAL OCEAN SERVICE TIDAL STATION ID#8536110 CAPE MAY NEW JERSEY. TIDAL EPOCH DATED JANUARY 1983 – DECEMBER 2001

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

11/17/2020
DATE OF SIGN.

RALPH PETRELLA JR.
N.J. PROFESSIONAL ENGINEER & LAND SURVEYOR LIC. NO. GB 23226

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consulting engineers, planners & land surveyors
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211 Bayberry Drive ● Cape May Court House, NJ 08210 ● 609-465-2600
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van note-harvey associates - Since 1894 -

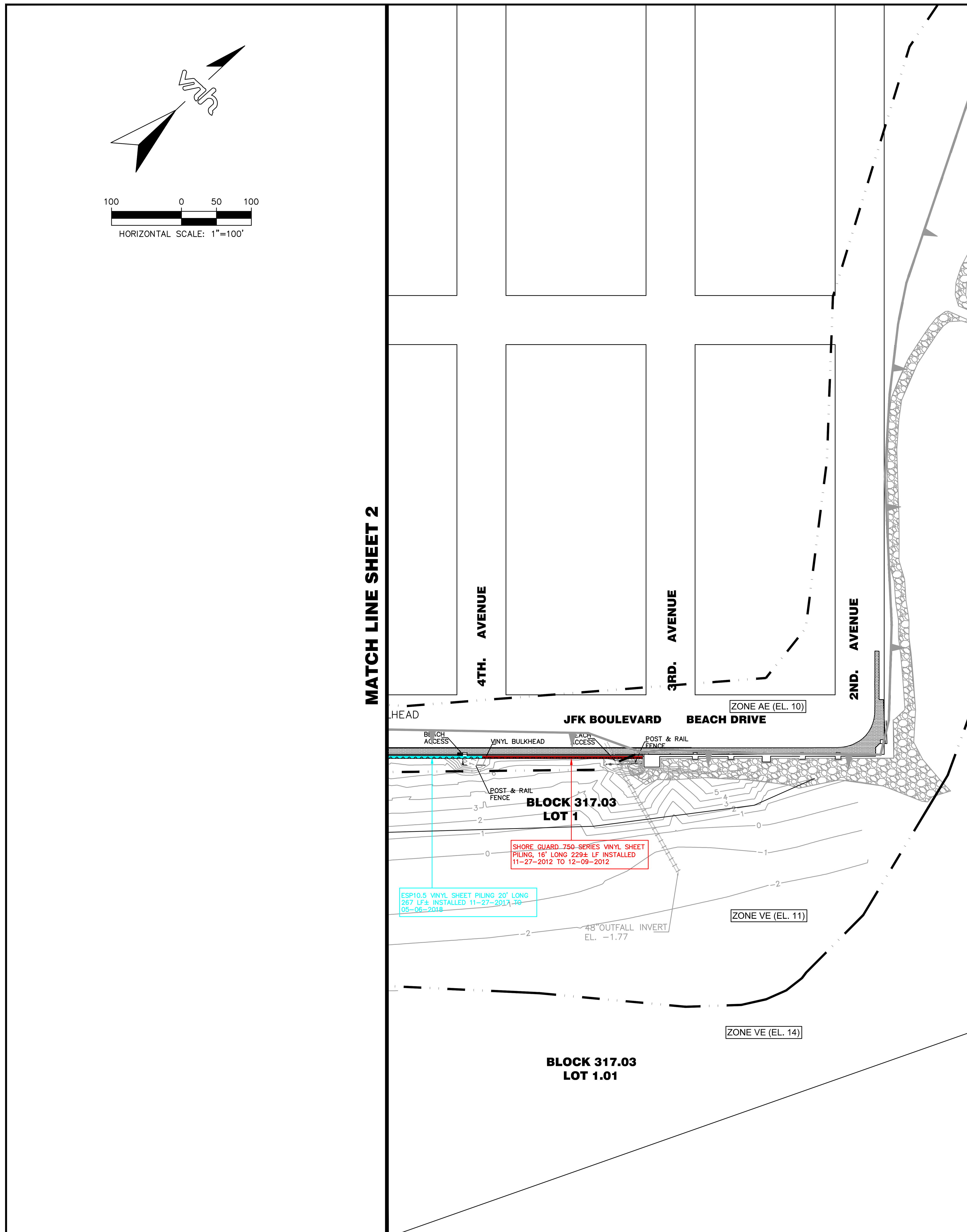
PLAN OF PROPOSED AND EXISTING

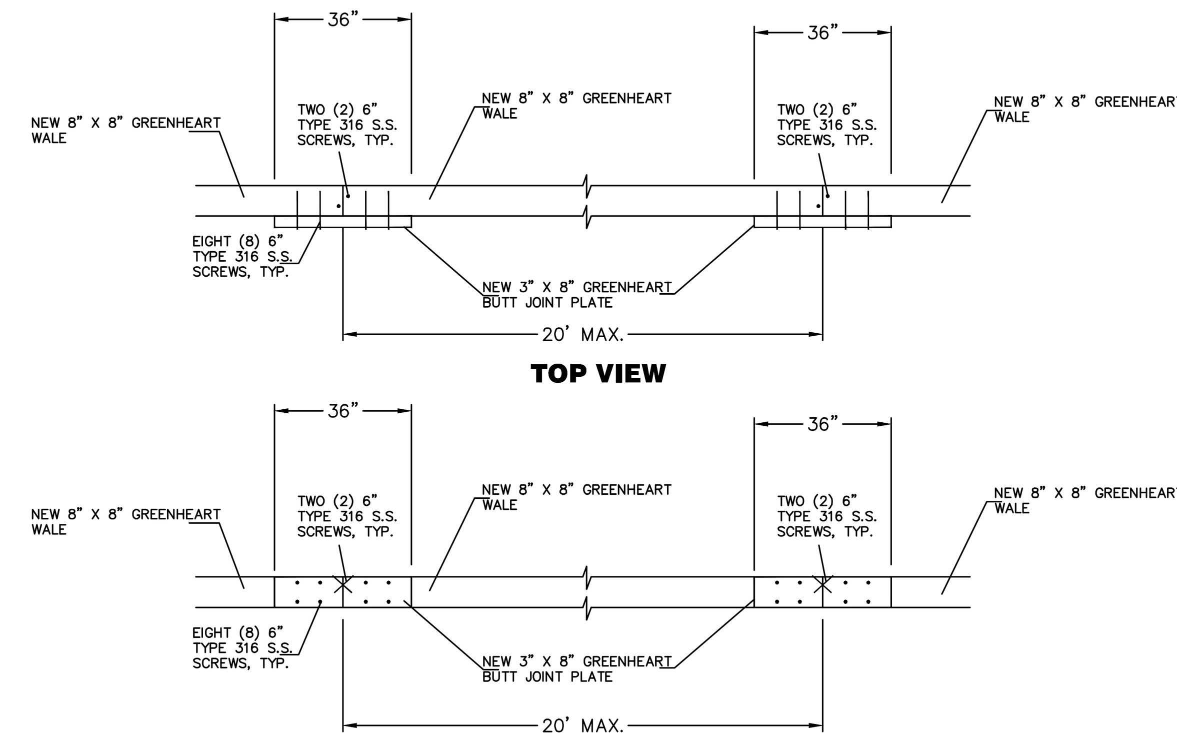
BEACH FRONT BULKHEAD

MID BLOCK TH AND 5TH AVE TO 15TH AVE
CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, N.J.

DRAWN BY DMH	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY RP/JWV	PAGE	44693-400-21		2

M:\44000PROJECTS\44693 EMERGENCY BULKHEAD EXTENSION\44693 NWW BEACH BULKHEAD SIGNED PLANS 11-17-2020.DWG

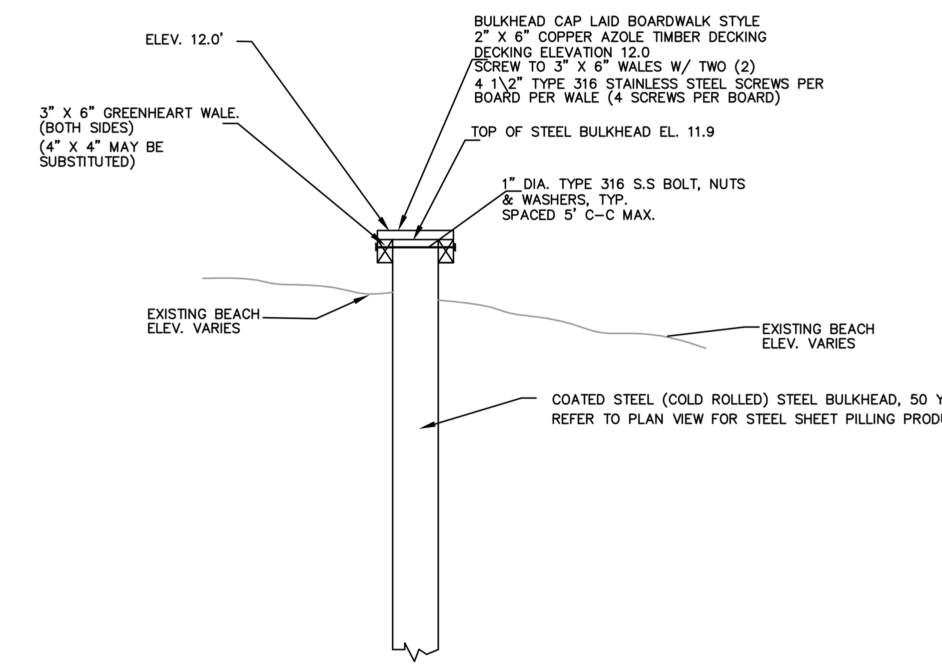




TOP VIEW

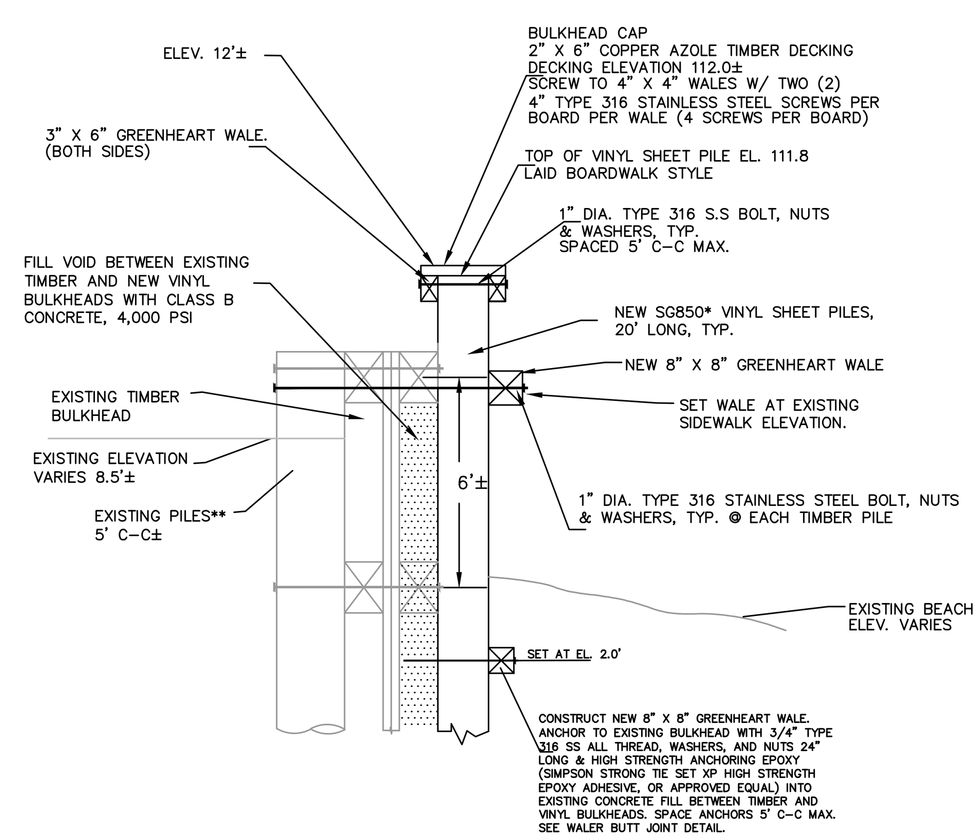
FRONT VIEW

WALER BUTT JOINT DETAIL



STEEL BULKHEAD CONSTRUCTION DETAIL

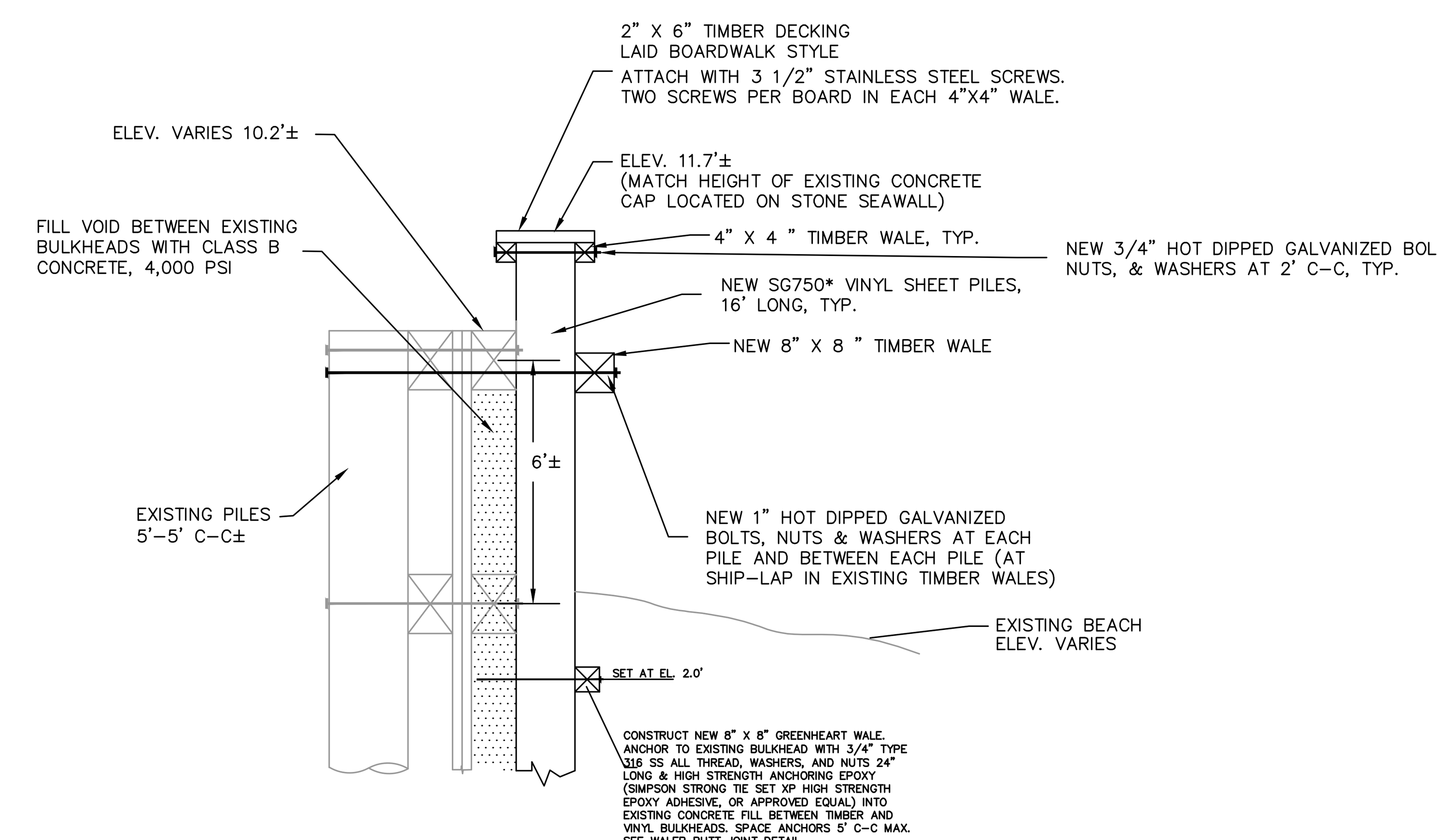
NOT TO SCALE



NOTES:
* SHORE GUARD 850 SERIES AS MANUFACTURED BY CRANE MATERIALS INTERNATIONAL, OR APPROVED EQUAL

4TH AVENUE TO 5TH AVENUE VINYL BULKHEAD CONSTRUCTION DETAIL

NOT TO SCALE



3RD AVENUE TO 4TH AVENUE BULKHEAD CONSTRUCTION DETAIL

NOT TO SCALE

LEGEND

ZONE VE (EL. 11) F.I.R.M. ZONE

LIMWA LINE

F.I.R.M. ZONE LIMIT LINE

NOTES:

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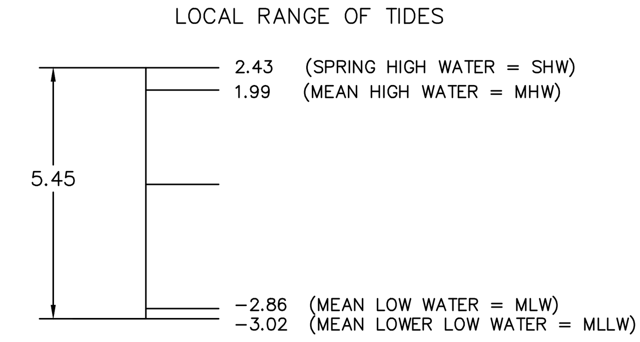
2 REFER TO FEMA FLOOD INSURANCE RATE MAP(S) (F.I.R.M.) NUMBER 34009C0306F EFFECTIVE DATE OCTOBER 5, 2017 AND MAP NUMBER 34009C0243F EFFECTIVE DATE OCTOBER 5,2017 FOR F.I.R.M. LIMIT LINES, ZONES AND LIMIT OF MODERATED WAVE ACTION LINE (LIMWA).

3 TAX MAP INFORMATION
BLOCK 317.03 LOTS 1, 1.01
BLOCK 289.03 LOT 1
BLOCK 290.01 LOT 1
BLOCK 291.01 LOT 1
BLOCK 315.02 LOT 1
BLOCK 316.02 LOT 1
BLOCK 317.02 LOT 1
SHEETS 17, 23, 62 AND 63

LOCAL RANGE OF TIDES



TIDAL INFORMATION U.S. DEPT. OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (N.O.A.A.) NATIONAL OCEAN SERVICE TIDAL STATION ID#8536110 CAPE MAY NEW JERSEY. TIDAL EPOCH DATED JANUARY 1983 – DECEMBER 2001

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

11/17/2020
DATE OF SIGN.

RALPH PETRELLA JR.
N.J. PROFESSIONAL ENGINEER & LAND SURVEYOR LIC. NO. GB 23226

van note-harvey associates, inc.
consulting engineers, planners & land surveyors
103 College Road East • Princeton, NJ 08540 • 609-987-2323
211 Bayberry Drive • Cape May Court House, NJ 08210 • 609-465-2600
www.vannoteharvey.com Certificate of Authorization No. 24GA28271300
- Since 1894 -

PLAN OF PROPOSED AND EXISTING

BEACH FRONT BULKHEAD

2ND AVE TO MID BLOCK 4TH AND 5TH AVE

CITY OF NORTH WILDWOOD

CAPE MAY COUNTY, N.J.

DRAWN BY DMH	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY RP/JWV	PAGE	44693-400-21		3

M:\44000PROJECTS\44693 EMERGENCY BULKHEAD EXTENSION\44693 NWW BEACH BULKHEAD SIGNED PLANS 11-17-2020.DWG

TABLE OF PROPOSED NJDEP REGULATED DISTURBANCES	PROPOSED BULKHEAD	PREVIOUSLY CONSTRUCTED/ EXISTING BULKHEAD	TOTAL
DISTURBANCE TO FRESHWATER WETLANDS UNDER GP 6	9,553 SQ.FT. (0.219 ACRES)	8,498 SQ.FT. (0.195 ACRES)	18051 SQ.FT. (0.414 ACRES)
DISTURBANCE TO FRESHWATER WETLANDS TRANSITION AREAS UNDER GP 6A	847 SQ.FT. (0.019 ACRES)	19,638 SQ.FT. (0.451 ACRES)	20,485 SQ.FT. (0.470 ACRES)
DISTURBANCE TO FRESHWATER WETLAND TRANSITION AREA PROPOSED UNDER AN ACCESS WAVIER	36,843 SQ.FT. (0.846 ACRES)	18,199 SQ.FT. (0.418 ACRES)	55.042 SQ.FT. (1.264 ACRES)
DISTURBANCE TO CAFRA AREA UNDER INDIVIDUAL PERMIT	111,679 SQ.FT. (2.674 ACRES)	77,884 SQ.FT. (1.79 ACRES)	189,563 SQ.FT. (4.352 ACRES)

LEGEND

- WETLANDS LINE
- LIMIT OF WETLANDS TRANSITION
- A1 WETLANDS POINT ID
- DP-1 DATA POINTS
- LIMIT OF DISTURBANCE
- AREA OF IMPACTED WETLANDS TRANSITION
- AREA OF IMPACTED WETLANDS
- BULKHEAD (EXISTING AND PROPOSED) SEE SHEETS 1 THRU 3
- ZONE VE (EL. 11) F.I.R.M. ZONE
- LIMWA LINE
- F.I.R.M. ZONE LIMIT LINE

NOTES:

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2 WETLANDS POINTS:
POINTS:
WG-1 THRU WG-4, WF-1 THRU WF-4, WE-1 THRU WE-4, WD-1 THRU WD-4
WC-1 THRU WC-4, WB-1 THRU WB-4, AND WA-1 THRU WA-4
WERE FILED DELINEATED AND LOCATED OCTOBER 2013 BY VANNOTE HARVEY ASSOCIATES.
WETLAND BOUNDARY LINE "C" AND LINE "A" WERE ESTABLISHED USING TOPOGRAPHY PER NOTE NO. 1 (AND NEARMAP AERIAL IMAGERY DATED MARCH 2020)

POINTS:
WG-4A THRU WA-4-C, WA-1A, AND WA-1B
WERE FIELD DELINATED AND LOCATED AUGUST 2018 BY VAN NOTE HARVEY ASSOCIATES

3 REFER TO FEMA FLOOD INSURANCE RATE MAP(S) (F.I.R.M.) NUMBER 34009C0306F EFFECTIVE DATE OCTOBER 5, 2017 AND MAP NUMBER 34009C0243F EFFECTIVE DATE OCTOBER 5,2017 FOR F.I.R.M. LIMIT LINES, ZONES AND LIMIT OF MODERATED WAVE ACTION LINE (LIMWA).

4 TAX MAP INFORMATION
BLOCK 317.03 LOTS 1, 1.01
BLOCK 289.03 LOT 1
BLOCK 290.01 LOT 1
BLOCK 291.01 LOT 1
BLOCK 315.02 LOT 1
BLOCK 316.02 LOT 1
BLOCK 317.02 LOT 1
SHEETS 17, 23, 62 AND 63

LOCAL RANGE OF TIDES

5.45
2.43 (SPRING HIGH WATER = SHW)
1.99 (MEAN HIGH WATER = MHW)
−2.86 (MEAN LOW WATER = MLW)
−3.02 (MEAN LOWER LOW WATER = MLLW)

TIDAL INFORMATION U.S. DEPT. OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (N.O.A.A.) NATIONAL OCEAN SERVICE TIDAL STATION ID#8536110 CAPE MAY NEW JERSEY. TIDAL EPOCH DATED JANUARY 1983 – DECEMBER 2001

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

11/17/2020
DATE OF SIGN.

RALPH PETRELLA JR.
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N.J.A.C. 7:7 AND N.J.A.C. 7:7A PERMIT PLAN OF

BEACH FRONT BULKHEAD

CITY OF NORTH WILDWOOD

CAPE MAY COUNTY, N.J.

DRAWN BY DMH	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY RP/JWV	PAGE	44693-400-21		4

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LEGEND

- WETLANDS LINE
- LIMIT OF WETLANDS TRANSITION
- A1 WETLANDS POINT ID
- DP-1 DATA POINTS
- LIMIT OF DISTURBANCE
- AREA OF IMPACTED WETLANDS TRANSITION
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2 WETLANDS POINTS:
POINTS:
WG-1 THRU WG-4, WF-1 THRU WF-4, WE-1 THRU WE-4, WD-1 THRU WD-4
WC-1 THRU WC-4, WB-1 THRU WB-4, AND WA-1 THRU WA-4
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BEACH FRONT BULKHEAD

CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, N.J.

DRAWN BY DMH	FIELD BK	ORDER No.	FILE No.	SHEET No.
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M:\44000PROJECTS\44693 EMERGENCY BULKHEAD EXTENSION\44693 NWW BEACH BULKHEAD SIGNED PLANS 11-17-2020.DWG

New Jersey Department of Environmental Protection
Land Use Management Program
Division of Land Use Regulation

PROPERTY OWNER CERTIFICATION

INSTRUCTIONS: All applicants are required to complete Sections A and B of this form. Applicants who are individual owners of record of the property upon which the activities will occur must also complete Section C.

All other persons who are required to certify to this application in accordance with N.J.A.C. 7:7-23.2(d), N.J.A.C. 7:7A-16.2(d), and N.J.A.C. 7:13-18.2(d) must complete Sections A and C.

Separate forms may be submitted for each signatory, or a single form may be submitted with all required signatures.

SECTION A. SITE INFORMATION (required)

Project Name: Beach Front Bulkhead

Applicant's Name: City of North Wildwood c/o Mr. Ronald Simone, City Administrator

Street Address: 901 Atlantic Avenue

Municipality: North Wildwood County: Cape May Zip Code: 08260

Blocks and Lots: Blocks: 289.03 / 290.01 / 291.01 / 315.02 / 316.02 / 317.02 / 317.03; Lots: 1 / 1 / 1 / 1 / 1 / 1 & 2 / 1

SECTION B. SIGNATURE OF APPLICANT

The undersigned applicant hereby certifies that he/she is one of the following: 1) an owner of the site on which the activity is proposed or conducted; 2) an agent designated by the site owner(s) to obtain the permit, verification, or letter of interpretation on the owner's behalf; 3) a representative of a public entity proposing an activity within a right-of-way or easement that is held or controlled by that entity or that will be appropriated by the entity under the power of eminent domain; OR 4) a person with the legal authority to perform the proposed activities.

The undersigned applicant also certifies to the following:

1. Does the application include any activities within an easement or right-of-way? .... ☐ Yes ☒ No

   If "**Yes**," has written consent from all easement or right-of-way holders in accordance with N.J.A.C. 7:7-23.2(g), 7:7A-16.2(g), and 7:13-18.2(g) been attached to this form? .... ☐ Yes ☐ No

2. Will any part of the project be located within property belonging to the State of New Jersey? .... ☐ Yes ☒ No

3. Does the application include activities on any property owned by any public agency that would be encumbered by Green Acres? .... ☒ Yes ☐ No

4. Does this project require a Section 106 (National Register of Historic Places) Determination as part of a federal approval? .... ☐ Yes ☒ No

Applicant's Name: City of North Wildwood c/o Mr. Ronald Simone, City Administrator Date: 11/16/2020

Applicant's Signature: Ronald C Simone

Applicant's Name: ____________ Date: ________

Applicant's Signature: ____________

Applicant's Name: ____________ Date: ________

Applicant's Signature: ____________

Applicant's Name: ____________ Date: ________

Applicant's Signature: ____________

SECTION C. PROPERTY OWNER'S CERTIFICATION

All individual owners of record of the property upon which the activities will occur must certify to this application unless the applicant is a corporation, partnership, sole proprietorship, municipality, or State, Federal, or other public entity. If the applicant is a corporation, a principal executive officer of at least the level of vice president must certify below. In the case of partnerships and sole proprietorships, a general partner or the proprietor, respectively, is required to certify. For a municipality or for a State, Federal, or other public entity, the certification must be provided by either a principal executive officer or ranking elected official.

A duly authorized representative may sign this application on behalf of any individual who is required to certify provided that the authorization is made in writing and is submitted as part of this application. Please note that in lieu of a property owner's signature, a legal agreement with the current property owner may be attached to this form. Acceptable legal agreements include, but are not limited to, certificates of eminent domain and certificates of inverse condemnation. **Please note that contracts of sale are not considered an acceptable substitute for a property owner's signature.**

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining and preparing the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment. I hereby grant permission for the conduct of the proposed activities and consent to allow access to the site by representatives or agents of the Department for the purpose of conducting a site inspection(s) of the property in question.

Name of Owner/Easement Holder: City of North Wildwood c/o Mr. Ronald Simone Date: 11/16/2020

Signature: Ronald C. Simone

Specific Block(s) and Lot(s) Owned: Blocks: 289.03/291.01/315.02/316.02/317.02/317.03; Lots: 1/1/1/1/1&2/1

Name of Owner/Easement Holder: Sportland Investments Date: ____________

Signature: ____________

Specific Block(s) and Lot(s) Owned: Block 290.01, Lot 1

Name of Owner/Easement Holder: ____________ Date: ____________

Signature: ____________

Specific Block(s) and Lot(s) Owned: ____________

Name of Owner/Easement Holder: ____________ Date: ____________

Signature: ____________

Specific Block(s) and Lot(s) Owned: ____________

Name of Owner/Easement Holder: ____________ Date: ____________

Signature: ____________

Specific Block(s) and Lot(s) Owned: ____________

Name of Owner/Easement Holder: ____________ Date: ____________

Signature: ____________

Specific Block(s) and Lot(s) Owned: ____________

New Jersey Department of Environmental Protection
Land Use Management Program
Division of Land Use Regulation

PUBLIC NOTICE

SECTION A. SITE INFORMATION

Applicant's Name: City of North Wildwood c/o Mr. Ronald Simone, City Administrator

Street Address: 901 Atlantic Avenue

Municipality: North Wildwood County: Cape May Zip Code: 08260

Blocks and Lots: Blocks: 289.03 / 290.01 / 291.01 / 315.02 / 316.02 / 317.02 / 317.03; Lots: 1 / 1 / 1 / 1 / 1 / 1 & 2 / 1

SECTION B. STANDARD NOTICE REQUIREMENTS

Except as provided at item 6 below, public notice of the application shall be provided no more than 30 calendar days prior to submitting the application and no later than the date the application is submitted to the Department.

1. Public notice is required for all of the following (*check all that apply*):

   - ☐ A flood hazard area general permit authorization (except general permit 1)
   - ☐ A flood hazard area individual permit
   - ☐ A flood hazard area verification
   - ☐ A coastal general permit authorization
   - ☒ A CAFRA individual permit
   - ☐ An in-water waterfront development individual permit
   - ☐ An upland waterfront development individual permit
   - ☐ A coastal wetlands individual permit
   - ☐ A freshwater wetlands individual permit
   - ☐ A freshwater wetlands transition area waiver
   - ☒ A freshwater wetlands general permit authorization (except general permit 15)
   - ☐ A freshwater wetlands general permit 15 **(please skip to Section C)**

2. Has a copy of the entire application been sent to the municipal clerk of each municipality in which the proposed activity or project is located?............ ☒ Yes ☐ No

   Note: For electronic submissions, the application consists of a description of the project, which must include the lot and block, municipality, and county, the specific permit(s)/authorization(s) being sought, and all items that will be uploaded to the submission service, including all required items on the applicable application checklist(s).

   If "**Yes**," did you attach a copy of the certified United States Postal Service white mailing receipt, or other written receipt, and a copy of any letter sent with the application to this form?.......... ☒ Yes ☐ No

3. Have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to the all following applicable agencies? .... ☒ Yes ☐ No

   - The construction official of each municipality in which the site is located
   - The environmental commission, or other government agency with similar responsibilities, of each municipality in which the site is located
   - The planning board of each municipality in which the site is located
   - The planning board of each county in which the site is located

   If "**Yes**," did you attach **both** of the following to this form?.............. ☒ Yes ☐ No

   - A copy of the certified United States Postal Service white mailing receipt or other written receipt
   - A copy of the notice letter

4. Is the application for a coastal permit for an activity within the 12-mile circle with Delaware, as described at N.J.A.C. 7:7-1.2(c), or within 200 feet of the 12-mile circle? ☐ Yes ☒ No

   If "**Yes**," have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to the State of Delaware, Department of Natural Resources & Environmental Control, Delaware Coastal Management Program, 89 Kings Highway, Dover, DE 19901? ☐ Yes ☐ No

   If "**Yes**," did you attach **both** of the following to this form? ☐ Yes ☐ No

   - A copy of the certified United States Postal Service white mailing receipt or other written receipt
   - A copy of the notice letter

5. Is the application for a waterfront development individual permit to install a submarine cable in the ocean or to perform sand mining in the ocean? ☐ Yes ☒ No

   If "**Yes**," have you submitted a description of the project, the specific permit(s)/authorization(s) being sought, and a copy of the NOAA nautical chart showing the proposed cable route or the limits of the proposed sand mining area to **all** of the following entities? ☐ Yes ☐ No

   - Garden State Seafood Association
   - National Fisheries Institute
   - North Atlantic Clam Association
   - Rutgers Cooperative Extension
   - New Jersey Shellfisheries Council
   - New Jersey Marine Fisheries Council

6. Does the application include a CAFRA individual permit? ☒ Yes ☐ No

   If "**No**," skip to Question 7.

   If "**Yes**," has newspaper notice, consisting of a legal notice or display advertisement, been published in the official newspaper of the municipality in which the site is located or a newspaper of general circulation in the municipality? ☒ Yes ☐ No

   If "**Yes**," did you attach a copy of the published newspaper notice, the date of publication, and the name of the newspaper to this form? ☒ Yes ☐ No

   If "**No**," did you verify that a newspaper notice, consisting of a legal notice or display advertisement, will be published in the official newspaper of the municipality in which the site is located or a newspaper of general circulation in the municipality no more than **10 calendar days** after the application is submitted to the Department? ☐ Yes ☐ No

   Note: A copy of the published newspaper notice, the date of publication, and the name of the newspaper must be submitted to the Department within this timeframe.

7. Does the application include one or more of the activities listed below (**other than those proposed in a freshwater wetlands individual permit application**)? ☒ Yes ☐ No

   - A delineation of one-half mile or longer of a regulated water
   - A mosquito control activity subject to flood hazard general permit 2
   - A linear project of one-half mile or longer
   - A shore protection development, including beach nourishment, beach and dune maintenance, or dune creation of one-half mile or longer
   - A public development on a site of 50 acres or more
   - An industrial or commercial development on a site of 100 acres or more
   - A project to remove sediment or debris from a channel of one-half mile or longer
   - Maintenance dredging of a State navigation channel of one-half mile or longer
   - A trail or boardwalk of one-half mile or longer subject to a freshwater wetlands general permit or transition area waiver

If you answered "**No**," to question 7:

Have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to all owners of real property, including easements, located **within 200 feet of the property boundary of the site**? ☐ Yes ☐ No

If "**Yes**," did you attach **all** of the following to this form? ☐ Yes ☐ No

- A copy of the certified United States Postal Service white mailing receipt or other written receipt
- A copy of the notice letter
- A certified list of all owners of real property, including easements, within 200 feet of the property boundary, prepared by the municipality with a date of certification no earlier than one year prior to the date of the application

If you answered "**Yes**," to question 7, answer questions I. and II. below:

I. Have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to all owners of property, including easements, **within 200 feet of any proposed above-ground structure**? ☒ Yes ☐ No

If "**Yes**," did you attach **all** of the following to this form? ☒ Yes ☐ No

- A copy of the certified United States Postal Service white mailing receipt or other written receipt
- A copy of the notice letter
- A certified list of all owners of real property, including easements, within 200 feet of the property boundary, prepared by the municipality with a date of certification no earlier than one year prior to the date of the application

II. For all applications, **except CAFRA individual permits**, has newspaper notice, consisting of a legal notice or display advertisement been published in the official newspaper of the municipality in which the site is located or a newspaper of general circulation in the municipality? ☒ Yes ☐ No

If "**Yes**," did you attach a copy of the published newspaper notice, the date of publication, and the name of the newspaper to this form? ☒ Yes ☐ No

8. Will the proposed activity or project disturb 5,000 square feet of land or more? ☒ Yes ☐ No

If "**Yes**," have both a notice letter, including a brief description of the proposed activity or project, and a legible copy of the site plans been sent to the local Soil Conservation District? ☒ Yes ☐ No

If "**Yes**," did you attach a copy of the certified United States Postal Service white mailing receipt or other written receipt **and** a copy of the notice letter to this form? ☒ Yes ☐ No

9. Is the proposed activity or project located within the Pinelands Area as designated under the Pinelands Protection Act at N.J.S.A. 13:18A-11(a)? ☐ Yes ☒ No

If "Yes," you are also required to complete Section D of this form.

10. Does the application include a freshwater wetlands individual permit application? ☐ Yes ☒ No

If "**No**," skip to Question 11.

If "**Yes**," does the proposed project involve more than 10 acres of fill? ☐ Yes ☐ No

If "**Yes**," has newspaper notice been published in a newspaper with regional circulation in the region in which the site is located? ☐ Yes ☐ No

If "**Yes**," did you attach a copy of the published newspaper notice, the date of publication, and the name of the newspaper to this form? ☐ Yes ☐ No

If "**No**," has newspaper notice consisting of a legal notice or display advertisement been published in the official newspaper of the municipality in which the site is located or a newspaper of general circulation in the municipality? ☐ Yes ☐ No

If "**Yes**," did you attach a copy of the published newspaper notice, the date of publication, and the name of the newspaper to this form? ☐ Yes ☐ No

11. Does the application include a flood hazard individual permit based on a hardship exception? ☐ Yes ☒ No

    If "**Yes**," do all notice letters and published newspaper notices attached to this form (under questions 3, 4, 7, and 8 above, as applicable) include a description of the nature of the hardship as well as the citation and subject matter of each requirement for which the hardship exception is being requested? ☐ Yes ☐ No

SECTION C. FRESHWATER WETLANDS GENERAL PERMIT 15 N/A

This section only applies to applications that include a freshwater wetlands general permit 15.

1. Is the applicant a Federal agency conducting activities on Federal land? ☐ Yes ☐ No

   If "Yes," public notice is not required for this activity.

2. Has a display advertisement describing the proposed activities, at least four column inches in size, been published in a newspaper with local circulation (including the municipality) and in a newspaper with regional circulation (including the county)? ☐ Yes ☐ No

   If "**Yes**," did you attach a copy of the published newspaper notices, the dates of publication, and the names of the newspapers to this form? ☐ Yes ☐ No

SECTION D. PINELANDS N/A

This section only applies to applications where the proposed activity or project is located within the Pinelands Area as designated under the Pinelands Protection Act at N.J.S.A. 13:18A-11.a.

1. Does the application include a flood hazard general permit or individual permit? ☐ Yes ☐ No

   If "**Yes**," has a description of the project, including the lot and block, municipality, county, and specific permit(s)/authorization(s) being sought, been sent to the New Jersey Pinelands Commission? ☐ Yes ☐ No

   If "**Yes**," did you attach a copy of the certified United States Postal Service white mailing receipt or other written receipt and a copy of any letter provided with the project description to this form? ☐ Yes ☐ No

2. Does the application include a coastal general permit or individual permit? ☐ Yes ☐ No

   If "**Yes**," has a copy of the entire application been sent to the New Jersey Pinelands Commission? ☐ Yes ☐ No

   Note: For electronic submissions, the application consists of a description of the project, which must include the lot and block, municipality, and county, the specific permit(s)/authorization(s) being sought, and all items that will be uploaded to the submission service, including all required items on the applicable application checklist(s).

   If "**Yes**," did you attach a copy of the certified United States Postal Service white mailing receipt or other written receipt and a copy of any letter provided with the application to this form? ☐ Yes ☐ No

3. Is the application solely for a freshwater wetlands general permit(s)? ☐ Yes ☐ No

   If "Yes," do not submit the application to the Department. Submit the application to the New Jersey Pinelands Commission.

van note - harvey
associates, inc.

103 College Road East
Princeton, New Jersey 08540
609-987-2323 Fax: 609-987-0005
NJ Authorization #24GA28271300

www.vannoteharvey.com

van note-harvey associates

Since 1894

CERTIFIED MAIL - RRR

November 20, 2020

Mr. W. Scott Jett, R.M.C., C.M.R.
City Clerk
City of North Wildwood
901 Atlantic Avenue
North Wildwood, NJ 08260

RE: NOTICE OF SUBMISSION
Coastal Area Facilities Review Act (CAFRA) Individual Permit (IP) and Freshwater Wetlands (FWW) General Permits 6 (GP6) and 6A (GP6A)
Project: Beach Front Bulkhead
Applicant: City of North Wildwood
c/o Mr. Ronald Simone, City Administrator
901 Atlantic Avenue
North Wildwood, New Jersey 08260
Property Owner: Same
Portions of Block 289.03, Lot 1; Block 290.01, Lot 1; Block 291.01, Lot 1, Block 315.02, Lot 1; Block 316.02, Lot 1; Block 317.02, Lots 1 and 2; and Block 317.03, Lot 1
City of North Wildwood, Cape May County, New Jersey
VNHA #44693-400-21

Dear Mr. Jett:

On behalf of the City of North Wildwood, Van Note-Harvey Associates (VNHA) is submitting a combined application for a CAFRA IP, and FWW GP6 and GP6A to the New Jersey Department of Environmental Protection (NJDEP) for the above referenced project. In accordance with N.J.A.C. 7:7 and N.J.A.C. 7:7A, we are required to file a complete copy of the application with your office.

Accordingly, please find enclosed one (1) copy of the combined application, prepared by VNHA, entitled: "Combined CAFRA Individual Permit, and Freshwater Wetlands General Permits 6 and 6A Application," containing the following:

1. One (1) copy each of the NJDEP application checklists;

2. A completed Property Owner Certification form (Note minimal work is proposed on the Sportland Investments parcel on Block 290.01, Lot 1. A portion of the project is subject to a notice of violation. The form has been provided to Sportland Investments for endorsement, however it has not been returned. Due to the urgency of submitting this application to address the notice of violation, the application form is being submitted with only the City of North Wildwood's signature. We will provide a copy of the fully executed form to NJDEP when received from Sportland Investment.);

3. Verification of Public Notice, which includes the following:

   a. One (1) completed Public Notice Form;

   b. One (1) copy of a General Notice Letter;

   c. One (1) copy of a certified list of property owners, including easements, within 200 feet of any proposed above ground structure that is part of the proposed development;

   d. As the newspaper notice is being published on November 20, 2020, proof of publication will be provided to NJDEP under separate cover;

   e. One (1) copy of the certified mail receipts as proof that the following individuals and/or government officials have been notified of this submission: City of North Wildwood Clerk, City of North Wildwood Environmental Commission, City of North Wildwood Construction Official, City of North Wildwood Planning Board, Cape May County Planning Board, Cape Atlantic Soil Conservation District, and all property owners, including easements, within 200 feet within 200 feet of proposed above ground structures;

4. One (1) copy of the City of North Wildwood tax maps, sheets numbered 17, 23, 61, 62, and 63 showing the approximate project location;

5. One (1) copy of portions of the United States Geological Survey (USGS) 2019 Quad Maps of Wildwood and Stone Harbor, New Jersey, showing the approximate project site and State Plane Coordinates;

6. One (1) copy of a Site Location Street Map, showing the approximate project site;

7. One (1) copy of each of the FEMA Flood Insurance Rate Maps (Map Nos. 34009C0306F, Effective 34009C0243F, both with the Effective Date of October 5, 2017) showing the approximate project site;

8. One (1) copy of a set of photographs and associated photo key maps of the project site;

9. One (1) copy of a NJDEP Office of Natural Lands Management Natural Heritage Database submission and subsequent correspondence (once the report is received it will be submitted to you);

10. One (1) copy of construction drawings showing existing conditions at the time of bulkhead construction for the portion of the project seeking after-the-fact approval;

11. One (1) copy of a report entitled: "City of North Wildwood Beach Management Plan for the Protection of Federally and State-Listed Species," dated December 2018;

12. One (1) copy of each of the NJDEP Notice of Violation letters dated June 6, 2020 and September 17, 2020.

13. One (1) copy of a NJDEP Letter of Interpretation for a portion of the Site.

14. One (1) copy of a combined Environmental Impact Statement and CAFRA/FWW Compliance Statement);

15. One (1) set of the plans prepared by VNHA, entitled:

    - "Plan of Proposed and Existing Beach Front Bulkhead," dated November 17, 2020, Sheet Nos. 1 through 3
    - "N.J.A.C. 7:7 and N.J.A.C. 7:7A Permit Plan of Beach Front Bulkhead," dated November 17, 2020, Sheet Nos. 4 and 5

16. One (1) copy of a Property Detail Report for each parcel showing property ownership; and

17. Qualifications of those who prepared this application.

Should you have any questions or require additional information, please do not hesitate to contact this office.

Very truly yours,

John C. Ryder, P.E., P.W.S.
Vice President

EMC/tes
Y:\VNHADATA\PROJECTS\44693\PERMITS\NJDEP\CAFRA_WFD\SUBMISSION DRAFT\ATTACHMENT 3 - PUBLIC NOTICE\CLKLETTER.DOC
Enclosures

ec: JV / SLW / EMC

van note - harvey
associates, inc.
103 College Road East
Princeton, New Jersey 08540
609-987-2323 Fax: 609-987-0005
NJ Authorization #24GA28271300
www.vannoteharvey.com

van note-harvey associates
Since 1894

VIA CERTIFIED MAIL - RRR

November 19, 2020

To: Cape May County Planning Board
Administration Building
4 Moore Road
Cape May Court House, NJ 08210

Environmental Commission
City of North Wildwood
901 Atlantic Avenue
North Wildwood, NJ 08620

Planning Board
City of North Wildwood
901 Atlantic Avenue
North Wildwood, NJ 08260

Construction Official
City of North Wildwood
901 Atlantic Avenue
North Wildwood, NJ 08260

Cape Atlantic SCD
6260 Old Harding Highway
Mays Landing, NJ 08330

All owners of real property, including easements, within 200 feet of proposed above ground structures

RE: Notice of NJDEP Submission
Coastal Area Facilities Review Act (CAFRA) Individual Permit (IP) and Freshwater Wetlands (FWW) General Permits 6 (GP6) and 6A (GP6A)
Project: Beach Front Bulkhead
Applicant: City of North Wildwood
c/o Mr. Ronald Simone, City Administrator
901 Atlantic Avenue
North Wildwood, New Jersey 08260
Property Owner: Same
Portions of Block 289.03, Lot 1; Block 290.01, Lot 1; Block 291.01, Lot 1, Block 315.02, Lot 1; Block 316.02, Lot 1; Block 317.02, Lot 1 and Lot 2; and Block 317.03, Lot 1
City of North Wildwood, Cape May County, New Jersey
VNHA #44693-400-21

Dear Interested Party:

This letter is to provide you with legal notification that a combined application for a CAFRA IP and FWW GP6 and GP6A will be submitted to the New Jersey Department of Environmental Protection (NJDEP), Division of Land Resource Protection for the development shown on the enclosed plans.

The City of North Wildwood (the City) is proposing the construction of a new steel bulkhead adjacent to JFK Boulevard Beach Drive and the boardwalk generally between 13th and 25th Avenues. The City is also seeking approval for a previously constructed vinyl bulkhead adjacent to JFK Boulevard Beach Drive between 3rd and 5th Avenues, and a steel bulkhead generally between 5th and 13th Avenues. Note that during review of the application, NJDEP may determine the freshwater wetlands are of exceptional resource value classification. If that occurs, supplemental documentation and updated plans will be provided to NJDEP to convert the application to a FWW IP.

A complete application package can be reviewed at the municipal clerk's office in the municipality in which the site subject to the application is located or by appointment at the Department's Trenton Office.

In addition, an electronic copy of the initial application can be provided via an OPRA request by contacting https://www.nj.gov/dep/opra/opraform.html from the Department's Trenton Office.

Either a 60-day public comment period or public hearing will be held on the application in the future. The Department of Environmental Protection welcomes comments and any information that you may provide concerning the proposed development and site. Written comments shall be sent to the Department at the below address within 45 calendar days of receiving this letter. Individuals may request a public hearing on the application within 45 calendar days of the date of receiving this letter. Requests for a public hearing shall be sent to the Department at the address below and shall state the specific nature of the issues to be raised at the hearing.

New Jersey Department of Environmental Protection
Division of Land Resource Protection
P.O. Box 420, Code 501-02A
501 East State Street
Trenton, New Jersey 08625
Attn: North Wildwood Supervisor

In accordance with the public notice requirements, please find enclosed one (1) copy of each of the following reduced plans prepared by VNHA, entitled: "N.J.A.C. 7:7 and N.J.A.C. 7:7A Permit Plan of Beach Front Bulkhead," dated November 17, 2020, Sheets Nos. 4 and 5.

Should you have any questions, please do not hesitate to contact this office.

Sincerely,

John C. Ryder, P.E., P.W.S.
Vice President

EMC/tes
Y:\VNHADATA\PROJECTS\44693\PERMITS\NJDEP\CAFRA_WFD\SUBMISSION DRAFT\ATTACHMENT 3 - PUBLIC NOTICE\GENERAL NOTICE LETTER.DOCX
Enclosures

ec w encl: JV / RPJr / SLW / EMC

TABLE OF PROPOSED NJDEP REGULATED DISTURBANCES	PROPOSED BULKHEAD	PREVIOUSLY CONSTRUCTED/ EXISTING BULKHEAD	TOTAL
DISTURBANCE TO FRESHWATER WETLANDS UNDER GP 6	9,553 SQ.FT. (0.219 ACRES)	8,498 SQ.FT. (0.195 ACRES)	18051 SQ.FT. (0.414 ACRES)
DISTURBANCE TO FRESHWATER WETLANDS TRANSITION AREAS UNDER GP 6A	847 SQ.FT. (0.019 ACRES)	19,638 SQ.FT. (0.451 ACRES)	20,485 SQ.FT. (0.470 ACRES)
DISTURBANCE TO FRESHWATER WETLAND TRANSITION AREA PROPOSED UNDER AN ACCESS WAVIER	36,843 SQ.FT. (0.846 ACRES)	18,199 SQ.FT. (0.418 ACRES)	55.042 SQ.FT. (1.264 ACRES)
DISTURBANCE TO CAFRA AREA UNDER INDIVIDUAL PERMIT	111,679 SQ.FT. (2.674 ACRES)	77,884 SQ.FT. (1.79 ACRES)	189,563 SQ.FT. (4.352 ACRES)

BLOCK 317.03 LOT 1.01

LEGEND

- WETLANDS LINE
- LIMIT OF WETLANDS TRANSITION
- A1 WETLANDS POINT ID
- DP-1 DATA POINTS
- LIMIT OF DISTURBANCE
- AREA OF IMPACTED WETLANDS TRANSITION
- AREA OF IMPACTED WETLANDS
- BULKHEAD (EXISTING AND PROPOSED) SEE SHEETS 1 THRU 3
- ZONE VE (EL. 11) F.I.R.M. ZONE
- LIMWA LINE
- F.I.R.M. ZONE LIMIT LINE

NOTES:

1 LOCATIONS AND ELEVATIONS SHOWN HEREON WERE TAKEN FROM GPS OBSERVATIONS PERFORMED 07/2020 & 08/25/2020 REFERENCING NATIONAL GEODETIC SURVEY CONTINUOUSLY OPERATING REFERENCE STATION (NGSCORS) CORS ID NJCM PID DI3828. VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NAVD88) (GEOID12B)

2 WETLANDS POINTS:
POINTS:
WG–1 THRU WG–4, WF–1 THRU WF–4, WE–1 THRU WE–4, WD–1 THRU WD–4
WC–1 THRU WC–4, WB–1 THRU WB–4, AND WA–1 THRU WA–4
WERE FILED DELINEATED AND LOCATED OCTOBER 2013 BY VANNOTE HARVEY ASSOCIATES.
WETLAND BOUNDARY LINE "C" AND LINE "A" WERE ESTABLISHED USING TOPOGRAPHY PER NOTE NO. 1 (AND NEARMAP AERIAL IMAGERY DATED MARCH 2020)

POINTS:
WG–4A THRU WA–4–C, WA–1A, AND WA–1B
WERE FIELD DELINATED AND LOCATED AUGUST 2018 BY VAN NOTE HARVEY ASSOCIATES

3 REFER TO FEMA FLOOD INSURANCE RATE MAP(S) (F.I.R.M.) NUMBER 34009C0306F EFFECTIVE DATE OCTOBER 5, 2017 AND MAP NUMBER 34009C0243F EFFECTIVE DATE OCTOBER 5,2017 FOR F.I.R.M. LIMIT LINES, ZONES AND LIMIT OF MODERATED WAVE ACTION LINE (LIMWA).

4 TAX MAP INFORMATION
BLOCK 317.03 LOTS 1, 1.01
BLOCK 289.03 LOT 1
BLOCK 290.01 LOT 1
BLOCK 291.01 LOT 1
BLOCK 315.02 LOT 1
BLOCK 316.02 LOT 1
BLOCK 317.02 LOT 1
SHEETS 17, 23, 62 AND 63

LOCAL RANGE OF TIDES

5.45
2.43 (SPRING HIGH WATER = SHW)
1.99 (MEAN HIGH WATER = MHW)
–2.86 (MEAN LOW WATER = MLW)
–3.02 (MEAN LOWER LOW WATER = MLLW)

TIDAL INFORMATION U.S. DEPT. OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (N.O.A.A.) NATIONAL OCEAN SERVICE TIDAL STATION ID#8536110 CAPE MAY NEW JERSEY. TIDAL EPOCH DATED JANUARY 1983 – DECEMBER 2001

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

11/17/2020
DATE OF SIGN.

RALPH PETRELLA JR.
N.J. PROFESSIONAL ENGINEER & LAND SURVEYOR LIC. NO. GB 23226

van note-harvey associates, inc.
consulting engineers, planners & land surveyors
103 College Road East ● Princeton, NJ 08540 ● 609-987-2323
211 Bayberry Drive ● Cape May Court House, NJ 08210 ● 609-465-2600
www.vannoteharvey.com Certificate of Authorization No. 24GA28271300
van note-harvey associates - Since 1894 -

N.J.A.C. 7:7 AND N.J.A.C. 7:7A PERMIT PLAN OF

BEACH FRONT BULKHEAD

CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, N.J.

DRAWN BY DMH	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY RP/JWV	PAGE	44693–400–21		4

M:\44000PROJECTS\44693 EMERGENCY BULKHEAD EXTENSION\44693 NWW BEACH BULKHEAD SIGNED PLANS 11–17–2020.DWG

LEGEND

- WETLANDS LINE
- LIMIT OF WETLANDS TRANSITION
- A1 WETLANDS POINT ID
- DP-1 DATA POINTS
- LIMIT OF DISTURBANCE
- AREA OF IMPACTED WETLANDS TRANSITION
- AREA OF IMPACTED WETLANDS
- ZONE VE (EL. 11) F.I.R.M. ZONE
- LIMWA LINE
- F.I.R.M. ZONE LIMIT LINE

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POINTS:
WG-1 THRU WG-4, WF-1 THRU WF-4, WE-1 THRU WE-4, WD-1 THRU WD-4
WC-1 THRU WC-4, WB-1 THRU WB-4, AND WA-1 THRU WA-4
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BLOCK 289.03 LOT 1
BLOCK 290.01 LOT 1
BLOCK 291.01 LOT 1
BLOCK 315.02 LOT 1
BLOCK 316.02 LOT 1
BLOCK 317.02 LOT 1
SHEETS 17, 23, 62 AND 63

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TIDAL INFORMATION U.S. DEPT. OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (N.O.A.A.) NATIONAL OCEAN SERVICE TIDAL STATION ID#8536110 CAPE MAY NEW JERSEY. TIDAL EPOCH DATED JANUARY 1983 – DECEMBER 2001

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N.J.A.C. 7:7 AND N.J.A.C. 7:7A PERMIT PLAN OF

BEACH FRONT BULKHEAD

CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, N.J.

DRAWN BY DMH	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY RP/JWV	PAGE	44693-400-21		5

CITY of NORTH WILDWOOD
901 Atlantic Avenue,
North Wildwood, NJ 08260
(609) 522-2030 / Fax (609) 846-9995

Jason W. Hesley, CTA
Tax Assessor

November 18, 2020

James Verna
Van Note Harvey
211 Bayberry Drive 2E
Cape May Court House, NJ 08210

Subject: 200 foot search

Beach & Bulkhead – North Wildwood

Mr. Verna:

Per your request, please find the list of properties within 200 ft. of the above-mentioned property.

This is a certified list as of November 20, 2020

Fee paid to City of North Wildwood for 200 Ft. Search List $ N/A

Taxes Current: N/A

Any contact information that we have regarding condominium associations appearing on the list will be so noted.

Yours truly,

Jason W. Hesley, CTA
City Tax Assessor

BLOCK	LOT	QUALIFIER	OWNER NAME	MAILING ADDRESS	CITY, STATE	ZIP CODE	NOTES/CONDO NAME	PROPERTY LOCATION
290	5	C000A	SPORT WEST, INC C/O KANTZIOS	PO BOX 37	NORTH WILDWOOD, NJ	08260	2300 BOARDWALK CONDO	2300 BOARDWALK
290	5	C000B	SPORT WEST, INC C/O KANTZIOS	PO BOX 37	NORTH WILDWOOD, NJ	08260	2300 BOARDWALK CONDO	2300 BOARDWALK
290	5	C000C	SPORT WEST, INC C/O KANTZIOS	PO BOX 37	NORTH WILDWOOD, NJ	08260	2300 BOARDWALK CONDO	2300 BOARDWALK
290	5	C000D	KOUTSIMIRIS, ANTONIOS & ELENI	319 E 6TH AVE	NORTH WILDWOOD, NJ	08260	2300 BOARDWALK CONDO	2300 BOARDWALK
290	5	C000E	SPORT WEST INC C/O KANTZIOS	PO BOX 37	WILDWOOD, NJ	08260	2300 BOARDWALK CONDO	2300 BOARDWALK
290	5	C000F	SPORT WEST, INC C/O KANTZIOS	PO BOX 37	NORTH WILDWOOD, NJ	08260	2300 BOARDWALK CONDO	2300 BOARDWALK
290	55.02	C0451	CORRENTI, DOROTHY & MILLER, LANCE R	451 E 24TH AVE	NORTH WILDWOOD, NJ	08260	24TH & BW WEST CONDO	451 E 24TH AVE
290	55.02	C0453	JOHN, ROBERT M & MARYANN K TRUSTEES	224 FOX HOLLOW DR	LANGHORNE, PA	19053	24TH & BW WEST CONDO	453 E 24TH AVE
290	55.02	C0455	WUNSCH, ROBERT & DIANE	2464 GREENSWARD S	WARRINGTON, PA	18976	24TH & BW WEST CONDO	455 E 24TH AVE
290	55.01	C0461	INGERSOLL, THOMAS C & KELLIE A	461 E 24TH AVE	NORTH WILDWOOD, NJ	08260	24TH & BW EAST CONDO	461 E 24TH AVE
290	55.01	C0463	GRANICK, JOSEPH & ARLETTE A	2 STILES LN	FRANKLIN PARK, NJ	08823	24TH & BW EAST CONDO	463 E 24TH AVE
290	55.01	C0465	FOLEY, DENISE & KEVIN	465 E 24TH AVE	NORTH WILDWOOD, NJ	08260	24TH & BW EAST CONDO	465 E 24TH AVE
293	16	C0001	POHLMAN, EDWARD G	PO BOX 389	WILDWOOD, NJ	08260	2000 BOARDWALK CONDO	2002-04 BOARDWALK
293	16	C0003	VAN ARSDALE, JAMES R	108 ZION RD	EGG HARBOR TWSP, NJ	08234	2000 BOARDWALK CONDO	2010-12 BOARDWALK
293	16	C0004	D R F ENTERPRISES @ DOMINCS PIZZA	1768 S LINCOLN AVE	VINELAND, NJ	08360	2000 BOARDWALK CONDO	2014-16 BOARDWALK
293	16	C0005	C&M SALEEB REAL ESTATE, LLC	2022 BOARDWALK	NORTH WILDWOOD, NJ	08260	2000 BOARDWALK CONDO	2018-20 BOARDWALK
293	16	C0006	C & M SALEEB REAL ESTATE, LLC	2022 BOARDWALK	NORTH WILDWOOD, NJ	08260	2000 BOARDWALK CONDO	2022-24 BOARDWALK
293	16	C002A	PRY ENTERPRISES, LLC	258 S HAVILAND AVE	AUDUBON, NJ	08106	2000 BOARDWALK CONDO	2006 BOARDWALK
293	16	C002B	HIGGINSON, WILLIAM C & NOEL A	130 HESS RD	COLLEGEVILLE, PA	19426	2000 BOARDWALK CONDO	2008 BOARDWALK
294	14	C0100	BARBIERI, MICHAEL J	476 LYNBROOKE RD	SPRINGFIELD, PA	19064	506 E 19TH AVE CONDO	506 E 19TH AVE #100
294	14	C0101	DIRESO, ROBERT & LINDA	3699 MIDVALE AVE	PHILADELPHIA, PA	19129	506 E 19TH AVE CONDO	506 E 19TH AVE #101
294	14	C0200	CARROLL, ROBERT J	4910 TOWNSHIP LINE RD	DREXEL HILL, PA	19026	506 E 19TH AVE CONDO	506 E 19TH AVE #200
294	14	C0201	GONTZ, GERARD E	3818 PATRICIAN DR	PHILADELPHIA, PA	19154	506 E 19TH AVE CONDO	506 E 19TH AVE #201
294	14	C0300	506, LLC	630 W SPRUCE AVE	NORTH WILDWOOD, NJ	08260	506 E 19TH AVE CONDO	506 E 19TH AVE #300
315.01	6	C0101	ROMANY AND SONS, LLC	2 IRETON KEY	COLTS NECK, NJ	07722	THE VIEW ON 18TH CON	1806 BOARDWALK #101
315.01	6	C0102	ROMANY AND SONS, LLC	2 IRETON KEY	COLTS NECK, NJ	07722	THE VIEW ON 18TH CO	1806 BOARDWALK #102
315.01	6	C0103	ROMANY AND SONS, LLC	2 IRETON KEY	COLTS NECK, NJ	07722	THE VIEW ON 18TH CON	1806 BOARDWALK #103
315.01	6	C0104	ROMANY AND SONS, LLC	2 IRETON KEY	COLTS NECK, NJ	07722	THE VIEW ON 18TH CON	1806 BOARDWALK #104
315.01	6	C0201	FEINGOLD, JOEL M & BARBARA C	2150 ESTEN RD	QUAKERTOWN, PA	18951	THE VIEW ON 18TH CON	1806 BOARDWALK #201
315.01	6	C0202	SALVATORE, ANTHONY & SUE ANN	12 SOUTH MAPLE AVE #107	MARLTON, NJ	08053	THE VIEW ON 18TH CON	1806 BOARDWALK #202
315.01	6	C0203	D'ALONZO, ALBERT & PATRICIA	935 SAINT JAMES DR	LANGHORNE, PA	19047	THE VIEW ON 18TH CON	1806 BOARDWALK #203
315.01	6	C0204	JOHNSON, JEFFREY D & SARAH	5 TOWNE LN	VOORHEES, NJ	08043	THE VIEW ON 18TH CON	1806 BOARDWALK #204
422	5	C0001	FORJOHN, DONALD J & PAULA	1 SCOUT DR	MEDFORD, NJ	08055	516 E 4TH AVE CONDO	516 E 4TH AVE
422	5	C0002	BUZOGANY,ALEXANDER JR & DONNA C	1442 SOCIETY HILL DR	BENSALEM, PA	19020	516 E 4TH AVE CONDO	516 E 4TH AVE
422	5	C0003	O'CONNOR, GERARD & DENISE	3057 WINCHESTER AVE	PHILADELPHIA, PA	19136	516 E 4TH AVE CONDO	516 E 4TH AVE
422	6	C0001	OLWELL, EDWARD & NEVIN,ROBERTA D	400 KENNEDY DR	NORTH WILDWOOD, NJ	08260	400 KENNEDY DR CONDO	400 KENNEDY DR
422	6	C0002	RONNERMANN, DREW P	4008 TRILLIUM WAY	CHESTER SPRINGS, PA	19425	400 KENNEDY DR CONDO	400 KENNEDY DR
422	6	C0003	REIFSNYDER,JOSEPH R & BRADLEY,MARY	230 WINTHROP LN	WAYNE, PA	19087	400 KENNEDY DR CONDO	400 KENNEDY DR
422	7	C0001	MCMULLEN, JAMES J & CYNTHIA A	153 CEDAR RD	MULLICA HILL, NJ	08062	402 KENNEDY DR CONDO	402 KENNEDY DR
422	7	C0002	MANZI, JOSEPH W & FAYE C	200 FOXCATCHER LN	MEDIA, PA	19063	402 KENNEDY DR CONDO	402 KENNEDY DR
422	8	C0001	EMMI, MARY ANN	2902 CENTURY LN	CHADDS FORD, PA	19317	404 KENNEDY DR CONDO	404 KENNEDY DR
422	8	C0002	RICCI JR, ANTHONY D & HELEN M	110 MORNING GLORY WAY	HUNTINGDON VALLEY, PA	19006	404 KENNEDY DR CONDO	404 KENNEDY DR
422	8	C0003	ARCHIBALD, WILLIAM & KLYMKOWSKI M H	3401 N RANDOLPH ST	ARLINGTON, VA	22207	404 KENNEDY DR CONDO	404 KENNEDY DR
422	9	C0001	HOLLYWOOD, MICHAEL J & AMY M	118 B DOCK ST	BENSALEM, PA	19020	519 E 5TH AVE CONDO	519 E 5TH AVE
422	9	C0002	MC LAUGHLIN SONIA E, ETAL	169 HART AVE	DOYLESTOWN, PA	18901	519 E 5TH AVE CONDO	519 E 5TH AVE
422	9	C0003	STEFANELLI, ALEXANDER P & MARY A	532 DRAYTON RD	ORELAND, PA	19075	519 E 5TH AVE CONDO	519 E 5TH AVE

BLOCK	LOT	QUALIFIER	OWNER NAME	MAILING ADDRESS	CITY, STATE	ZIP CODE	NOTES/CONDO NAME	PROPERTY LOCATION
288.01	6		W & E ENTERPRISES INC @ WEINER	PO BOX 1649	WILDWOOD, NJ	08260		422 E 25TH AVE
288.01	7		W & E ENTERPRISE INC@ M WEINER	PO BOX 1649	WILDWOOD, NJ	08260		2500 BOARDWALK
288.01	8		W & E ENTERPRISES INC @M WEINER	PO BOX 1649	WILDWOOD, NJ	08260		435 E 26TH AVE
288.01	9		THE FOUR W'S, LLC	P O BOX 1649	WILDWOOD, NJ	08260		431 E 26TH AVE
288.02	1		THE MOREY ORG.	3501 BOARDWALK	WILDWOOD, NJ	08260		2501 BOARDWALK
289	7		2400 BOARDWALK, LLC ETAL	650 NEW RD, STE #B	LINWOOD, NJ	08221		2400-24 BOARDWALK
289	8		MANAGEMENT CONSORTIUM, LLC	P O BOX 1649	WILDWOOD, NJ	08260		431 E 25TH AVE
289.03	1		CITY OF NORTH WILDWOOD	901 ATLANTIC AVE	NORTH WILDWOOD, NJ	08260	BOARDWALK GAME	2401 BOARDWALK
290	56.02		MANNING, MICHAEL C & KELLY Q	1520 STATE HILL RD	CAMP HILL, PA	17011		452 E 23RD AVE
290	56.03		MANNING, MICHAEL C	1520 STATE HILL RD	CAMP HILL, PA	17011		454 E 23RD AVE
290.01	1		SPORTLAND INVESTMENTS	205 ANDY WARHOL WAY	MARLTON, NJ	08053		2301 BOARDWALK
291	10		THE FOUR W'S, LLC	PO BOX 1649	WILDWOOD, NJ	08260		428 E 22ND AVE
291	11		THE FOUR W'S, LLC	PO BOX 1649	WILDWOOD, NJ	08260		2200-10 BOARDWALK
291	12		RHR WILDWOOD 423, LLC	1600 MATSO DR	TOMS RIVER, NJ	08753	L9 QUALITY INN M	423 E 23RD AVE
291.01	1		CITY OF NORTH WILDWOOD	901 ATLANTIC AVE	NORTH WILDWOOD, NJ	08260	SEAPORT PIER	2201 BOARDWALK
292	8		2100 BOARDWALK HOLDING, LLC	2022 BOARDWALK	NORTH WILDWOOD, NJ	08260		2100 BOARDWALK
293	15		KNOLL, ROBT F & MARY P	105 E TOLEDO AVE	WILDWOOD CREST, NJ	08260		430 E 20TH AVE
294	15		OVPH, LLC	230 S BROAD ST #304	PHILADELPHIA, PA	19102		1900 BOARDWALK
317.03	1		CITY OF NORTH WILDWOOD	901 ATLANTIC AVE	NORTH WILDWOOD, NJ	08260		BEACH
411	3		MATADOR MOTEL INC	511 E 16TH AVE	NORTH WILDWOOD, NJ	08260	MATADOR MOTEL INC	511 E 16TH AVE
315.01	5		CW MOTEL, LLC	515 E 8TH AVE	NORTH WILDWOOD, NJ	08260	SAHARA MOTEL	510 E 18TH AVE
315.02	1		CITY OF NORTH WILDWOOD	901 ATLANTIC AVE	NORTH WILDWOOD, NJ	08260		1801 BOARDWALK
316.01	4		YOUSCHAK PROPERTIES, LLC	1710 BOARDWALK	NORTH WILDWOOD, NJ	08260	1,2,5 MONTEGO BA'	1700-1710 BOARDWALK
316.02	1		CITY OF NORTH WILDWOOD	901 ATLANTIC AVE	NORTH WILDWOOD, NJ	08260		1701 BEACH
317.01	8		1610 BOARDWALK, LLC	312 HELMS AVE	SWEDESBORO, NJ	08085		1610 BOARDWALK
317.02	1		CITY OF NORTH WILDWOOD	901 ATLANTIC AVE	NORTH WILDWOOD, NJ	08260		1600 BEACH
317.02	2		CITY OF NORTH WILDWOOD	901 ATLANTIC AVE	NORTH WILDWOOD, NJ	08260		1601 BOARDWALK
413	5		D'ANDREA, ROCCO J & HANNALORE TRUST	PO BOX 470	WILDWOOD, NJ	08260		508 E 13TH AVE
413	6		NORTH POINT DEVELOPERS, LLC	510 E 13TH AVE	NORTH WILDWOOD, NJ	08260	AMERICAN INN	510 E 13TH AVE
419	6		WISCH, MARGUERITE	515 E 8TH AVE	NORTH WILDWOOD, NJ	08260	ALANTE MOTEL	515 E 8TH AVE
423	5		WYOMING PROPERTIES, INC	300 KENNEDY DR	NORTH WILDWOOD, NJ	08260	ACROPOLIS MOTEL	300 KENNEDY DR
424	5		CATANZARO, JOAN	210 KENNEDY DR	NORTH WILDWOOD, NJ	08260	ALOHA MOTEL	210 KENNEDY DR

BLOCK	LOT	QUALIFIER	OWNER NAME	MAILING ADDRESS	CITY, STATE	ZIP CODE	NOTES/CONDO NAME	PROPERTY LOCATION
289	4		SHERMAN, GLENN	23 MEADOW RUN RD	BORDENTOWN, NJ	08505	OCEAN HAVEN CONDO	434 E 24TH AVE
289	6		MCLAUGHLIN, SEAN P & DONNA M	326 BRANDWINE DR	MARLTON, NJ	08053	440 E 24TH AVE CONDO	440 E 24TH AVE
292	7		MYERS, NICOLE L	235 CEDARVIEW DR	PERKASIE, PA	18944	LAMPOST CONDO	442 E 21ST AVE
294	15		COLLEEN AHLUM	3314 PACIFIC AVE	WILDWOOD, NJ	08260	1900 BOARDWALK CONDO	1900 BOARDWALK
294	16		BARBIERI, EUGENE	49 STEPHEN DR	GLEN MILLS, PA	19342	BEACH COVE CONDO	425 E 20TH AVE
295	9		DILELLA, ARDIA A	666 W GERMANTOWN PK,#1803	PLYMOUTH MEETING, PA	19462	BUCCANEER CONDO	503 E 19TH AVE
316.01	2		DEFEO, ROBERT L & ELLEN	5460 DREXEL AVE	PENNSAUKEN, NJ	08109	TIDES OCEAN VW CONDO	504 E 17TH AVE
317.01	6		YONSON, JOSEPH & ELIZABETH	2454 N GREENSWARD RD	WARRINGTON, PA	18976	TIKI CONDO	514 E 16TH AVE
317.01	7		DIDONATO, ALBA	1600 BOARDWALK #301	NORTH WILDWOOD, NJ	08260	1600 BOARDWALK CONDO	1600 BOARDWALK
317.01	9		KILLE, EDWARD & SUSAN	38 BIRCH LN	PILESGROVE, NJ	08098	OUTRIGGER CONDO	513-15 E 17TH AVE
412	7		MICHAUD, ROBERT L & MARTHA K	14 CHATHAM RD	LITTLE EGG HARBOR, NJ	08087	SKYLINE CONDOS	506 E 14TH AVE
412	8		HILL, JEFFREY H	189 JONESTOWN RD	OXFORD, NJ	07863	LE BOOT CONDOS	510 E 14TH AVE
412	9		SMITH, THERESA C	120 BROOKSIDE DR	HOLLAND, PA	18966	SEA EDGE CONDO	505 E 15TH AVE
413	7		BRADY, KEVIN	513 E 14TH AVE	NORTH WILDWOOD, NJ	08260	14TH & BEACH CONDO	505 E 14TH AVE
414	6		RANSLEY, AMELIA	290 YARDLEY AVE	FALLSINGTON, PA	19054	TRYLON CONDOS	1200 KENNEDY DR
415	7		SUSAN WOJDULA	958 SPRING CITY RD	PHOENIXVILLE, PA	19460	MAUNALOA BEACH CLUB	1100 KENNEDY DR
416	4		SHORE RESORT PROPERTY MGMT	5406 NEW JERSEY AVE	WILDWOOD CREST, NJ	08260	ROMAN HOLIDAY CONDO	1000 KENNEDY DR
416	5		GALLAGHER, JOYCE	43 ARABIAN WAY	HOLLAND, PA	18966	EAST ISLAND BEACH	515 E 11TH AVE
417	8		D'AMICO, LINDA	15 S HILLTOP AVE	SOMERDALE, NJ	08083	OLYMPIC GARDENS	900 KENNEDY DR
418	6		CUDDY, LORRAINE	19 CEPP RD	PERKIOMENVILLE, PA	18074	LE SABRE CONDOS	510 E 8TH AVE
419	5		DE LUCA, JOYCE	107 N OAKHILL RD	PITTSBURGH, PA	15238	KENNEDY DRIVE CONDOS	514 E 7TH AVE
420	6		SHORE RESORT PROPERTY MGMT	5406 NEW JERSEY AVE	WILDWOOD CREST, NJ	08260	SEACREST TOWERS	600 KENNEDY DR
420	7		DAVIS, EUGENE M & LAURA	215 DRAKE LN	NORTH WALES, PA	19454	CORAL REEF CONDO	513 E 7TH AVE
421	1		BILL PFAFF	500 KENNEDY DR	NORTH WILDWOOD, NJ	08260	REGENCY TOWER CONDOS	500 KENNEDY DR
424	4		BENEVENGA, GINO & ELMA	16 TARA LN	MONTVILLE, NJ	07045	HORIZON CONDOS	514 E 2ND AVE

PUBLIC NOTICE

Take Notice that a combined application will be submitted to the New Jersey Department of Environmental Protection (NJDEP), Division of Land Resource Protection for a CAFRA Individual Permit (IP), and Freshwater Wetlands (FWW) General Permits 6 (GP6) and 6A (GP6A) for the development described below. Note that during review of the application, NJDEP may determine the freshwater wetlands are of exceptional resource value classification. If that occurs, supplemental documentation and updated plans will be provided to NJDEP to convert the application to a FWW IP.

APPLICANT: City of North Wildwood
901 Atlantic Avenue, North Wildwood, NJ 08260

PROJECT NAME: Beach Front Bulkhead

PROJECT DESCRIPTION: The City of North Wildwood (the City) is proposing the construction of a new steel bulkhead adjacent to JFK Boulevard Beach Drive and the boardwalk generally between 13th and 25th Avenues. The City is also seeking approval for a previously constructed vinyl bulkhead adjacent to JFK Boulevard Beach Drive between 3rd and 5th Avenues, and a steel bulkhead generally between 5th and 13th Avenues.

PROJECT STREET ADDRESS: JFK Boulevard Beach Drive between 3rd and 26th Avenues.

BLOCK, LOT: Portions of Block 289.03, Lot 1; Block 290.01, Lot 1; Block 291.01, Lot 1, Block 315.02, Lot 1; Block 316.02, Lot 1; Block 317.02, Lot 1 and Lot 2; and Block 317.03, Lot 1

MUNICIPALITY: City of North Wildwood

COUNTY: Cape May County

The complete permit application package can be reviewed at the municipal clerk's office in the municipality in which the site subject to the application is located or by appointment at the Department's Trenton Office. In addition, an electronic copy of the initial application can be provided via an OPRA request by contacting https://www.nj.gov/dep/opra/opraform.html from the Department's Trenton Office. Either a 60-day public comment period or public hearing will be held on the application in the future. The Department of Environmental Protection welcomes comments and any information that you may provide concerning the proposed development and site. Written comments shall be sent to the Department at the below address within 45 calendar days of receiving this notice. Individuals may request a public hearing on the application within 45 calendar days of the date of receiving this notice. Requests for a public hearing shall be sent to the Department at the address below and shall state the specific nature of the issues to be raised at the hearing.

New Jersey Department of Environmental Protection
Division of Land Resource Protection
P.O. Box 420, Code 501-02A
501 East State Street
Trenton, New Jersey 08625
Attn: North Wildwood Supervisor

Printer Fee: $49.14
Pub Date: November 20, 2020

Order #: 0000156079

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ARTICLE ADDRESS TO:

Mr. W. Scott Jett, R.M.C., C.M.R.
City of North Wildwood
Municipal Clerk
901 Atlantic Avenue
North Wildwood NJ 08260-5778

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ROBERT L & ELLEN DEFEO
5460 DREXEL AVE
PENNSAUKEN NJ 08109-1012

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ARTICLE ADDRESS TO:

ROBERT M JOHN & MARYANN K TRUSTEES
224 FOX HOLLOW DR
LANGHORNE PA 19053-2477

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ARTICLE ADDRESS TO:

ROBERT & DIANE WUNSCH
2464 GREENSWARD S
WARRINGTON PA 18976-2060

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ARTICLE ADDRESS TO:

MS. AMELIA RANSLEY
290 YARDLEY AVE
FALLSINGTON PA 19054-1121

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ARTICLE ADDRESS TO:

PRY ENTERPRISES, LLC
258 S HAVILAND AVE
AUDUBON NJ 08106-1126

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ARTICLE ADDRESS TO:

WYOMING PROPERTIES, INC
300 John F KENNEDY Blvd
NORTH WILDWOOD NJ 08260-5946

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ARTICLE ADDRESS TO:

MS. MARY ANN EMMI
2902 CENTURY LN
CHADDS FORD PA 19317-8973

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ARTICLE ADDRESS TO:

SPORTLAND INVESTMENTS
205 ANDY WARHOL WAY
MARLTON NJ 08053-7236

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ARTICLE ADDRESS TO:

SEAN P & DONNA M MCLAUGHLIN
326 Brandywine DR
MARLTON NJ 08053-1041

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Postage per piece	$1.200
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ARTICLE ADDRESS TO:

JOSEPH & ELIZABETH YONSON
2454 GREENSWARD N
WARRINGTON PA 18976-2064

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ARTICLE ADDRESS TO:

MS. COLLEEN AHLYM
3314 PACIFIC AVE
WILDWOOD NJ 08260-4824

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Certified Fee	$3.550
Return Receipt Fee	$2.850
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ARTICLE ADDRESS TO:

MS. NICOLE L MYERS
235 CEDARVIEW DR
PERKASIE PA 18944-2359

FEES	
Postage per piece	$1.200
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Return Receipt Fee	$2.850
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9490 9118 9956 4142 6232 60

FEES	
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Certified Fee	$3.550
Return Receipt Fee	$2.850
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ARTICLE ADDRESS TO:

MC LAUGHLIN SONIA E, ETAL
169 HART AVE
DOYLESTOWN PA 18901-5723

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FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
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ARTICLE ADDRESS TO:

YOUSCHAK PROPERTIES, LLC
1710 BOARDWALK
NORTH WILDWOOD NJ 08260

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9414 7118 9956 4142 6968 71

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9490 9118 9956 4142 6967 14

FEES	
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Certified Fee	$3.550
Return Receipt Fee	$2.850
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ARTICLE ADDRESS TO:

D R F ENTERPRISES @ DOMINCS PIZZA
1768 S LINCOLN AVE
VINELAND NJ 08361-6643

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9490 9118 9956 4142 6989 16

FEES	
Postage per piece	$1.200
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ARTICLE ADDRESS TO:

MS. LORRAINE CUDDY
19 CEPP RD
PERKIOMENVILLE PA 18074-9742

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9490 9118 9956 4142 6909 34

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

ROMANY AND SONS, LLC
2 IRETON KEY
COLTS NECK NJ 07722-1778

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9414 7118 9956 4142 6979 53

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6979 64

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
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ARTICLE ADDRESS TO:

MR. JEFFREY H HILL
189 JONESTOWN RD
OXFORD NJ 07863-3122

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OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6926 75

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6921 12

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
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ARTICLE ADDRESS TO:

JOSEPH & ARLETTE A GRANICK
2 STILES LN
FRANKLIN PARK NJ 08823-1749

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OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6950 65

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6950 21

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

JOSEPH W & FAYE C MANZI
200 FOXCATCHER LN
MEDIA PA 19063-1106

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OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6937 57

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6937 68

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

C & M SALEEB REAL ESTATE, LLC
2022 BOARDWALK
NORTH WILDWOOD NJ 08260

Postmark Here

PLAINSBORO POST OFFICE NOV 20 20 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6717 55

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6717 66

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

MS. JOAN CATANZARO
210 John F KENNEDY Blvd
NORTH WILDWOOD NJ 08260-5958

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6779 79

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6776 14

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

JOEL M & BARBARA C FEINGOLD
2150 ESTEN RD
QUAKERTOWN PA 18951-2245

Postmark Here

PLAINSBORO POST OFFICE NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6942 80

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6942 39

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

2100 BOARDWALK HOLDING, LLC
2022 BOARDWALK
NORTH WILDWOOD NJ 08260

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6535 77
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6542 19

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

WILLIAM C & NOEL A HIGGINSON
130 HESS RD
COLLEGEVILLE PA 19426-2820

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6552 12
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6552 54

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

MS. THERESA C SMITH
120 BROOKSIDE DR
HOLLAND PA 18966-2256

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6659 76
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6656 11

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

DONALD J & PAULA FORJOHN
1 SCOUT DR
MEDFORD NJ 08055-8142

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6502 31
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6502 73

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

MICHAEL J & AMY M HOLLYWOOD
118b DOCK ST
BENSALEM PA 19020-8756

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6522 35
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6522 77

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

ANTHONY & SUE ANN SALVATORE
12 SOUTH MAPLE AVE Apt 107
MARLTON NJ 08053-2211

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6649 17
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6649 59

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

ROBT F & MARY P KNOLL
105 E TOLEDO AVE
WILDWOOD CREST NJ 08260-3662

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6560 73
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6564 11

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

MS. JOYCE DE LUCA
107 N Oak Hill RD
PITTSBURGH PA 15238-3019

Postmark Here

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6576 81
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6576 30

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

MR. JAMES R VAN ARSDALE
108 ZION RD
EGG HARBOR Twp NJ 08234-7000

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6587 18
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6587 50

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

ANTHONY D & HELEN M RICCI
110 MORNING GLORY WAY
HUNTINGDON VALLEY PA 19006-5457

Postmark Here

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6207 46
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6207 88

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

JAMES J & CYNTHIA A MCMULLEN
153 CEDAR RD
MULLICA HILL NJ 08062-2501

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6248 43
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6248 85

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

RHR WILDWOOD 423, LLC
1600 MATSO DR
TOMS RIVER NJ 08753-4686

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6258 57
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6258 68

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

MS. ALBA DIDONATO
1600 BOARDWALK Apt 301
NORTH WILDWOOD NJ 08260-5467

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1229 12
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1229 54

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

MR. GERARD E GONTZ
3818 PATRICIAN DR
PHILADELPHIA PA 19154-3412

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1225 85
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1225 34

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

EDWARD & SUSAN KILLE
38 BIRCH LN
PILESGROVE NJ 08098-2418

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1278 94
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1278 43

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

WILLIAM & KLYMKOWSKI ARCHIBALD
3401 N RANDOLPH ST
ARLINGTON VA 22207-4439

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1161 71
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1163 11

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

2400 BOARDWALK, LLC ETAL
650 NEW RD, STE #B
LINWOOD NJ 08221-1252

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6354 67
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6354 23

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

ROCCO J D'ANDREA & HANNALORE TRUST
PO BOX 470
WILDWOOD NJ 08260-0470

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6769 27
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6769 07

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

EUGENE M & LAURA DAVIS
215 DRAKE LN
NORTH WALES PA 19454-1650

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6433 56
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6433 67

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

NORTH POINT DEVELOPERS, LLC
510 E 13TH AVE
NORTH WILDWOOD NJ 08260-5628

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1253 71
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1250 16

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

EDWARD OLWEL & ROBERTA D NEVIN
400 John F KENNEDY Blvd
NORTH WILDWOOD NJ 08260-5109

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1900 27
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1900 07

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

MR. ROBERT J CARROLL
4910 TOWNSHIP LINE RD
DREXEL HILL PA 19026-4235

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1954 35
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1954 77

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

MR. BILL PFAFF
REGENCY TOWERS
500 John F KENNEDY Blvd
NORTH WILDWOOD NJ 08260-5894

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1965 24
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1965 04

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

DENISE & KEVIN FOLEY
465 E 24TH AVE
NORTH WILDWOOD NJ 08260-5207

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1920 14
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1920 56

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

JEFFREY D & SARAH JOHNSON
5 TOWNE LN
VOORHEES NJ 08043-4813

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1188 47
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1188 89

ARTICLE ADDRESS TO:

ALBERT & PATRICIA D'ALONZO
935 SAINT JAMES DR
LANGHORNE PA 19047-1624

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6753 02
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6753 99

ARTICLE ADDRESS TO:

JOSEPH R REIFSNYDER & MARY BRADLEY
230 WINTHROP LN
WAYNE PA 19087-2152

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1185 71
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1172 19

ARTICLE ADDRESS TO:

CITY OF NORTH WILDWOOD
901 ATLANTIC AVE
NORTH WILDWOOD NJ 08260-5778

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6721 96
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6721 45

ARTICLE ADDRESS TO:

OVPH, LLC
230 S BROAD ST Ste 304
PHILADELPHIA PA 19102-4109

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1174 51
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1174 62

ARTICLE ADDRESS TO:

MS. ARDIA A DILELLA
666 W GERMANTOWN Pike Apt 1803
PLYMOUTH MEETING PA 19462-1017

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO P...
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6709 49
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6709 81

ARTICLE ADDRESS TO:

MR. GLENN SHERMAN
23 MEADOW RUN RD
BORDENTOWN NJ 08505-4728

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6323 05
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6323 92

ARTICLE ADDRESS TO:

506, LLC
630 W SPRUCE AVE
NORTH WILDWOOD NJ 08260-3032

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1936 08
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1936 95

ARTICLE ADDRESS TO:

MATADOR MOTEL INC
511 E 16TH AVE
NORTH WILDWOOD NJ 08260-5516

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1203 83
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1203 32

ARTICLE ADDRESS TO:

ROBERT & LINDA DIRESO
3699 MIDVALE AVE
PHILADELPHIA PA 19129-1712

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6494 40
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6494 82

ARTICLE ADDRESS TO:

MR. KEVIN BRADY
513 E 14TH AVE
NORTH WILDWOOD NJ 08260-6127

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1289 07
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1289 94

ARTICLE ADDRESS TO:

THE MOREY ORG
3501 BOARDWALK
WILDWOOD NJ 08260-5427

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6449 40
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6449 82

ARTICLE ADDRESS TO:

MR. EUGENE BARBIERI
49 STEPHEN DR
GLEN MILLS PA 19342-8814

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ
NOV 20 2020
08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6400 65
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6400 21

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

ANTONION & ELENI KOUTSIMIRIS
319 E 6TH AVE
NORTH WILDWOOD NJ 08260-5825

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1755 12
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1755 54

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

CW MOTEL, LLC
515 E 8TH AVE
NORTH WILDWOOD NJ 08260-5709

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1757 58
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1757 69

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

ALEXANDER P & MARY A STEFANELLI
532 DRAYTON RD
ORELAND PA 19075-2024

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1974 91
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1974 40

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

MR. MICHAEL J BARBIERI
476 LYNBROOKE RD
SPRINGFIELD PA 19064-3535

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1241 45
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1241 87

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

MR. DREW P RONNERMANN
4008 TRILLIUM WAY
CHESTER SPRINGS PA 19425-3887

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1109 26
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1109 06

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

MS. SUSAN WOJDULA
958 SPRING CITY RD
PHOENIXVILLE PA 19460-1881

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1234 45
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1234 87

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

MS. JOYCE GALLAGHER
43 ARABIAN WAY
HOLLAND PA 18966-5303

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1142 69
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1142 25

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

SPORT WEST, INC
PO BOX 37
NORTH WILDWOOD NJ 08260-0037

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1232 78
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1238 14

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

DOROTHY CORRENTI & LANCE R MILLER
451 E 24TH AVE
NORTH WILDWOOD NJ 08260-5207

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1121 28
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1121 08

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

MANAGEMENT CONSORTIUM, LLC
PO BOX 1649
WILDWOOD NJ 08260-7649

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1298 98
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1298 47

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

THOMAS C & KELLIE A INGERSOLL
461 E 24TH AVE
NORTH WILDWOOD NJ 08260-5207

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

Certified Mail Receipt
U.S. Postal Service

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1153 72
RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1150 17

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	**$7.600**

ARTICLE ADDRESS TO:

THE FOUR W'S, LLC
PO BOX 1649
WILDWOOD NJ 08260-7649

Postmark Here
PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1723 82

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1723 31

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

MS. MARGUERITE WISCH
515 E 8TH AVE
NORTH WILDWOOD NJ 08260-5709

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1318 91

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1318 40

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

MR. EDWARD G POHLMAN
PO BOX 389
WILDWOOD NJ 08260-0389

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6489 86

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6489 35

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

1610 BOARDWALK, LLC
312 HELMS AVE
SWEDESBORO NJ 08085-1018

Postmark Here

PLAINSBORO POST OFFICE PLAIN NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1142 69

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1142 25

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

SPORT WEST, INC
PO BOX 37
NORTH WILDWOOD NJ 08260-0037

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NJ NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 6472 62

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 6472 28

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

GERARD & DENISE O'CONNOR
3057 WINCHESTER AVE
PHILADELPHIA PA 19136-1805

Postmark Here

PLAINSBORO POST OFFICE PLAIN NOV 20 2020 08536 USPS

U.S. Postal Service Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 4142 1143 75

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 4142 1140 10

FEES	
Postage per piece	$1.200
Certified Fee	$3.550
Return Receipt Fee	$2.850
Total Postage & Fees:	$7.600

ARTICLE ADDRESS TO:

W & E ENTERPRISES INC @M WEINER
PO BOX 1649
WILDWOOD NJ 08260-7649

Postmark Here

PLAINSBORO POST OFFICE PLAINSBORO NOV 20 2020 08536 USPS

KELLER EXHIBIT B

From: Cluelow, Patricia
To: _Ryder, John
Bcc: Cobb, Jessica; Dow, Diane; Torok, Larry
Subject: DLUR File #0507-20-0006.1 - North Wildwood City Bulkhead
Date: Thursday, December 3, 2020 3:41:00 PM

Mr. Ryder:

The Department is in receipt of the above referenced combination application which was assigned file #0507-20-0006.1 LUP200001 and includes a CAFRA individual permit, a Freshwater Wetlands general permit #6 and #6A. Upon review of the application materials it has been determined that additional information is required before the combination application can be declared "administratively complete".

The property owner's certification lists "Sportland Investments" as the owner of Block 290.01, Lot 1 which is a parcel included in the project. A signature from an authorized representative for "Sportland Investments" was not provided on the property owner's certification. Prior to this combination application being declared "administratively complete", you must submit a revise property owner's ceritification that bears the signature of an authorized representative of "Sportland Investments". In lieu of such signature, you may provide documentation that Block 290.01, Lot 1 is now owned by that City of North Wildwood.

In addition, please submit the CAFRA newspaper notice that is required as part of the application.
Upon submittal of the revised property owner's certification and the the newspaper notice, the Division will declare the above applications "administratively complete" and assign the applications to the appropriate project manager for technical review. Please submit the required information within 30 days of this e-mail in order for these applications to be declared "administratively complete". Please submit the additional information by e-mail and include a copy of this e-mail so that the information may be properly directed.
Best Regards,
Patti Cluelow

Supervisor, ASU
NJDEP – DLUR
P.O. Box 420, Code 501-02A
Trenton, NJ 08625-0420

KELLER EXHIBIT C

Kathi Cooley

Subject: FW: City of North Wildwood: Emergency Storm Damage Notice and Mitigation Efforts
Attachments: 2022-10-05 Lt Lomax to Keller Stewart re Emerg Auth Req Subm.pdf

Importance: High

From: Peter Lomax <plomax@lomaxconsulting.com>
Sent: Wednesday, October 5, 2022 10:26 PM
To: Keller, Colleen [DEP] <Colleen.Keller@dep.nj.gov>; Stewart, Janet [DEP] <Janet.Stewart@dep.nj.gov>
Cc: Moriarty, Jennifer [DEP] <Jennifer.Moriarty@dep.nj.gov>; Cahall, Kimberly [DEP] <Kimberly.Cahall@dep.nj.gov>; Mazzei, Becky [DEP] <Becky.Mazzei@dep.nj.gov>; Cobb, Jessica [DEP] <Jessica.Cobb@dep.nj.gov>; Kropilak, Michele [DEP] <Michele.Kropilak@dep.nj.gov>; Lutz, Michael [DEP] <Michael.Lutz@dep.nj.gov>; Patrick Rosenello <prosenello@northwildwood.com>; nlong@northwildwood.com; jverna@vannoteharvey.com; Yoskin, Neil <nyoskin@cullenllp.com>
Subject: [EXTERNAL] RE: City of North Wildwood: Emergency Storm Damage Notice and Mitigation Efforts
Importance: High

Colleen/Janet,

Attached for your reference and review, please find the Emergency Authorization request submission package on behalf of the City of North Wildwood, which includes the information specified in *N.J.A.C. 7:7-21.2* and specifically addresses the considerations you highlighted in your email yesterday (below). Thank you, in advance, for your assistance and consideration in this regard.

Sincerely,
Peter

Peter L. Lomax
President

The Lomax Consulting Group
P.O. Box 9 (mail)
1435 Route 9 North (delivery)
Cape May Court House, NJ 08210
609-465-6700 (o)
609-465-2449 (f)
plomax@lomaxconsulting.com
www.lomaxconsulting.com

From: Keller, Colleen [DEP] <Colleen.Keller@dep.nj.gov>
Sent: Tuesday, October 4, 2022 3:16 PM
To: Peter Lomax <plomax@lomaxconsulting.com>

Cc: Moriarty, Jennifer [DEP] <Jennifer.Moriarty@dep.nj.gov>; Cahall, Kimberly [DEP] <Kimberly.Cahall@dep.nj.gov>; Stewart, Janet [DEP] <Janet.Stewart@dep.nj.gov>; Kropilak, Michele [DEP] <Michele.Kropilak@dep.nj.gov>; Lutz, Michael [DEP] <Michael.Lutz@dep.nj.gov>; Patrick Rosenello <prosenello@northwildwood.com>; nlong@northwildwood.com; jverna@vannoteharvey.com; Cobb, Jessica [DEP] <Jessica.Cobb@dep.nj.gov>; Edward McLaughlin <emclaughlin@lomaxconsulting.com>
Subject: RE: City of North Wildwood: Emergency Storm Damage Notice and Mitigation Efforts

Pete, DLRP will expedite review/response for any submitted Emergency Authorization (EA) request. Please email me and Janet Stewart the EA request, reach out to me or Janet Stewart if necessary to discuss via phone at (609) 633-2289, or if after hours, call on my work cell at (609) 775-7913. I note that, as per the Standards Applicable to Emergency Post-Storm Restoration within the CZM rules, specifically NJAC 7:7-10.3(b), emergency beach restoration activities as part of an emergency post-storm recovery include the placement of clean fill material (compatible to the existing beach), alongshore transfer of sand on the beach, placement of rock and the placement of sand filled geotextile tubes. These activities should be considered prior to a proposed placement of a bulkhead, which could potentially increase erosion to adjacent areas. NWW should not conduct any work that is requested through an Emergency Authorization, until DLRP has reviewed to determine that the emergency work is immediately necessary due to the threat of the loss of life or property, and if so, until DLRP has issued a verbal or written Emergency Authorization response. Any questions, let me know.

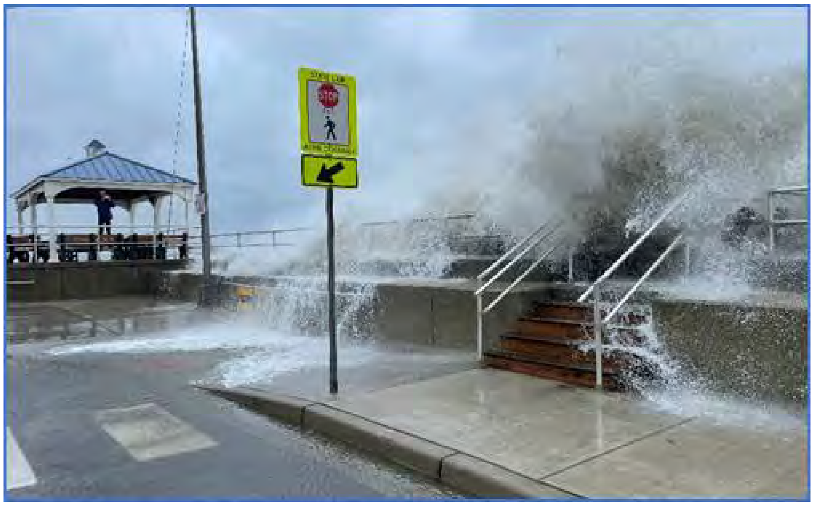
From: Peter Lomax <plomax@lomaxconsulting.com>
Sent: Monday, October 3, 2022 5:48 PM
To: Keller, Colleen [DEP] <Colleen.Keller@dep.nj.gov>
Cc: Moriarty, Jennifer [DEP] <Jennifer.Moriarty@dep.nj.gov>; Cahall, Kimberly [DEP] <Kimberly.Cahall@dep.nj.gov>; Stewart, Janet [DEP] <Janet.Stewart@dep.nj.gov>; Kropilak, Michele [DEP] <Michele.Kropilak@dep.nj.gov>; Lutz, Michael [DEP] <Michael.Lutz@dep.nj.gov>; Patrick Rosenello <prosenello@northwildwood.com>; nlong@northwildwood.com; jverna@vannoteharvey.com; Mazzei, Becky [DEP] <Becky.Mazzei@dep.nj.gov>; Cobb, Jessica [DEP] <Jessica.Cobb@dep.nj.gov>; Edward McLaughlin <emclaughlin@lomaxconsulting.com>
Subject: [EXTERNAL] RE: City of North Wildwood: Emergency Storm Damage Notice and Mitigation Efforts
Importance: High

Colleen,

Thank you for your prompt reply. Having spent the better part of the afternoon inspecting the site conditions and meeting with the City team, it appears that we will be needing an Emergency Authorization. For exactly what and where, those details are being worked out presently by the City Engineer which will carry into this evening, and we will put together as complete a package as is possible for the staff's review. This is a very fluid situation (no pun intended), and we are working very hard to determine the best means of mitigating damage in the most effective means possible. Based on an assessment by the City Engineer this afternoon, 30' of dune was lost in the last 24 hours and it is suspected that this rate of loss will continue for at least the next 24 hours, which will essentially breach the dune at 15th/16th Avenues in front of the Beach Patrol headquarters. This is a critical facility in the City, and we must do everything possible to protect it from the onslaught of these storm-driven waves.

Given that time will be absolutely critical, what is your counsel in terms of being able to "hold the line" against this storm vs. awaiting NJDEP Emergency Authorization review? I am providing a small selection of representative photos taken by me this afternoon for your reference.

View at 2nd Avenue / JFK Avenue Seawall this afternoon



View at 3rd Avenue / JFK Avenue seawall / stormwater outfall vent this afternoon

View at 15th Avenue dune scarp (±10') in front of Beach Patrol headquarters

View of Beach Patrol headquarters, right side of photos is the remaining 30' wide dune as of this afternoon which terminates at a ±10' scarp dropping into the Atlantic Ocean

I will circle back to you and the DLRP/Enforcement staff tomorrow with a game plan and submission for review/authorization. Again, thank you for your prompt attention, and let's hope for calming seas before irreparable damage to the City of North Wildwood occurs.

Regards,
Peter

Peter L. Lomax
President

The Lomax Consulting Group
P.O. Box 9 (mail)
1435 Route 9 North (delivery)
Cape May Court House, NJ 08210
609-465-6700 (o)
609-465-2449 (f)
plomax@lomaxconsulting.com
www.lomaxconsulting.com

From: Keller, Colleen [DEP] <Colleen.Keller@dep.nj.gov>
Sent: Monday, October 3, 2022 4:00 PM
To: Peter Lomax <plomax@lomaxconsulting.com>
Cc: Moriarty, Jennifer [DEP] <Jennifer.Moriarty@dep.nj.gov>; Cahall, Kimberly [DEP] <Kimberly.Cahall@dep.nj.gov>; Stewart, Janet [DEP] <Janet.Stewart@dep.nj.gov>; Kropilak, Michele [DEP] <Michele.Kropilak@dep.nj.gov>; Lutz, Michael [DEP] <Michael.Lutz@dep.nj.gov>; Patrick Rosenello <prosenello@northwildwood.com>; nlong@northwildwood.com; jverna@vannoteharvey.com; Edward McLaughlin <emclaughlin@lomaxconsulting.com>; Mazzei, Becky [DEP] <Becky.Mazzei@dep.nj.gov>; Cobb, Jessica [DEP] <Jessica.Cobb@dep.nj.gov>
Subject: RE: City of North Wildwood: Emergency Storm Damage Notice and Mitigation Efforts

Pete, thanks for reaching out regarding the City of North Wildwood's storm response. As you are likely aware, any post-storm restoration or installation of any storm protection measures (i.e., bulkhead or other mitigative measures) within regulated areas will likely require authorization (Emergency Authorization (EA) or permit) from the NJDEP Division of Land Resource Protection prior to conducting the work. If it is determined that emergency work is necessary due to an immediate threat to life or property, DLRP can quickly issue an EA prior to the work, with permit follow up after the storm threat has passed. The information that is necessary to request an Emergency Authorization is attached. We are always available to answer any questions that you may have with regard to regulated activities in response to the storm.

Colleen Keller (she/her), Assistant Director
NJDEP Division of Land Resource Protection
Watershed & Land Management
501 East State Street, Trenton, NJ 08625
Mail Code 501-02A
T (609) 633-2289| F (609) 633-3656
colleen.keller@dep.nj.gov

From: Peter Lomax <plomax@lomaxconsulting.com>
Sent: Monday, October 3, 2022 12:21 PM
To: Stewart, Janet [DEP] <Janet.Stewart@dep.nj.gov>; Mazzei, Becky [DEP] <Becky.Mazzei@dep.nj.gov>
Cc: Keller, Colleen [DEP] <Colleen.Keller@dep.nj.gov>; Cahall, Kimberly [DEP] <Kimberly.Cahall@dep.nj.gov>; Kropilak, Michele [DEP] <Michele.Kropilak@dep.nj.gov>; Lutz, Michael [DEP] <Michael.Lutz@dep.nj.gov>; Patrick Rosenello <prosenello@northwildwood.com>; nlong@northwildwood.com; jverna@vannoteharvey.com; Edward McLaughlin <emclaughlin@lomaxconsulting.com>
Subject: [EXTERNAL] City of North Wildwood: Emergency Storm Damage Notice and Mitigation Efforts
Importance: High

Janet/Becky,

Please be advised that the City of North Wildwood is sustaining significant beach/dune losses and storm damage as part of the current coastal low/Hurricane Ian remnants. Losses became pronounced and threatening to health, safety and welfare over the weekend, and these impacts are expected to continue through the next few days, particularly during elevated tidal cycles. Significant coastal flooding is occurring throughout the County's coastal areas, impacting transportation corridors and operating schedules for public facilities, including schools. Despite these dynamic conditions, we are currently in the process of inventorying the threats and mitigative measures necessary to the protect private and public property and critical City infrastructure.

Later today, I will forward photos for your reference and review. Once we have a better sense of the damage, I will follow-up with more details on action(s) required and whether an emergency permit authorization will be necessary.

Thank you for your consideration and attention in this regard,
Peter

Peter L. Lomax
President

The Lomax Consulting Group
P.O. Box 9 (mail)
1435 Route 9 North (delivery)
Cape May Court House, NJ 08210
609-465-6700 (o)
609-465-2449 (f)
plomax@lomaxconsulting.com
www.lomaxconsulting.com

KELLER EXHIBIT C-1

the LOMAX Consulting group

P. O. Box 9 (MAILING)
1435 ROUTE 9 NORTH (DELIVERY)
CAPE MAY COURT HOUSE, NJ 08210, USA

609-465-9857 (P)
609-465-2449 (F)
WWW.LOMAXCONSULTING.COM

Peter L. Lomax, Managing Principal
(609) 465-6700 ext. 13
plomax@lomaxconsulting.com

October 5, 2022
Via email

New Jersey Department of Environmental Protection
Division of Land Resource Protection
501 East State Street, Second Floor
Trenton, NJ 08625
ATTN: Ms. Colleen Keller and Ms. Janet Stewart

RE: Coastal Program Emergency Authorization – Shore Protection Measures
25th Avenue Beach Access and Beach Patrol Building/Oceanfront Safety Facility
Block 289.03, Lot 1 (portion thereof) and Block 317.03, Lot 1 (portion thereof)
City of North Wildwood, Cape May County, NJ
TLCG File No.: 22-1093.2

Dear Ms. Keller and Ms. Stewart,

On behalf of the City of North Wildwood (hereafter "City" or "Applicant"), please accept this request for an Emergency Authorization pursuant to the Coastal Zone Management Rules (CZMR) *(N.J.A.C. 7:7 et seq.)* under the authority of the NJ Department of Environmental Protection (NJDEP). This request follows our previous email exchanges in this regard over the past few days during which the low pressure system remnants of Hurricane Ian stalled off the mid-Atlantic coast causing a sustained multi-day period of significant coastal flooding throughout the region and, more specifically, potentially catastrophic beach and dune erosion to the City of North Wildwood oceanfront. Given the absence of a defined beach berm and loss of greater than 75% of the protective dune system in front of the Beach Patrol Building/Oceanfront Safety Facility, Block 317.03, Lot 1 (portion thereof), the City Engineer has determined that a breach condition is imminent requiring that emergency measures be implemented to re-establish reliable shore protection at this location. Additionally, the 25th Avenue beach access, Block 289.03, Lot 1 (portion thereof), continues to sustain significant erosion which has undermined this vehicular beach access and exposed adjoining shore protection structure to further scour and scarping. These emergent conditions were first observed during the weekend (October 1, 2022) and exacerbated through the following days *(see attached photo pages)*.

Please note that, consistent with previous collaborative discussions with the NJDEP and direction to keep all parties informed, this submission will be transmitted to the Bureau of Coastal and Land Use Compliance and Enforcement staff to ensure that they too are properly informed of the imminent threat and the Applicant's intent to implement emergency shore protections measures in the wake of this most recent coastal storm.

Applicant:
City of North Wildwood
901 Atlantic Avenue
North Wildwood, NJ 08260
Attn: Nicholas Long, City Administrator
609-522-6464
nlong@northwildwood.com

It should be noted that, despite the City's $3.7 million investment in 2022 beach renourishment in advance of the summer season via the NJDEP and USACE-approved sand backpassing project, residual sand reserves were sufficiently depleted by the end of the season that little remained to withstand a single coastal storm event. Sand volume placed as part of the backpassing project was shaped into a dune ridge and dry beach area along the oceanfront consistent with the approved design template. *"The final tally of sand moved from Wildwood beaches to the beaches of North Wildwood was provided by the municipal engineer at 361,221 cubic yards making this season's transfer the largest thus far in this "in house" effort to restore a recreational and storm protection shoreline during this period of extensive oceanfront beach erosion manifesting itself in North Wildwood since the late 1990's."* (2022 Spring Report to the City of North Wildwood on the Condition of City Beaches, Stockton University Coastal Research Center, July 25, 2022). The prior season, 357,000 cubic yards of sand was backpassed by the City for renourishment, also at exceptional expense borne by the City. In total, approximately 1,611,372 cubic yards of sand has been backpassed to renourish the City's eroding beaches since 2016. However, due to prevailing coastal processes, these reserves have been lost in quantity from the beach-dune complex annually and have now settled into offshore deposits.

As a result of this most recent coastal storm event and in light of the depleted sand reserves whereby a dune breach is imminent, the City, as owner of the subject properties and steward of the municipal transportation, utility and public safety infrastructure, has given its permission to pursue the prescribed emergency measures below and is hereby seeking an Emergency Authorization for the following activities:

<u>15th – 16th Avenues waterward of the Beach Patrol Building (Block 317.03, Lot 1 (portion thereof))</u>

1) Immediate deployment of Jersey barriers (20' segments) in a 400LF alignment extending from the 15th Avenue northern right-of-way limit line along the landward edge of dune to the 16th Avenue southern right-of-way limit line
2) Remove/relocate existing composite/timber decking walkway from in front of the building to facilitate Jersey barrier deployment
3) Reshape dune remnants, protecting existing dune vegetation to the maximum extent possible, to establish stabilized slopes secured landward by the Jersey barrier wall
4) Installation of 404LF cantilevered steel bulkhead (coated) with timber cap
5) Reconstruct/stabilize vehicular/pedestrian access from 16th Avenue right-of-way to the beach

The above activities are depicted on a hand sketch prepared by Jim Verna III, P.E. of Van Note-Harvey Associates Inc., dated October 4, 2022, as well as separate hand-annotated detail sheets, each dated October 4, 2022, and a cut sheet for Meever USA sheet piles *(attached)*. A line drawing of these proposed measures is in progress and will be transmitted under separate cover for reference, once completed. Please note that the topographic contours on the hand sketch are vestigial to conditions in 2020 and the aerial image is from February 2022; hence, these do not reflect existing conditions. The proposed activities are designed to avoid previously delineated interdunal freshwater wetlands in the back dune north of the project area limit, as well as its associated transition area. Items 1-3 will commence immediately and are expected to be completed over a one-day period. Items 4 and 5 will commence upon receipt of the bulkhead materials delivery and mobilization and are expected to require several weeks to complete this installation and associated restorative actions. The project area limits for this activity are depicted on Figure 1 *(attached)* at the terminus of 15th and 16th Avenues, area delineated by a red boundary.

Before specifying the above emergency mitigative actions, an assessment of alternative measures was completed by the City Engineer. Specifically, the standards applicable to emergency post-storm beach restoration under *N.J.A.C. 7:7-10.3* were evaluated, including NJDEP-preferred options under *(b)*, for feasibility. The following is a summary of that alternatives analysis.

Deposition of clean fill material consistent with grain size compatible with that of the existing beach material proved to be problematic in terms of sourcing, logistics, and secondary impacts. The current oceanfront conditions and profile have, at least for now, severed the route for on-beach access to sand reserves further south of the project area limits. Beach berm erosion has extended a significant portion of the tide cycle to the waterward extent of both the 24th and 26th Avenue piers precluding effective transport of sand which could be harvested from Wildwood beaches *(see attached photo pages)*. Moreover, the existing conditions of the profile at Poplar Avenue have exposed the City of Wildwood's stormwater outfall at this location also precluding a southerly truck route. Because these locations are inundated daily by the tidal cycle, the deposition of sand in these areas to re-establish a trucking route for alongshore transfer of sand is infeasible, at least until the beach profile re-forms through accretion *(see attached photo pages)*. The lack of sand reserves in the lower beach profile also makes it impossible to bulldoze sand to the upper beach profile as an alternative means of re-establishing shore protection. Transport of material from sand and gravel mines was assessed, and it was determined that there are several impediments to pursuing this option. The sand composition available from the proximate mines, as compared to that of the *in situ* beach material, was found to be inconsistent. Additionally, the logistics of pursuing this option were not feasible due to existing trucking shortages as compared to the volume of sand required to address this recurrent erosion. Further, offshore sources will require the City's contractor to complete an intermediate sand transfer from street-legal tri-axle dump trucks to the heavy duty off-highway articulated dump trucks necessary to transit the existing oceanfront conditions. Pursuing this option would require duplicative handling of the fill material, if even suitable material could eventually be sourced within a reasonable proximity. Given the emergent nature of this matter, there is insufficient time to pursue an option that is, at best, inefficient, slow and expensive, but also risks secondary damage to municipal infrastructure, including City streets that were not designed for the volume and frequency of heavy transport that would be required for this option.

While hydraulic beach fill/renourishment could access sand reserves in nearshore or offshore waters, where prior backpassed sand has settled and which are unattainable via typical trucking/backpassing, these dredging projects require scheduling years in advance, and the City does not have ready access to or control the availability a dredge for this purpose. The timeline for such a process does not reconcile with the current situation faced by the City, nor does the City have the funds to pursue such a project without significant State and/or Federal participation.

The placement of rock, rubble or concrete is a very slow process, which again relies upon a trucking industry facing existing labor shortages, as well as the challenges of sourcing these materials locally and the secondary impacts to municipal infrastructure, including City streets that were not designed for the volume and frequency of heavy transport that would be required for this option. Additional design concerns were expressed upon evaluating this option in that the placement of these materials restricts future engineering options, including facilitation of public access. The inability to drive piles for future timber walkover/ADA ramp structures would create challenges to efficient and effective public and Beach Patrol staff access to/from the beach. In addition to ready access of the Beach Patrol building by its staff, this oceanfront safety facility also provides beachgoers with public restrooms. a first aid station, showers/footwash amenities, and shelter via the existing dune walkover/ramp structure at the 15th Avenue right-of-way alignment *(see attached photo pages)*. A breach will destroy this access and the placement of rock, rubble or concrete will complicate or even preclude the replacement of such a facility.

The placement of sand-filled geotextile tubes requires a source for beach sand material, which is not available from the existing beach conditions and is challenging to acquire from offshore sources as was previously described in detail above. To fill these tubes *in situ* would further deplete the City's oceanfront of sand resources, especially given that the prevailing coastal processes trend is one of erosion in this location. While geotextile tubes could serve as a protective measure and means to rebuild the dune features, these applications are only effective when combined with a robust, large-scale hydraulic beach fill project whereby the tube would remain covered for an extended period of time. At present, the State and Federal authorities have not advanced a beach nourishment program of this type in partnership with the City, and it remains unclear if/when the State/Federal Island-wide Dune Construction Project may be implemented from Hereford Inlet south to Cape May Inlet to serve as hurricane and storm damage reduction, including its associated planned cyclical renourishments.

In contrast, a bulkhead, when deployed under certain oceanfront conditions where beach re-nourishment proves to be unreliable and challenging, has proven to be the more efficient and effective means of sustainable shore protection measures. These installations can be implemented rapidly and have longer useful life options where the cost-benefit ratio can be justified and effective shore protection realized. Additionally, the footprint of disturbance for these installations can be minimized to reduce secondary impacts and avoid sensitive areas where sloped angles of repose would otherwise encroach. This option minimizes the number of truck trips required to implement shore protection thereby reducing secondary impacts to the municipal infrastructure. Further, given the minimal footprint, future site improvements, including public accessways and dune construction, can be effectuated over top of and/or on either side of the bulkhead.

25th Avenue Beach Access (Block 289.03, Lot 1 (portion thereof))

1) Immediately reconstruct the beach access via profile grading and deposition of stabilizing material within the residual upper beach berm and back beach limits; relatively minimal volumes of fill material are required to accomplish the necessary grading and restoration
2) Reconstruct the sloped ramps and landings within the access to restore the vehicular and pedestrian use, including pedestrian public access from the boardwalk and the adjoining 26th Avenue pier

The above activities are depicted on a line drawing titled, *"25th Ave and the Beach Adjacent to Amusement Pier, North Wildwood Beach, City of North Wildwood, Cape May County, NJ"*, prepared by Van Note-Harvey Associates Inc., dated October 5, 2022 (attached). Please note that these proposed activities are designed to avoid previously delineated interdunal freshwater wetlands in the back dune north of the project area limit. While the activities are located within the associated transition area, these restorative measures do not extend beyond the pre-existing footprint of disturbance and therefore will not result in adverse impacts to regulated areas *(see attached photo pages)*. Items 1 and 2 will commence immediately upon receipt of Emergency Authorization from NJDEP and are expected to be completed over a one to two-day period. The project area limits for this activity are depicted on Figure 1 (attached) at the terminus of 25th Avenue, area delineated by a red boundary.

Enclosed for review and reference please find the following: 1) a site location map (*"Figure 1 Site Location on Aerial Photographs Depicting the Project Area Limits,"* prepared by The Lomax Consulting Group, dated October 4, 2022); 2) existing conditions photographs depicting post-storm damage and impacted areas; 3) hand sketch prepared by Jim Verna III, P.E. of Van Note-Harvey Associates Inc., dated October 4, 2022, as well as separate hand-annotated detail sheets, each dated October 4, 2022, and a cut sheet for Meever USA sheet piles; and 4) a line drawing titled, *"25th Ave and the Beach Adjacent to Amusement Pier, North Wildwood Beach, City of North Wildwood, Cape May County, NJ"*, prepared by Van Note-Harvey Associates Inc., dated October 5, 2022.

If you have any questions or require additional information, please do not hesitate to contact me. Thank you for your prompt attention to this matter.

Sincerely,
THE LOMAX CONSULTING GROUP, LLC

Peter L. Lomax
Managing Principal

Enclosures

ec: Jennifer Moriarty, Director NJDEP DLRP (w/enclosures)
Becky Mazzei, NJDEP DLRP (w/enclosures)
Kimberly Cahall, Chief Enforcement Officer NJDEP CLUE (w/enclosures)
Michelle Kropilak, Manager NJDEP CLUE (w/enclosures)
Michael Lutz, NJDEP CLUE (w/enclosures)
Mayor Patrick Rosenello, City of North Wildwood (w/enclosures)
Nicholas Long, City Administrator, City of North Wildwood (w/enclosures)
Jim Verna III, PE, Van Note-Harvey Associates, Inc. (w/enclosures)
Neil Yoskin, Esq., Cullen & Dykman LLP (w/enclosures)

BLOCK 289.03, LOT 1 (P/O); BLOCK 317.03, LOT 1 (P/O)
CITY OF NORTH WILDWOOD, CAPE MAY COUNTY, NEW JERSEY 22-1093.2

FIGURE 1: SITE LOCATION ON AERIAL PHOTOGRAPHS DEPICTING THE PROJECT AREAS LIMITS SOURCE: GIS DATA PROVIDED BY THE NJDEP, BING NEARMAP AND THE COUNTY PLANNING DEPARTMENT	the LOMAX Consulting group	DATE: 2022-10-04	DRAWN BY: EJM	W N S E
		SCALE: AS NOTED		

\Prj\Act\22-1093.2\St Map\Rs Map\Aerial - Emergency Authorization

SITE PHOTOGRAPHS

PHOTOGRAPH 1. **View north of the dune scarp (right) eroded to a point landward of the pre-existing dune crest between 15th and 16th Avenues in front of the City of North Wildwood Beach Patrol headquarters (left) and upper landing of dune walkover railing (background)**

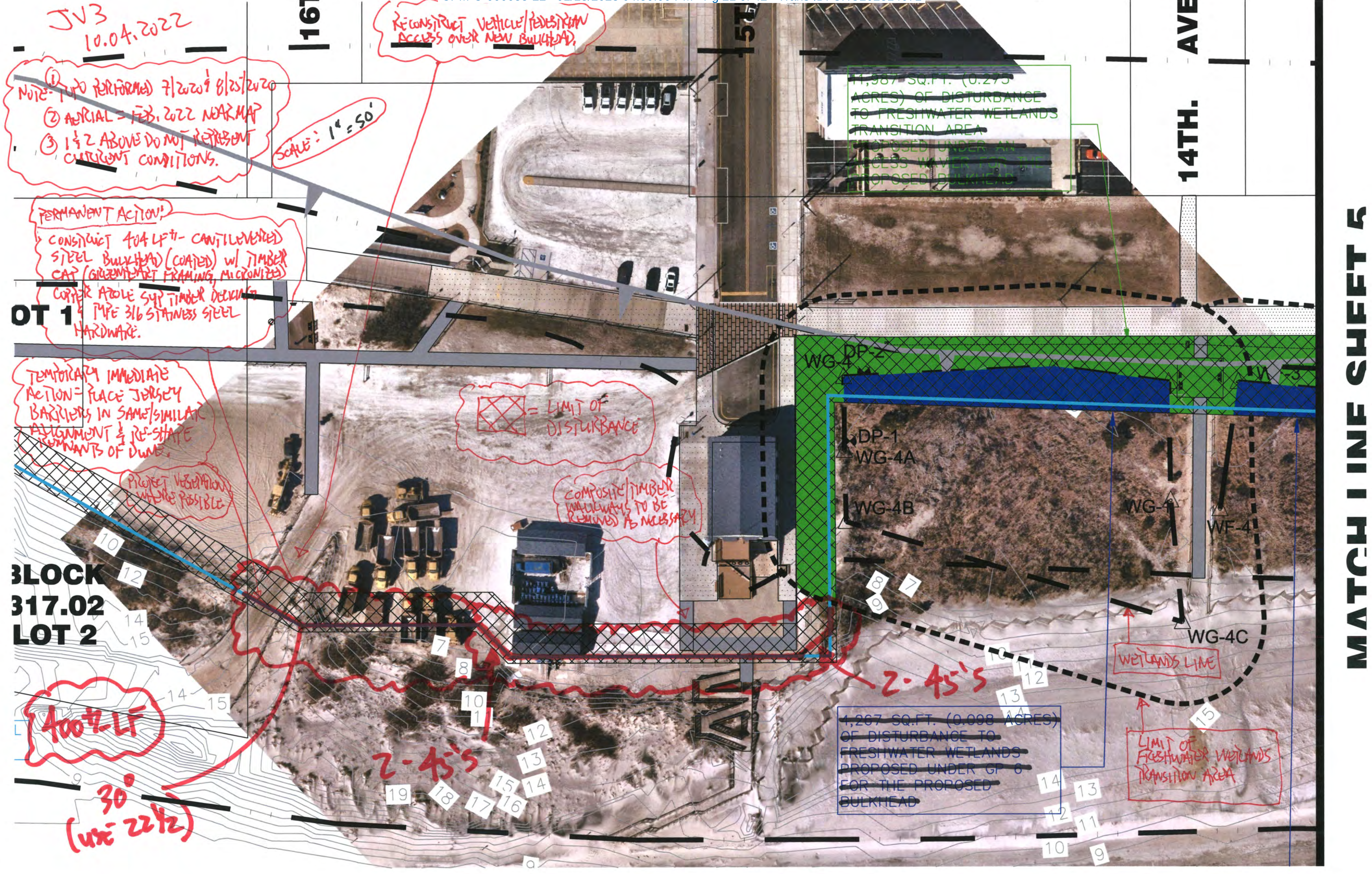
PHOTOGRAPH 2. **View west of the eroded and scoured public accessway at the 25th Avenue beach access terminus.**

PHOTOGRAPH 3. **View north of the 24th Avenue pier terminus and absence of beach berm waterward of the pier end, which precludes the sand backpassing truck route.**

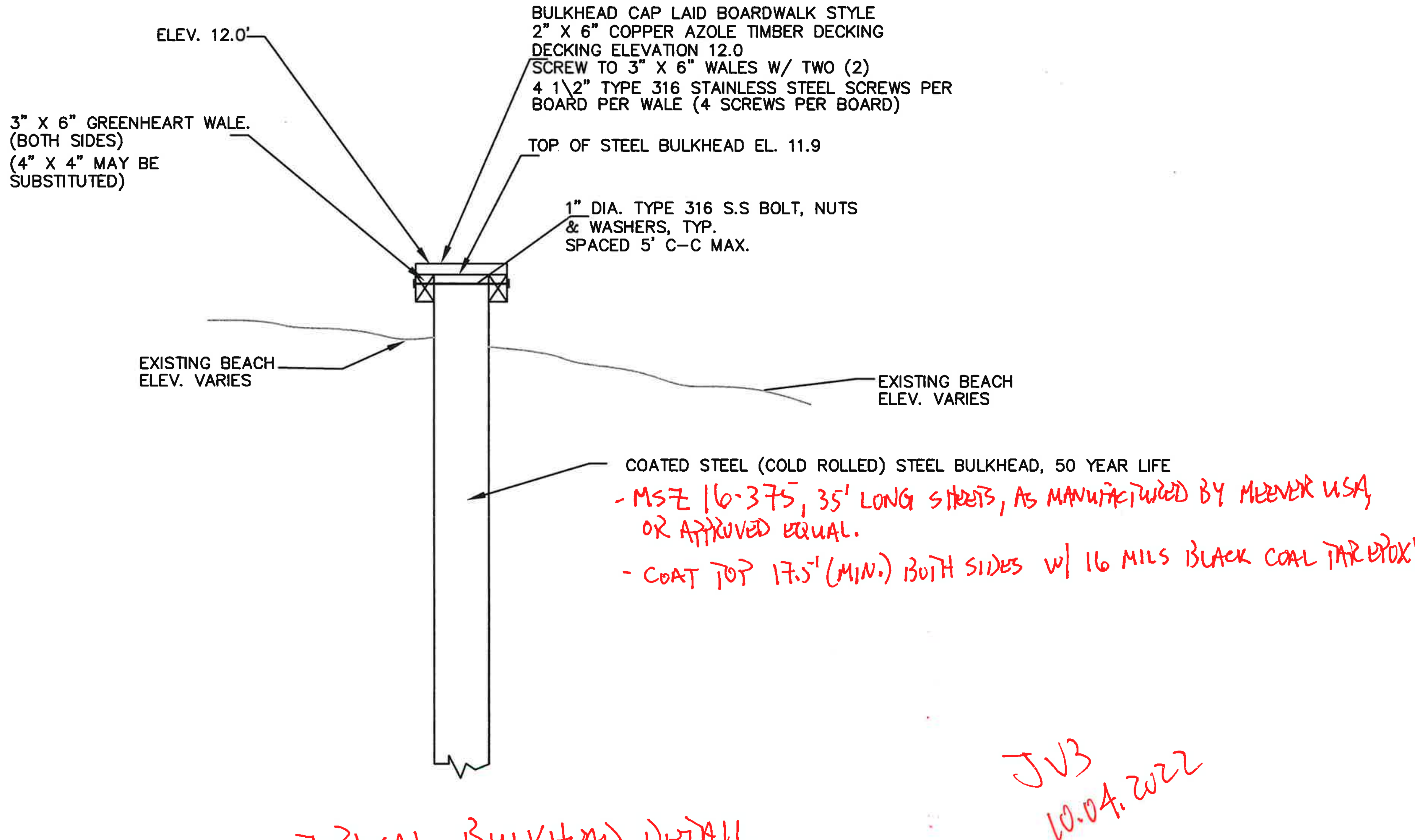
PHOTOGRAPH 4. **View south of the City of Wildwood exposed stormwater outfall at the Poplar Avenue right-of-way alignment, which precludes the sand backpassing route.**

PHOTOGRAPH 5. **View of the City of North Wildwood Beach Patrol headquarters which serves as a critical oceanfront safety facility with public access amenities. Note: eroded dune scarp is located at the right edge behind the dune fencing.**

PHOTOGRAPH 6. **View of the dune walkover and ADA access ramp in front of the City of North Wildwood Beach Patrol headquarters. Note: eroded dune scarp is located immediately behind the upper staircase landing.**



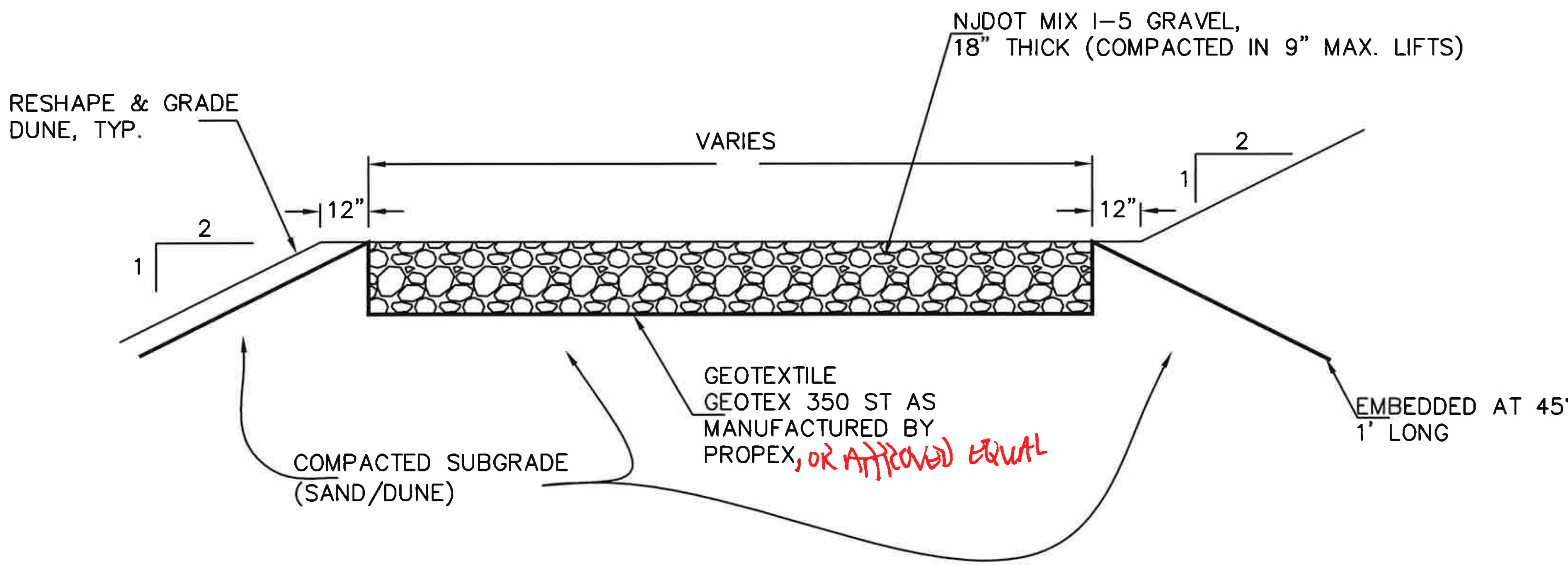
JV3
10.04.2022
RECONSTRUCT VEHICLE/PEDESTRIAN ACCESS OVER NEW BULKHEAD.
NOTE: ① TOPO PERFORMED 7/2020 & 8/25/2020
② AERIAL = FEB. 2022 NEARMAP
③ 1 & 2 ABOVE DO NOT REPRESENT CURRENT CONDITIONS.
SCALE: 1" = 50'
PERMANENT ACTION:
CONSTRUCT 404 LF± CANTILEVERED STEEL BULKHEAD (COATED) w/ TIMBER CAP (GREENHEART FRAMING, MICRONIZED COPPER AZOLE SYP TIMBER DECKING) TYPE 316 STAINLESS STEEL HARDWARE.
TEMPORARY IMMEDIATE ACTION = PLACE JERSEY BARRIERS IN SAME/SIMILAR ALIGNMENT & RE-SHAPE REMNANTS OF DUNE.
PROTECT VEGETATION WHERE POSSIBLE
= LIMIT OF DISTURBANCE
COMPOSITE/TIMBER WALKWAYS TO BE REMOVED AS NECESSARY
16T
15T
14TH. AVE
~~11,987 SQ.FT. (0.275 ACRES) OF DISTURBANCE TO FRESHWATER WETLANDS TRANSITION AREA PROPOSED UNDER AN ACCESS WAIVER FOR THE PROPOSED BULKHEAD~~
OT 1
LOCK
317.02
LOT 2
WG-4
DP-2
DP-1
WG-4A
WG-4B
WG-4C
WF-4
WETLANDS LINE
2-45's
2-45's
400±LF
30° (USE 22½)
~~4,267 SQ.FT. (0.098 ACRES) OF DISTURBANCE TO FRESHWATER WETLANDS PROPOSED UNDER GP 6 FOR THE PROPOSED BULKHEAD~~
LIMIT OF FRESHWATER WETLANDS TRANSITION AREA
MATCH LINE SHEET 5



TYPICAL BULKHEAD DETAIL

N.T.S.

NOTE: CANTILEVERED (NO TIE-BACK SYSTEM)



NOTE:
1. GEOTEXTILE SECTIONS MUST OVERLAP MINIMUM OF 5', TYP.
2. SLOPE: 1V:12H MAX.

PROPOSED VEHICLE ACCESS DETAIL FOR 16TH AVE.

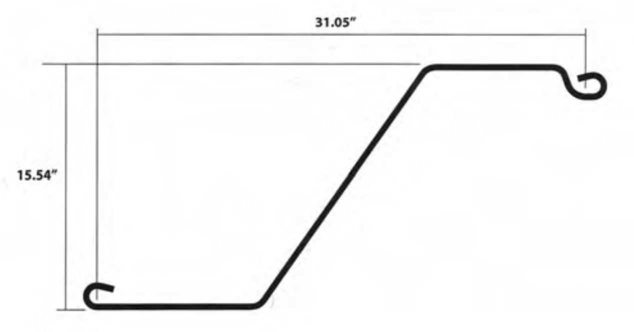
NOT TO SCALE

JV3
10.04.2022

MEEVER USA

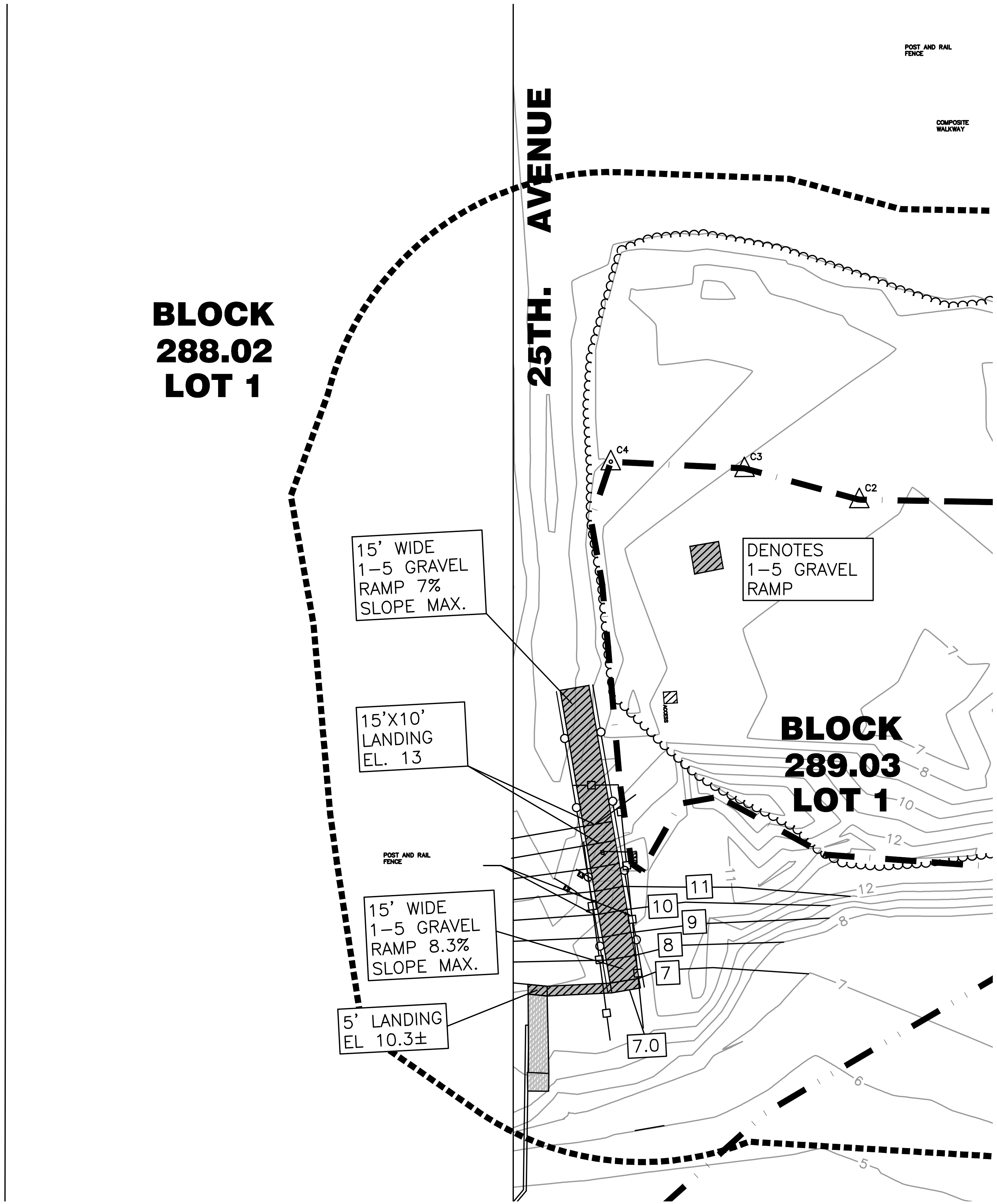
T +1 (866) 313-8770 | E info@meever.us | I www.meever.us

MSZ 16-375 (Cold rolled sheet piles)



Section description	Product group	Shape	Section Modulus	Moment of Inertia	Width	Height	Thickness flange	Thickness web	Weight single	Weight	Coating 2 sides	Coating area
			in^3/ft cm^3/m	in^4/ft cm^4/m	inch mm	inch mm	inch mm	inch mm	lbs/ft kg/m	lbs/ft^2 kg/m^2	ft^2/ft m^2/m	ft^2/ft m^2/m
MSZ 16-375	Cold rolled sheet piles	Z	34.0 1,825	267.9 36,580	31.05 789	15.54 395	0.375 9.5	0.375 9.5	59.7 88.79	23.06 34.31	7.54 2.30	1.43 1.43

Production acc. ASTM standards in A572 GR50 or A328
available from inventory and production
Origin: USA



NOTES:
1. TOPOGRAPHY TAKEN FROM DECEMBER 2021

2. IAN STORM HAS SEVERELY ERODED THE AREA DAMAGING DUNE, BERM, AND BEACH ACCESS

RELEASE 10/05/2022

van note-harvey associates, inc.
consulting engineers, planners & land surveyors
103 College Road East ● Princeton, NJ 08540 ● 609-987-2323
211 Bayberry Drive ● Cape May Court House, NJ 08210 ● 609-465-2600
www.vannoteharvey.com **Certificate of Authorization** No. 24GA28271300
van note-harvey associates - Since 1894 -

SKETCH SHOWING PROPOSED BEACH ACCES
25TH AVE AND THE BEACH ADJACENT TO AMUSEMENT PIER
NORTH WILDWOOD BEACH
CITY OF NORTH WILDWOOD
CAPE MAY COUNTY, N.J.

DRAWN BY BMP	FIELD BK	ORDER No. 46006	FILE No.	SHEET No.
CHECKED BY RP/JV	PAGE	400-21		1

KELLER EXHIBIT D

From:	Keller, Colleen [DEP]
To:	Yoskin, Neil; Patrick Rosenello; nlong@northwildwood.com
Cc:	Vincent Mazzei (DEP); Katrina Angarone (DEP); Jane Rosenblatt (DEP); Jennifer Moriarty (DEP); Kimberly Cahall (DEP); Dennis Reinknecht (DEP); Lomax, Peter; Janet Stewart (DEP); Michele Kropilak (DEP)
Subject:	Response to October 20, 2022 Correspondence - NWW
Attachments:	image001.png

If the City of North Wildwood (NWW) proceeds with the unauthorized activities, DEP will pursue immediate enforcement action for both past and current violations, including the assessment of substantial penalties for intentional violations. DEP enforcement staff are on-site in NWW to observe and document any unauthorized activity. DEP's Coastal Zone Management Rules at N.J.A.C. 7:7-10.3(b) authorize certain emergency post-storm beach restoration activities designed to return the beach to its pre-storm conditions. This provision does not contemplate hardening measures, such as the placement of a bulkhead. As acknowledged by NWW, a bulkhead has the potential to increase erosion to adjacent areas. DEP can only approve such measures where the City has demonstrated that these alternative measures are not feasible. Reshaping/regrading the dunes for the installation of a bulkhead was also not authorized.

In addition, Mr. Yoskin's correspondence expresses public safety concerns about people scaling the dune scarp. Public safety is of the highest concern to the Department, and the public should not be accessing or walking in protected dune areas. NWW did not request post-storm maintenance of all legally existing accessways in the previous Emergency Authorization (EA) requests. DEP would typically allow this maintenance under a simple beach and dune maintenance permit; however, NWW does not have a valid permit for this activity. If requested by NWW, DEP could issue an EA for post-storm maintenance of the legally existing accessways for safe access.

DEP is preparing a more formal response to Mr. Yoskin's letter. In the meantime, we strongly urge NWW to refrain from proceeding with the unauthorized activities.

DEP remains committed to ensuring public health and safety by maintaining proper coastal protection measures, including emergency beach restoration efforts.

Colleen Keller (she/her), Assistant Director
NJDEP Division of Land Resource Protection
Watershed & Land Management
501 East State Street, Trenton, NJ 08625
Mail Code 501-02A
T (609) 633-2289| F (609) 633-3656
colleen.keller@dep.nj.gov

KELLER EXHIBIT E

From:	Keller, Colleen [DEP]
To:	Yoskin, Neil
Cc:	Mayor Rosenello; Nicholas Long (Nlong@northwildwood.com); Michael J. Donohue, Esq. (mike@blaneydonohue.com); James Verna (jverna@vannoteharvey.com); plomax@lomaxconsulting.com; Jennifer Moriarty (DEP); Janet Stewart (DEP); Michael Lutz (DEP); Robert Clark (DEP); LaPenna, Cynthia; Dennis Reinknecht (DEP); Kimberly Cahall (DEP); Kimberly Cahall (DEP); Kevin Terhune; Michele Kropilak (DEP); Kelly Guire (DEP); Joslin Tamagno (DEP); Jessica Cobb (DEP)
Subject:	City of North Wildwood, Shore Protection Emergency
Attachments:	image001.png NWW Colleen Keller and Michele Kropilak 10-21-22 re City of North Wildwood.pdf

Good afternoon. In response to the attached October 21, 2022 correspondence, I would like to provide clarification regarding your statement that the City has made every effort to comply with the Department's continued requests for information for the bulkhead permit application. The permit application that was submitted in November 2022 which requested the legalization of the unauthorized oceanfront bulkhead, with proposed bulkhead installation extending to 25th Ave, was immediately made administratively deficient on December 3, 2020. This deficiency was for required property owner signatures and for the initial newspaper ad. To my knowledge, there has not been any response from the City to this request that was made two years ago, and there have not been any additional requests for information regarding this application since that time from the NJDEP Division of Land Resource Protection (DLRP).

In an effort to move this forward, DLRP would like to offer a meeting to answer any questions regarding what is necessary to address the administrative deficiencies, and in order to start discussing some technical review items (which will be requested once the administrative deficiencies are corrected), request a more robust alternatives analysis to the proposed bulkhead legalization/new extension. Please provide some available dates/times (preferably for next week) to Kelly Guire (cc'd) for scheduling purposes, and the alternatives analysis prior to the meeting, once scheduled. Please don't hesitate to reach out if you have questions.
Thanks.

Colleen Keller (she/her), Assistant Director
NJDEP Division of Land Resource Protection
Watershed & Land Management
501 East State Street, Trenton, NJ 08625
Mail Code 501-02A
T (609) 633-2289| F (609) 633-3656
colleen.keller@dep.nj.gov

From: LaPenna, Cynthia <clapenna@cullenllp.com>
Sent: Friday, October 21, 2022 10:57 AM
To: Keller, Colleen [DEP] <Colleen.Keller@dep.nj.gov>; Kropilak, Michele [DEP] <Michele.Kropilak@dep.nj.gov>
Cc: Mayor Rosenello <prosenello@northwildwood.com>; Nicholas Long (Nlong@northwildwood.com) <Nlong@northwildwood.com>; Michael J. Donohue, Esq. (mike@blaneydonohue.com) <mike@blaneydonohue.com>; James Verna (jverna@vannoteharvey.com) <jverna@vannoteharvey.com>; plomax@lomaxconsulting.com; Moriarty, Jennifer [DEP] <Jennifer.Moriarty@dep.nj.gov>; Stewart, Janet [DEP] <Janet.Stewart@dep.nj.gov>; Lutz, Michael [DEP] <Michael.Lutz@dep.nj.gov>; Clark, Robert [DEP] <Robert.Clark@dep.nj.gov>; Reinknecht, Dennis [DEP] <Dennis.Reinknecht@dep.nj.gov>; Cahall, Kimberly [DEP] <Kimberly.Cahall@dep.nj.gov>; Dr. Stewart Farrell <Stewart.Farrell@stockton.edu>; Yoskin, Neil <nyoskin@cullenllp.com>
Subject: [EXTERNAL] City of North Wildwood, Shore Protection Emergency

Good Morning Ms. Keller and Ms. Kropilak,
Please see Mr. Yoskin's correspondence attached.
Thank you and have a nice day, Cyndi

Cyndi LaPenna
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NEIL YOSKIN
PARTNER
NYoskin@cullenllp.com

October 21, 2022
Via e-mail

Colleen Keller, Ass't. Director (*colleen.keller@dep.nj.gov*)
Division of Land Resource Protection
New Jersey DEP
501 E State Street, Mail Code 501-02A
Trenton, NJ 08625

Michele Kropilak, Manager (*Michele.Kropilak@dep.nj.gov*)
Bureau of Coastal and Land Use Compliance
and Enforcement
New Jersey DEP
1510 Hooper Avenue; Suite 140
Toms River, NJ 08753

RE: City of North Wildwood, Cape May County
Shore Protection Emergency

Dear Ms. Keller and Ms. Kropilak:

This will acknowledge receipt of the Department's October 20, 2022 Notice of Violation (NOV). Please be advised that the reshaping and regrading of the dune remnants was completed yesterday, October 20, thereby eliminating for the moment the hazardous conditions that were present. Because of supply chain issues, the materials required for the proposed emergency construction of the bulkhead are not yet available. The City anticipates a 30 day period of time in which the matter of the bulkhead can be discussed further.

One additional matter that is ancillary to the immediate emergency requires a response. Several of the Department's communications have made reference to the City's prior construction of a protective bulkhead and to the fact that the application to legalize it remains administratively incomplete, and suggests that this is the City's fault. The City does not agree. The Department's review of the application has been ongoing, and the City has made every effort to comply with the Department's continued requests for additional information.

Cullen | Dykman

The same communications have repeatedly made reference to the Department's claims that the City disturbed upwards of 12 acres of dunes and wetlands in the course of building that bulkhead. That is highly inaccurate. The City has documented the fact that almost the entirety of the dune field was lost to natural erosional processes, and that the area of disturbed wetlands is in the range of 9000 s.f. It is misleading and unfair of the Department to state otherwise.

North Wildwood has always indicated its willingness to restore the wetland conditions and the dunes in question once the Corps and DEP meet their obligations to implement the shore protection project authorized by Congress in 2016. But until that occurs, restoration is impossible,

One final note. The City has now received communication from five different individuals in the Department, so please designate one single contact going forward.

Sincerely,
CULLEN AND DYKMAN LLP

Neil Yoskin

Neil Yoskin

NY/cl
cc (via e-mail):

- Patrick Rosenello, Mayor, City of North Wildwood
- Nick Long, City of North Wildwood
- Michael Donohue, Esq.
- James Verna, PE
- Peter Lomax
- Jennifer Moriarty, NJDEP
- Janet Stewart, NJDEP
- Michael Lutz, NJDEP
- Robert Clark, NJDEP
- Dennis Reinknecht, NJDEP
- Kimberly Cahall, NJDEP
- Dr. Stewart Farrell

Neil\north wildwood Keller and Kropilak 10-21-22 re NWW

KELLER EXHIBIT F

STEVENS
INSTITUTE OF TECHNOLOGY
1870

Davidson Laboratory

Department of Civil, Environmental and Ocean Engineering

1 Castle Point Terrace

November 15, 2022

Ms. Colleen Keller
New Jersey Department of Environmental Protection
Division of Land Use Regulation
501 East State Street
Trenton, NJ 08609
Re: North Wildwood Beach Patrol Headquarters Erosion

Ms. Keller,

At the request of your office, Stevens, through the New Jersey Coastal Protection Technical Assistance Service (NJCPTAS) has reviewed the recent erosion in the vicinity of the North Wildwood Beach Patrol Headquarters at East 15th Avenue in North Wildwood. The opinions expressed in this letter are based upon a review of:

1. The Initial Coastal Storm Survey and Damage Assessment prepared by NJDEP after Hurricane Ian;
2. Google Earth imagery;
3. Aerial imagery documenting the condition of the beach after the passage of Hurricane Ian;
4. New Jersey Beach Profile Network reports compiled by Stockton University's Coastal Research Center.

The opinions expressed in this letter supplement and where necessary supersede those presented in a previous letter dated July 25, 2022, which addressed the entire northern North Wildwood shoreline. As noted in the previous letter, the North Wildwood shoreline is extremely dynamic and largely controlled by long-term changes in the Hereford Inlet shoal system. For simplicity the opinions expressed previously pertaining to the shoreline segment containing the Beach Patrol Headquarters is repeated below, followed by a more focused discussion of the recent erosion directly in front of the Beach Patrol Headquarters.

The following opinion was provided previously (July 25th, 2022) for Shoreline Segment 3 (13th to 25th Avenue):

STEVENS
INSTITUTE OF TECHNOLOGY
1870

> *The beach and dune system within Segment 3 remains healthy. Although this section of beach is also subject to natural variability, most beaches and dunes within Segment 3 are greater than 100 feet wide (Figure 3). In addition, the majority of the dunes are well vegetated. The beach/dune system in this area is adequate to provide protection to upland infrastructure and the need for a continuous bulkhead/seawall in Segment 3 is not apparent. The only exceptions are in the vicinity of the beach patrol headquarters (15th Avenue) and at the Seaport (22nd Avenue) and Sportland (23rd/24th Avenue) amusement piers. The beach patrol headquarters is constructed on the crest of the existing dune. To protect the structure the dune line has been pushed seaward, which compromises the beach in front of the building. Without a natural beach to sustain the artificial dune, it will be perpetually vulnerable to erosion/breaching. At the two piers, the lack of an adequate, well vegetated dune leaves upland infrastructure vulnerable to storm damage. Although an argument could be made for constructing a bulkhead in these select areas, other alternatives such as raising or relocating the beach patrol headquarters, and/or filling in the breaks within the existing dune system may provide similar benefits.*

As described in the original letter, the siting of the Beach Patrol Headquarters (and its ancillary structures) within the primary dune presents a problem. As a result of their location within the natural dune, an artificial dune line has been created in a seaward, more exposed location. As the beach fronting this seaward shifted dune has eroded the toe has become exposed in advance of the natural dunes to the north and south. This became evident as the remnants of Tropical Storm Ian passed offshore of New Jersey between September 29th and October 5th, 2022.

NJDEP Post-storm Inspection Report

While erosion was widespread in North Wildwood, the exposed dune fronting the Beach Patrol Headquarters was hit particularly hard. In their post-storm inspection report, NJDEP described the erosion between 8th and 16th Avenue as follows:

> *Up to 80' of sloped erosion, up to 4' in height with vertical dune scarps, up to 14' in height and up to 35' in width (mostly between 13th Ave. and 16th Ave.) Wave runup/tide to the upper beach/dune with some runup into the dunes. Most access impacted or closed and damaged between 2nd and 7th Ave. and between 13th Ave. and 16th Ave.*

The erosion is more precisely documented in Figure 1, which was prepared by the NJDEP. The figure highlights the dramatic difference between the width of the remaining dunes north (over 200 ft) and south (over 125 ft) of the Beach Patrol Headquarters complex as compared to that immediately in front of it (70-80 ft).

STEVENS
INSTITUTE OF TECHNOLOGY
1870

Figure 1: Figure prepared by NJDEP documenting the erosion in the vicinity of the North Wildwood Beach Patrol Headquarters.

Google Earth Imagery

A comparison of the two most recent satellite images contained in the Google Earth repository is shown below in Figure 2. The exact date of the most recent image is not specified, but it is believed to have been taken in the Fall of 2021. The previous image was taken in October 2019. A comparison of the two images reveals significant dune erosion (on the order of 50 ft) between 2019 and 2021. Although the instantaneous shoreline position is much more dynamic, the most recent picture also contains evidence of dramatic shoreline recession. It should be noted that these pictures do not reflect the most recent beach/dune erosion; however, they do provide context into the scale of the changes occurring at the site.

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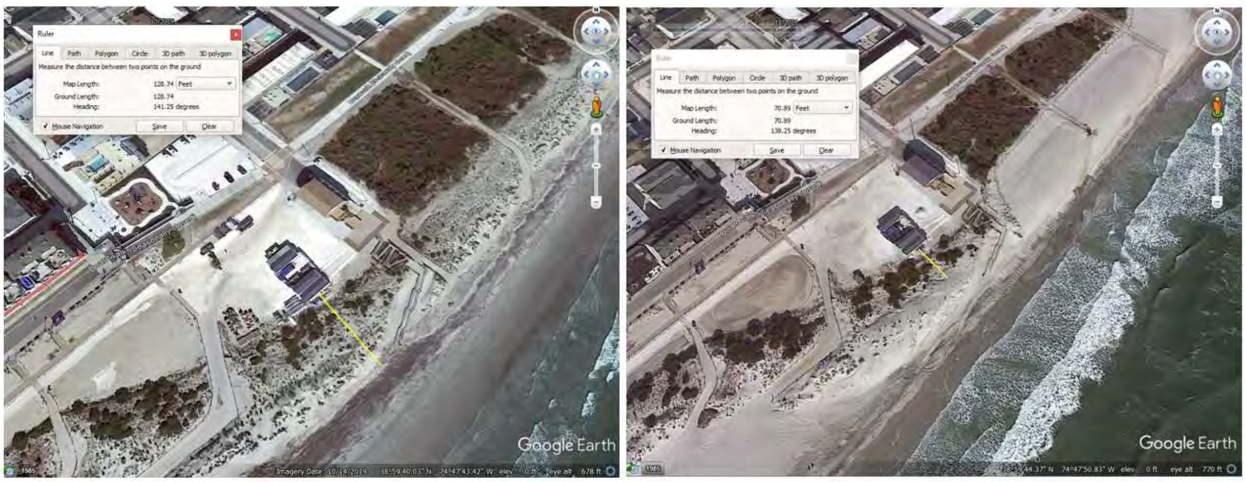

Figure 2: Comparison of the two most recent Google Earth images of the North Wildwood Beach Patrol Headquarters.

Recent Aerial Imagery

Several recent aerial photographs of the beach in the vicinity of the North Wildwood Beach Patrol Headquarters are presented below in Figures 3-5. Figure 3 is a view looking south, taken on November 3, 2022, approximately one month after the passage of Ian. The image illustrates the dramatic seaward displacement of the dune fronting the Beach Patrol Headquarters as compared to the adjacent beaches. As discussed in the previous letter, this seaward displacement makes the dune system inherently more vulnerable in this area. Figure 4 is a photograph taken at ground level looking north towards the Beach Patrol Headquarters, immediately after the passage of Ian. Noticeable in the picture is the low relief of the beach compared to the dune scarp and the width of the remaining dune compared to the access ramp. The remaining dune is roughly 2.5-3 times the width of the access ramp, or approximately 50-60 ft. This is consistent with the dimensions provided in Figure 1. The low relief of the beach fronting the dune makes the remaining dune inherently more vulnerable to erosion during small to moderate level storms. Figure 5 is an aerial view which highlights and confirms the vertical dimension of the erosion (12-15 ft).

Figure 3: Aerial photograph looking south depicting the beach in the vicinity of the North Wildwood Beach Patrol Headquarters after the passage of Hurricane Ian.

Figure 4: Ground level view looking north at the North Wildwood Beach Patrol Headquarters after the passage of Hurricane Ian.

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Figure 5: Drone photo depicting the erosion in the vicinity of the North Wildwood Beach Patrol Headquarters after the passage of Hurricane Ian.

NJBPN Reports

Stockton University's Coastal Research Center has been collecting and compiling data on New Jersey's beaches since 1986. In 2011, they completed a report which summarized 25 years of beach profile changes. Figure 6 summarizes the changes though 2011 at profile number 111 which is located at 15th Avenue in North Wildwood. Although the figure does not include the most recent changes, it does highlight the dynamic nature of the beaches in North Wildwood, which Stockton identified as the most erosional in the state. The data illustrate a long-term erosional trend, with shoreline recessions of between 50 and 100 ft/yr, and volume losses of 50 to 100 cy/ft/yr relatively common.

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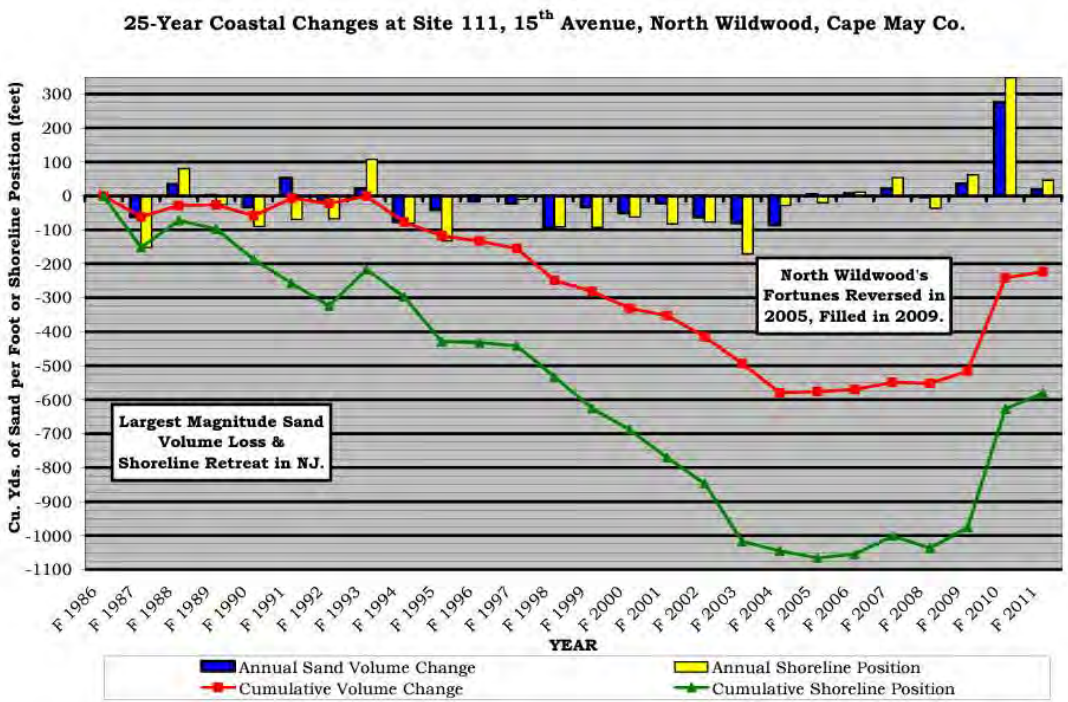

Figure 6: Summary of the changes at NJBPN profile 111 (15th Ave North Wildwood).

Opinion

As the remnants of Hurricane Ian skirted the New Jersey Coast in early October, it created what can be classified as a low-moderate level coastal storm. The low/narrow nature of the beaches in North Wildwood at the time, combined with the extended duration of the storm conditions, resulted in significant dune impacts. Assessment reports compiled by the NJDEP in the wake of the storm documented increased erosion between 13th and 16th Avenue. This increased erosion is attributed to the seaward displacement of the dune in this area. It is expected that as long as this portion of the dune remains displaced, the dune and any structures located on it will be more susceptible to damage during future storms. The approximate "stable" dune position can be identified by connecting the stable linear dune sections to the north and south. This is shown in Figure 7.

Figure 7: Figure illustrating the likely "stable" dune position (yellow line).

Consistent with the comments provided in our previous letter, we believe that the majority of the beaches between 13th and 25th Avenue remain robust enough to withstand immediate threats. With regards to the seaward displaced potion of the dune and the structures built on top of it, two categories can be defined based on location with respect to the equilibrium dune position. The portion of the dune located seaward of the equilibrium position is inherently less stable and will erode faster. Referring to Figure 7, this implies that the two seaward most garage structures face an increased risk of undermining. With only 72 feet of dune (according to the dimensions provided in Figure 1) separating the seaward most structure from the current dune scarp, it is conceivable, although not likely, that a single large storm could erode the remaining dune and threaten the structure. A far more likely mode of failure would be the accumulation of impacts from a series of smaller storms. The Beach Patrol Headquarters itself, along with the landward most garage structure are located landward of the equilibrium dune position. It is anticipated that once the shore/dune line straighten, the rate of erosion will slow. Currently the

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Beach Patrol Headquarters building (not including the deck) is located approximately 150 ft from the edge of the scarp. Given the amount of sediment remaining in the dune system, it is considered extremely unlikely that a single storm will undermine the Beach Patrol Headquarters building. Although the building may eventually be threatened by an accumulation of storms, the fact that the building is set back 150 ft from the current edge and roughly 75 ft from the equilibrium dune line defining the accelerated erosion regime suggests that failure is not imminent.

It should be noted that due to the time-sensitive nature of the request, the opinions provided above are only based upon an analysis of readily available data sources which are assumed to accurately represent and effectively characterize the "current" site conditions in the vicinity of the Beach Patrol Headquarters in North Wildwood, NJ. Every effort has been made to thoughtfully consider the available information and render a sound engineering judgement; however, beaches are inherently dynamic, and storms are intrinsically unpredictable and it is possible that outcomes could differ from those expected.

Sincerely,

____

Jon K. Miller
Director NJCPTAS
Research Associate Professor
Stevens Institute of Technology

TERHUNE
FIRST
SUPPLEMENTAL
CERTIFICATION
EXHIBIT A

From: Kevin Terhune
To: Kathi Cooley
Subject: FW: [EXTERNAL]RE: North Wildwood
Date: Wednesday, January 11, 2023 9:12:49 AM

-----Original Message-----
From: Yoskin, Neil <nyoskin@cullenllp.com>
Sent: Thursday, December 8, 2022 11:59 AM
To: Kevin Terhune <Kevin.Terhune@law.njoag.gov>
Subject: Re: [EXTERNAL]RE: North Wildwood

I'll get them

Sent from my iPhone

> On Dec 8, 2022, at 11:50 AM, Kevin Terhune <Kevin.Terhune@law.njoag.gov> wrote:
>
> I will broach the subject with our client, but I would request some details of what is being proposed.
>
> Thanks.
>
> kevin
>
> -----Original Message-----
> From: Yoskin, Neil <nyoskin@cullenllp.com>
> Sent: Thursday, December 8, 2022 11:44 AM
> To: Kevin Terhune <Kevin.Terhune@law.njoag.gov>
> Subject: [EXTERNAL] North Wildwood
>
> Kevin: there is the possibility of a nor'easter this weekend. The city would like to have a contingency plan in place just in case. This would involve reinforcing the dune with sand, not bulkheading. Please discuss with your client and let me know.
>
> Sent from my iPhone

MATTHEW J. PLATKIN
ATTORNEY GENERAL OF NEW JERSEY
R.J. Hughes Justice Complex
25 Market Street, P.O. Box 093
Trenton, NJ 08625-0093
Attorney for Plaintiff State of New Jersey
Department of Environmental Protection

By: Kevin A. Terhune (046601996)
Deputy Attorney General
(609) 376-2735

SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. CPM-C-55-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **FIRST SUPPLEMENTAL CERTIFICATION OF KEVIN A. TERHUNE IN SUPPORT OF PLAINTIFF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S ORDER TO SHOW CAUSE FOR PRELIMINARY INJUNCTION & TEMPORARY RESTRAINTS**

I, KEVIN A. TERHUNE, of full age, certify and say:

1. I am employed by the New Jersey Department of Law & Public Safety, Division of Law, as a deputy attorney general and have been assigned to represent plaintiff New Jersey Department of Environmental Protection ("DEP" or "Plaintiff").

2. I make this first supplemental certification in support of Plaintiff's Order to Show Cause for a preliminary injunction and temporary restraints. This supplemental certification outlines correspondence between NWW's counsel and the Division

of Law and NJDEP since Plaintiff's filing of the Order to Show Cause. It also includes a recent letter dated January 5, 2023 from Jennifer Moriarty, Director of the Division of Land Resource Protection to North Wildwood Mayor Patrick Rosenello reconfirming DEP's commitment to review any new Emergency Authorization ("EA") request.

3. On December 8, 2022, NWW's counsel, Neil Yoskin, sent me an email stating that NWW was formulating a contingency plan in the event of the possible nor'easter that weekend. He indicated this contingency plan would not involve bulkheading, but would involve reinforcing the dune with sand. Mr. Yoskin's email and my response to it is attached hereto as **Exhibit A**.

4. On the afternoon of December 8, 2022, Colleen Keller, Assistant Director of the DEP Wetlands and Coastal Resources Element, Division of Land Resource Protection, Watershed & Land Management responded to NWW's counsel's email, copying NWW's engineer and forwarding further information that DEP required for review of the proposed new Emergency Authorization. Mr. Yoskin responded that NWW's concern was "preliminary at this point." Jennifer Moriarty, Director of DEP's Division of Land Resource Protection, responded that if anything was needed over the weekend, she could be contacted by cell phone. The email string between Mr. Yoskin and Colleen Keller and Jennifer Moriarty is attached hereto as **Exhibit B**.

5. On December 9, 2022, I sent a follow-up email to NWW's counsel, requesting further details of NWW's proposed contingency plan. I also pointed out recent local news coverage wherein the NWW Mayor had made purported statements concerning NWW's plans, and requested that Mr. Yoskin confirm whether those purported statements were inaccurate and that NWW would not be performing any oceanfront construction without seeking Emergency Authorization. Mr. Yoskin responded that an EA request had not yet been submitted, and that no immediate steps to install a bulkhead would be taken. The December 9, 2022 email from me and Mr. Yoskin's response is attached hereto as **Exhibit C**.

6. On December 16, 2022, NWW's counsel sent me photographs taken that morning from 14th and 15th Avenues in NWW. We discussed conditions at those locations and I further inquired about NWW's intentions concerning submitting a new EA. The email string between Mr. Yoskin and myself from December 9, 2022 is attached hereto as **Exhibit D**.

7. On December 19, 2022, Jennifer Moriarty, Director of DEP's Division of Land Resource Protection contacted NWW's counsel and engineer, copying me, and assuring both that NJDEP was monitoring the conditions at the 15th and 16th Avenue beaches, and that if NWW filed a new EA, NJDEP would review it expeditiously. Mr. Yoskin responded that NWW was preparing an

EA in the event it was needed. The email string between Jennifer Moriarty and NWW's counsel from December 19, 2022 is attached hereto as **Exhibit E**.

8. Later in the afternoon of December 19, 2022, NWW's counsel sent a message to Jennifer Moriarty and others at NJDEP and DOL forwarding information regarding NWW's intention to deploy certain equipment to the beach patrol area of the site, and to file a new EA in the event it was needed. On December 20, 2022, Jennifer Moriarty responded to Mr. Yoskin's message and reminding him that any regulated activity without authorization would subject the City and its engineers to enforcement action. She further urged NWW to complete its 2020 bulkhead application. Mr. Yoskin responded to Ms. Moriarty's message later that day requesting information concerning an alternatives analysis. Ms. Moriarty further responded on December 21, 2022 with the information that should be included in the alternatives analysis, and Mr. Yoskin conveyed his understanding of those requirements. The email string between Mr. Yoskin and Ms. Moriarty from December 19 through 21, 2022 is attached hereto as **Exhibit F**.

9. Separately on December 20, 2022, Mr. Yoskin responded to Ms. Moriarty's questions with specific responses noted in all capital letters which included information that the City would be redesigning its 2020 permit application to address its

administrative deficiencies. Mr. Yoskin's email of December 20, 2020 is attached hereto as **Exhibit G**.

10. On December 30, 2022, I contacted NWW's counsel Neil Yoskin to check on the status of NWW's new EA request and the delivery of the bulkhead materials. Mr. Yoskin replied that the bulkhead materials delivery had been delayed and that he would check on the EA status. On January 3, 2023, I inquired further as to the bulkhead materials, and Mr. Yoskin responded that he expected the draft EA would be forwarded in the next day or two. The email string between Neil Yoskin and myself from December 30, 2022 to January 3, 2023 is attached hereto as **Exhibit H**.

11. On January 5, 2023 Jennifer Moriarty forwarded a letter to NWW Mayor Patrick Rosenello, NWW's counsel and others, reiterating the steps DEP had taken in an attempt to assist NWW with its filing of an emergency authorization and its deficient 2020 permit application. Ms. Moriarty also advised that DEP became aware that engineering stakes marked "Bulkhead" had been installed around the dunes in front of the lifeguard station, reminding NWW that it did not have approval from DEP for further construction activity, and that any such construction activity would result in enforcement action against NWW and its contractors. On January 6, 2023, NWW's counsel, Neil Yoskin responded to me that it was still NWW's intention to send DEP

a draft EA for informal pre-review and that this EA may include requests for installation of a bulkhead in the area in question near 15th and 16th Avenues and that this new request may also include the installation of bulkhead at additional locations along the oceanfront. Attached hereto as **Exhibit I** is Mr. Yoskin's January 6, 2023 email and Ms. Moriarty's January 5, 2023 email attaching her letter.

12. In spite of the repeated assurances that NWW would be submitting a new Emergency Authorization request, no such submission has been received by DEP.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Dated: January 11, 2003

/s/ Kevin A. Terhune
Kevin A. Terhune
Deputy Attorney General

MATTHEW J. PLATKIN
ATTORNEY GENERAL OF NEW JERSEY
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Trenton, NJ 08625-0093
Attorney for Plaintiff State of New Jersey
Department of Environmental Protection

By: Dianna E. Shinn (242372017)
Deputy Attorney General
(609) 376-2789

SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. * ____-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **CERTIFICATION OF ERICK M. DOYLE IN SUPPORT OF PLAINTIFF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S ORDER TO SHOW CAUSE FOR PRELIMINARY INJUNCTION & TEMPORARY RESTRAINTS**

I, ERICK M. DOYLE, of full age, certify and say:

1. I am the Bureau Chief within the Division of Resilience Engineering and Construction, Office of Coastal Engineering ("OCE") at the Department of Environmental Protection ("DEP"). I started my recent position in 2017 and my duties include, but are not limited to providing storm damage reduction, coastal resilience, and public access to coastal waterways for the coastal communities along the ocean, bays, and tidal rivers of New Jersey. My

primary responsibilities are to provide engineering and construction expertise for shore protection and coastal resilience projects, prepare, bid, and manage the construction of state and local shore protection and coastal resilience projects, oversee the Office’s role as liaison between local municipalities and the federal government as the non-federal sponsor on United States Army Corps of Engineers (“USACE”) Storm Damage Reduction and Coastal Storm Erosion Control projects, manage the inspection and compilation of post-storm initial storm beach damage assessments (storm surveys), identify damages requiring state and/or federal intervention for repairs (through NJOEM, USACE, FEMA, etc.) and oversee the marking and maintaining of buoys, channel markers, and slow speed buoys on state navigation channels.

2. Before I began this position in 2017, I was the Supervising Environmental Engineer for OCE responsible for implementing all of Coastal Engineering’s state and local shore protection projects including the direct preparation, bidding, and construction management of said projects. This work included review of engineering plans and specifications, coordination with environmental staff on permit plan requirements, providing municipal engineers with detailed lists of required plan changes,

and writing and executing State Aid Agreements outlining the roles and responsibilities between the state and municipalities engaging in the projects.

3. I have worked for DEP for 18 years, after graduating from The College of New Jersey with a Bachelor of Science in Mechanical Engineering.

4. I make this certification in support of the Department's request for a preliminary injunction and temporary restraints to halt North Wildwood ("NWW") from moving forward with installing a bulkhead as recently denied by the Department on October 12, 2022 in NWW's Emergency Authorization ("EA") application following the remnants of Hurricane Ian and in violation of numerous Department statutes as NWW does not have an approved permit to conduct such regulated activity.

5. The Office of Coastal Engineering is responsible for conducting storm surveys and beach damage assessments. Following the remnants of Hurricane Ian in early October 2022, OCE conducted a routine post-storm survey along portions of the State's 127-mile coastline. This routinely includes conducting on the ground inspections and taking photographs to document post-storm conditions and occasionally conducting a flyover of the shoreline and taking aerial photographs of the coastline.

Post-Ian Storm Surveying

6. On October 4, 2022, OCE staff conducted post-storm surveying along the shorelines of the New Jersey coast. For the past several years, OCE staff has inspected 81 sites (or reaches) as part of this post-storm survey assessment process. NWW has two of these reaches that are used to help define the preliminary impacts from a storm in NWW; one is along the inlet and the other is along the oceanfront. The site at 15th Ave. historically has been one of the locations used to help assess the stretch between 8th Avenue and 16th Avenue due to several factors. These factors include: ease of access (4WD vehicular access), being located along the approximate center of NWW's oceanfront beaches while being at the northern end of the boardwalk, and the location of the beach patrol building, which is further out into the beach and dune system than most development in NWW. Attached as **Exhibit A** are the photographs taken in the area of 15th Avenue in NWW from OCE's post-storm survey. These photographs were used in OCE's assessment of the dune system.
7. On October 6, 2022, to supplement the ground inspection and photo-documentation, OCE conducted a post-storm flyover of the State's coastline. During this flyover,

OCE took an aerial photograph of the area of 15th Avenue in NWW. This photograph was used in DEP's decision regarding NWW's EA request. Attached as **Exhibit B** is the aerial photograph taken on October 6, 2022.

8. Following notable coastal storms, OCE conducts a written post-storm survey. The written post-storm survey for Ian was published on October 12, 2022. Attached as **Exhibit C** is the October 12, 2022 post-Ian written survey. This written survey provides an overview of the impacts of Ian along the shoreline and identifies where serious erosion occurred. DEP determined that the area of 15th Avenue in NWW experienced major erosion. This written survey was not used by OCE or DLRP in rendering DEP's decision on NWW's EA request because the written report was not ready to be published until October 12, 2022, the same day DEP denied the remainder of NWW's EA request. However, DLRP consulted with OCE in responding to NWW's EA request to determine whether a threat to life, severe loss of property, or environmental degradation existed or was imminent in the area of 15th Avenue following Ian.

9. When necessary, DLRP will consult with OCE regarding an EA request to assist with determining the potential impacts to an OCE project. In this instance, OCE agreed with DLRP that despite the erosion from Ian,

approximately 50-60% of the dune remained seaward of the Beach Patrol Building in NWW at 15th Avenue, offering shore protection. DLRP's consultation with OCE was based on OCE's familiarity with the size and shape of the beach and dune systems that provide shore protection along the State's coast and familiarity with this specific area on NWW's beachfront. This consultation aided DLRP in determining the immediate installation of a permanent bulkhead was not warranted under the CZM Rules at this time.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Dated: 12-2-22

Erick Doyle

Erick M. Doyle

DOYLE EXHIBIT A


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DOYLE EXHIBIT B

DOYLE EXHIBIT C

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Watershed and Land Management
Division of Resilience Engineering & Construction
Office of Coastal Engineering
1510 Hooper Ave., Suite 140
Toms River, N. J. 08753
Telephone: 732-255-0767 Fax: 732-255-0774

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

MEMORANDUM

TO: Vince Mazzei, Assistant Commissioner
Dennis Reinknecht, Director

FROM: CC Chris Constantino through Erick Doyle, Bureau Chief (Bureau of Construction) and Kelley Staffieri, Bureau Chief (Bureau of Operations)

DATE: October 12, 2022

SUBJECT: Initial Coastal Storm Survey & Damage Assessment
Atlantic Ocean, Delaware Bay, and Raritan Bay shorelines
September 29, 2022 – October 5, 2022 – Hurricane Ian/Remnant Coastal Low

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Despite the early start of tropical cyclone activity in late May, surf heights and coastal storm activity have been relatively calm since the May 6th to May 11th, 2022 coastal low that plagued the coast of New Jersey. However, during this period of calm storm activity, a nearly two-month period of persistent southerly and southwesterly winds induced localized impacts which included large beach cusps and pronounced scarping, especially on the downdrift side of groins and jetties. Despite these impacts from the coastal dynamics related to this longer-term weather pattern, natural recovery of the beach and dune systems was noted up and down the coast in the lead up to event of September 29th – October 5th During this period, several typical 'hot spots' experienced less notable recovery and more notable erosion than much of the coast, often due to changing inlet dynamics and localized wave patterns.

Tropical activity in the Atlantic Basin began to ramp back up in late August after a 60-day hiatus. Some of this activity introduced periods of increased surf heights to New Jersey, mostly in the form of long period swells. While long period swells tend to be less destructive, especially when coupled with smaller wave heights, 'hot spots' tend to be impacted more significantly. Following two periods of long period swell reaching moderate size from offshore Hurricanes Earl and Fiona in early and mid-September, a new tropical cyclone began to take shape east of the Windward Islands – little did we know that the impacts would be as destructive and as wide reaching as Hurricane Ian, which included portions of the New Jersey's coast. The impacts from Ian (and its remnants) were felt from September 21st through October 5th from the Caribbean all the way to the Mid-Atlantic coast, despite officially dissipating on October 1st.

After significantly impacting a large portion of Florida and the southeast coast, Ian tracked inland towards Virginia where its energy eventually transferred off the southern Mid-Atlantic coast; the effects from this developing coastal low began in New Jersey on Thursday September 29th. A coastal low-pressure system meandered in between the southern Mid-Atlantic coast and the coast of New Jersey through late Wednesday, October 5th. The strength and position of this system plagued New Jersey with a prolonged period of onshore winds that created several days of rough seas and elevated surf conditions and persistent rainfall. The roughest of surf conditions persisted through Wednesday, October 5th, with the heights peaking in the 5- to 9-foot range.

Off the New Jersey coast, buoys recorded wind gusts near 60 mph. Inland reporting stations also recorded gusts near 60 mph during the peak of the event, with the strongest periods occurring between October 2nd and October 3rd. During this storm, nearby buoys recorded peak wave heights between 11 and 22 feet. All oceanfront and back bay locations reached minor flood stage levels during several tide cycles, with several locations approaching moderate flood stage; the peak of the flooding for most locations was on Monday, October 3rd. These elevated tides were a product of several days of moderate to strong onshore winds and the proximity of the storm system center relative the coast.

A full post-storm assessment for the September 29, 2022 – October 5, 2022 – Hurricane Ian/Remnant Coastal Low was conducted on Thursday, October 6th; the results of this assessment are contained in this report. During the compilation of this report, the surf conditions were in the 2- to 4-foot range with offshore winds under 15 mph. As a general note about this assessment, many sites were plagued with wind-blown sand as well as the varying types of debris on the beaches. A detailed summary listed by municipality from north to south is enclosed.

Of the 81 sites surveyed, 63 had minor beach or dune erosion, 6 had moderate beach or dune erosion and 12 had major beach or dune erosion. Criteria for determining damage levels is listed at the end of this summary.

Please note that the storm damage assessments found herein were conducted in a rapid time interval with pre-storm and post-storm observations being made immediately before and after the event in question. Please note that the changes documented in this report are from this event; pre-existing conditions (i.e. scarps in dunes prior to the event) and what caused these conditions are not always reported herein. It is often the Division's experience that much of the material eroded from the "dry" beach area has not been lost, but rather redistributed within the beach profile system, such as creation or enlargement of offshore sand bars. Our expectation is that much of this material will return to the "dry" beach in time following the storm; this time frame may vary based on several contributing factors such as storm frequency and duration.

*** Damage Levels:**
Major erosion – consists of significant or total beach berm loss and/or significant erosion and scarping of the dunes, in portions or all of the reach assessed.
Moderate erosion – consists of significant beach scarping and/or significant sloped erosion of beach berm and/or minor erosion of the dunes, in portions or all of the reach assessed.
Minor erosion – consists of redistribution of sand within the beach profile or loss of sand without significant scarping or significant sloped erosion, in portions or all of the reach assessed.

LOCATION	INSPECTION NOTES	DAMAGE LEVEL*
PERTH AMBOY	Minor sloped erosion and redistribution of sand. No major incidents or damage observed or reported. Wave runup/tide to the upper beach.	Minor
SOUTH AMBOY	Minor sloped erosion and redistribution of sand. No major incidents or damage observed or reported. Wave runup/tide to the upper beach.	Minor
OLD BRIDGE	Minor sloped erosion (under 20 feet in width) and redistribution of sand. Pre-existing scarp remains the same. No major incidents or damage observed or reported. Wave runup/tide to the upper beach. Debris noted on the beach.	Minor
ABERDEEN	No major incidents or damage observed or reported.	Minor
ABERDEEN CLIFFWOOD BEACH	Minor sloped erosion (under 20 feet in width) and redistribution of sand. Wave runup/tide to the upper beach. Windblown sand along Lakeshore Dr. and Ocean Blvd. Pre-existing scarps to the dune remain. No major incidents or damage observed or reported.	Minor
KEYPORT	Minor sloped erosion (under 10 feet in width) and redistribution of sand. No major incidents or damage observed or reported. Wave runup/tide to the upper beach. Debris noted on the beach.	Minor
UNION BEACH	Minor sloped erosion (under 10 feet in width) and redistribution of sand. Wave runup/tide to the upper beach. No major incidents or damage observed or reported. Debris noted on the beach.	Minor
KEANSBURG – BAYSHORE FLOODGATE	Minor sloped erosion and redistribution of sand. No major incidents or damage reported. Gate was closed consistent with the Operations Manual. Notable shoaling adjacent to the terminal groin on the east side of the creek mouth.	Minor
KEANSBURG	**Floodgate Facility to Point Comfort:** Up to 25' of sloped erosion. Some wave runup/tide to the upper beach/dune. Additional erosion to the pre-existing 5' high vertical beach scarps; up to 300 linear feet. **Point Comfort to Ideal Beach:** Up to 25' of sloped erosion. Some wave runup/tide to the upper beach/dune. Additional erosion to the pre-existing 4' high vertical beach scarping near Point Comfort; up to 150 linear feet. No major incidents or damage observed or reported. **Ideal Beach to Pews Creek:** Minor sloped erosion (under 10 feet) and redistribution of sand. Some wave runup/tide to the upper beach/dune. No major incidents or damage observed or reported. Maintenance dredging of Pews Creek; dredged material being deposited on the beach to the west of the Creek.	Minor
MIDDLETOWN	**Pews Creek Pump Station:** Gate was closed consistent with the Operations Manual.	Minor
	Port Monmouth: Minor to moderate sloped erosion and redistribution of sand. Some wave runup/tide to the upper beach/dune. No major incidents or damage observed or reported. Remnant timber groins exposed east of the Bayshore Waterfront Park pier.	Minor

	Belford: Some additional erosion to the existing scarp along the dike at the ferry terminal. No major incidents or damage observed or reported. County stabilizing the CDF dike.	Minor
	Leonardo: Minor sloped erosion (under 10 feet) and redistribution of sand. Some wave runup/tide to the upper beach/dune. No major incidents or damage observed or reported. Debris noted on the beaches.	Minor
ATLANTIC HIGHLANDS	Minor sloped erosion (under 10 feet) and redistribution of sand. Additional vertical dune scarping (up 3' in height.) Some wave runup/tide to the upper beach. No major incidents or damage observed or reported. Debris noted on the beaches.	Minor
HIGHLANDS	Minor sloped erosion (under 10 feet) and redistribution of sand. Some wave runup/tide to the upper beach/dune. No major incidents or damage observed or reported.	Minor
SEA BRIGHT	Up to 50'of sloped erosion with some wave runup/tide to the upper beach/dunes/seawall with some runup into the dunes. Some minor scarping of the beach and the dunes. Several sinkholes along the seaward toe of the seawall near and north of Center St. No major incidents or damage observed or reported.	Moderate
MONMOUTH BEACH	**Riverview Road to Beach Rd.:** Up to 25' of sloped erosion. Wave runup/tide to the upper beach/dunes with some runup into the dunes. No major incidents or damage observed or reported.	Minor
	Beach Rd. to South end of Borough: Up to 70' of sloped erosion, with up to 150 linear feet of vertical beach scarping, near remnant steel groin. Approximately 80' of dilapidated bulkhead exposed, up to 4 feet in height. Wave runup/tide to the upper beach/dunes/seawall. No major incidents or damage observed or reported.	Moderate
LONG BRANCH	**Seven Presidents to Seaview Ave.:** Up to 40' of sloped erosion. Some wave runup/tide to the upper beach/bulkhead. No major incidents or damage observed or reported.	Minor
	Seaview Ave. to Cottage Pl.: Up to 60' of sloped erosion. Wave runup/tide to the upper beach/dune/bulkhead. No major incidents or damage observed or reported.	Minor
	Cottage Pl. to south end of City: Up to 55' of sloped erosion. Little to no beach from south of Lake Takanassee to approximately 1,000 linear south of Pullman Ave. Wave runup/tide to the upper beach/bulkhead, especially south of Lake Takanassee. Increased exposure of groins and outfalls. Bulkhead overtopped by wave runup during this event near Pullman Ave, causing additional sinkholes.	Moderate
DEAL	Up to 100' of sloped erosion with various sections of vertical beach scarping, up to 3' in height. Wave runup/tide to the upper beach. No major incidents or damage observed or reported.	Minor

ALLENHURST	Up to 50' of sloped erosion. Wave runup/tide to the upper beach. No major incidents or damage observed or reported.	Minor
LOCH ARBOUR	Up to 40' of sloped erosion and redistribution of sand. Wave runup/tide to the upper beach. Some localized beach scarping up to 2' in height. No major incidents or damage observed or reported.	Minor
ASBURY PARK	Up to 80' of sloped erosion and redistribution of sand. Wave runup/tide to the upper beach. No major incidents or damage observed or reported.	Minor
NEPTUNE OCEAN GROVE	Up to 90' of sloped erosion and redistribution of sand. No major incidents or damage observed or reported.	Minor
BRADLEY BEACH	Up to 60' sloped erosion and redistribution of sand. Wave runup/tide to the upper beach. No major incidents or damage observed or reported.	Minor
AVON	Up to 40' sloped erosion and redistribution of sand. Wave runup/tide to the upper beach. Windblown sand to boardwalk. No major incidents or damage observed or reported.	Minor
BELMAR	Up to 60' of sloped erosion and redistribution of sand. Windblown sand to boardwalk and some public access points. Wave runup/tide to the upper beach. No major incidents or damage observed or reported.	Minor
SPRING LAKE	Up to 70' of sloped erosion and redistribution of sand with minor localized scarping. Windblown sand partially covering access points along boardwalk. Wave runup/tide to the upper beach. Minor dune fence damage.	Minor
SEA GIRT	Up to 35' of sloped erosion and redistribution of sand. Wave runup/tide to the upper beach/dune. No major incidents or damage observed or reported.	Minor
MANASQUAN	Up to 40' of sloped erosion and redistribution of sand. Wave runup/tide to the upper beach. No major incidents or damage observed or reported.	Minor
POINT PLEASANT BEACH	Up to 70' of sloped erosion, up to 8' in height with some redistribution of sand. Wave runup/tide to the upper beach/dune.	Minor
BAY HEAD	Up to 60' of sloped erosion, up to 6' in height with vertical dune scarping up to 8' in height. Several sections have notable portions of the USACE engineered dune missing. Wave runup/tide to the upper beach/dune with some runup into the dune. Damage to crossovers especially along the northern ½ of the Borough's beaches.	Major
MANTOLOKING	Up to 20' of sloped erosion, up to 6' in height and redistribution of sand. Wave runup/tide to the upper beach/dune with some runup into the dune.	Minor
BRICK	Up to 20' of sloped erosion, up to 4' in height and redistribution of sand. Wave runup/tide to the upper beach/dune.	Minor
TOMS RIVER NORMANDY BEACH through MONTEREY BEACH	Up to 25' of sloped erosion, up to 6' in height and redistribution of sand. Wave runup/tide to the upper beach/dune with some runup into the dune.	Minor

LAVALLETTE	Up to 30' of sloped erosion, up to 6' in height and redistribution of sand. Wave runup/tide to the upper beach/dune.	Minor
TOMS RIVER ORTLEY BEACH	Up to 25' of sloped erosion, up to 6' in height with vertical dunes scarping up to 10' in height. Several sections with notable portions of the USACE engineered dune missing. Damage to crossovers and all the seaward dune fencing missing between 4th and 8th Avenues. Wave runup/tide to the upper beach/dune with some runup into the dune.	Major
SEASIDE HEIGHTS	Up to 80' of sloped erosion, up to 6' in height and redistribution of sand. Wave runup/tide to the upper beach/dune.	Minor
SEASIDE PARK	Up to 40' of sloped erosion, up to 6' in height and redistribution of sand. Wave runup/tide to the upper beach/dune with some runup into the dune. Windblown sand covering crossovers preventing access at certain locations.	Minor
BERKELEY TWP. S. SEASIDE PARK	Up to 25' of sloped erosion, up to 6' in height and redistribution of sand. Wave runup/tide to the upper beach/dune. Windblown sand covering crossovers preventing access at certain locations.	Minor
ISLAND BEACH STATE PARK	Minor to moderate sloped erosion and redistribution of sand. No major incidents or damage observed or reported as of report time. Wave runup/tide to the upper beach/dune. Some windblown sand covering crossovers temporarily impacting access at certain locations.	Minor
BARNEGAT LIGHT	Moderate sloped erosion and redistribution of sand. No major incidents or damage observed or reported.	Minor
LONG BEACH TWP. LOVELADIES	Up to 80' of sloped erosion, up to 4' in height and redistribution of sand. Approximately 1,000 linear feet of vertical dune scarping, up to 8' in height and 20' in depth. Wave runup/tide to the upper beach/dune with some runup into the dune. Damage to vehicular and ADA access crossovers.	Moderate
HARVEY CEDARS	Up to 80' of sloped erosion, up 4' in height. 5,000 linear feet of vertical dune scarping, up to 14' in height and up to 25' in depth, much of which is to the USACE engineered dune. Wave runup/tide to the upper beach/dune with some runup into the dune. Damage to ADA, vehicular and pedestrian crossovers.	Major
LONG BEACH TWP. NORTH BEACH	Up to 60' of sloped erosion, approximately 4' in height and redistribution of sand. Wave runup/tide to the upper beach/dune.	Minor
SURF CITY	Up to 60' of sloped erosion, up to 4' in height with some accretion of sand noted at the north end of the Borough. Wave runup/tide to the upper beach/dune.	Minor
SHIP BOTTOM	Up to 60' of sloped erosion, up to 4' in height and redistribution of sand. Wave runup/tide to the upper beach.	Minor
LONG BEACH TWP. BRANT BEACH through N. BEACH HAVEN	Up to 60' of sloped erosion, up to 4' in height in height. 2,000 linear feet of scarping up to 8' in height and 12' in depth (1,000 feet near 46th St. and 1,000 feet near north 13th St.) Wave runup/tide to the upper beach/dune with some runup into the dunes.	Major

BEACH HAVEN	Up to 80' of sloped erosion, up to 4' in height. Approximately 6,200 linear feet of vertical scarping at various section, up to 14' in height and up to 15' in depth. Several sections with nearly 50% of the USACE engineered dune missing. Wave runup/tide to the upper beach/dune with some runup into the dunes. Windblown sand on crossovers and others significantly damaged. Some new nearshore accretion noted at a few locations.	Major
LONG BEACH TWP. HOLGATE	Up to 60' of sloped erosion, up to 4' in height. Approximately 3,200 linear of vertical dune scarping up to 16' in height and 20' in depth. Several sections with nearly 50% of the USACE engineered dune missing. Wave runup/tide to the upper beach/dune with some runup into the dunes. Multiple crossovers damaged or destroyed.	Major
BRIGANTINE	Up to 70' of sloped erosion, up to 3' in height throughout the City. Wave runup/tide to the upper beach/dunes/revetment with some runup into the dunes. Some ponding noted on upper beach. 15th St. N. to 5th St. N. continues to experience more enhanced erosion; vertical dune scarp, up 6' in height near and north of 15th St. N. and from 6th St. N. through Roosevelt Blvd. Some minor vertical dune scarping from Roosevelt Blvd through 7th St. S.	Moderate
ATLANTIC CITY	**<u>Inlet Seawall and Terminal Jetty area:</u>** No incidents or damage observed or reported.	Minor
	<u>Inlet Jetty to Ventnor Border:</u> Up to 50' of sloped erosion throughout the City with a few isolated sections of low vertical dune scarping north of North Carolina Ave. Some wave runup/tide to the upper beach/dunes with some runup into the dunes.	Minor
VENTNOR	Up to 50' of sloped erosion and redistribution of sand throughout the City. Some wave runup/tide to the upper beach/dunes with some wave runup into the dune.	Minor
MARGATE	Minor sloped erosion and redistribution of sand throughout the City. Some wave runup/tide to the upper beach/dunes.	Minor
LONGPORT	Up to 25' of sloped erosion and redistribution of sand throughout the Borough. Some wave runup/tide to the upper beach/dunes with some runup into the dunes.	Minor
OCEAN CITY	Up to 50' of sloped erosion up to 2' in height throughout the City. Various sections of vertical dune scarps, ranging from to 2' to 6' in height north of the 12th St. with total dune loss from south of 5th St. through near 7th St. Some wave runup/tide to the upper beach/dunes with some runup into the dunes.	Major

UPPER TWP. STRATHMERE	Up to 50' of sloped erosion, up to 3' in height, with sections of vertical dune scarping up to 14' in height and up to 20' in width from Seaview Ave. south through Whale Beach. 50% or more of the USACE engineered dune is missing north of Winthrop Ave. (3 blocks) with almost no dune left at Seaview Ave. Wave runup/tide to the upper beach/dune with some runup into the dunes. Several access points impacted or closed north of Williams Ave.	Major
SEA ISLE CITY	**Whale Beach to Townsend Inlet Waterfront Park:** Up to 75' of sloped erosion, up to 4' in height with vertical dune scarping up to 14' in height and up to 15' in width, with the focus near JFK Blvd. and south of 88th St; much of which is to the USACE engineered dune. Wave runup/tide to the upper beach/dune with some runup into the dunes. Some access impacted near JFK Blvd. And most access impacted or closed south of 84th St.	Major
AVALON	Up to 50' of sloped erosion, up to 4' in height with vertical dune scarping up to 14' in height and up to 30' in width (between 11th St. and 23rd St.), some of which may be to the USACE engineered dune. Wave runup/tide to the upper beach/dune. Multiple beach access points closed and damaged between 12th St. and 23rd St. Wave runup/tide to the upper beach/dune with some runup into the dunes.	Major
STONE HARBOR	Up to 60' of sloped erosion, up to 4' in height. Vertical dune scarping, throughout the Borough, up to 10' in height and up to 15' in width, some of which may be the USACE engineered dune. Wave runup/tide to the upper beach/dune with some runup into the dunes. Many access points closed and damaged.	Major
NORTH WILDWOOD	**Hereford Inlet & Surf Ave:** Up to 50' of sloped erosion, up to 3' in height. Wave runup/tide to the upper beach/dune/seawall with some runup into the dunes. No major incidents or damage observed or reported to the inlet beach and inlet seawall.	Minor
	2nd Ave. to 8th Ave.: Up to 75' of sloped erosion, up to 4' in height. Wave runup/tide to the upper beach/revetment/bulkhead. Accessways closed. **8th Ave to 16th Ave.:** Up to 80' of sloped erosion, up to 4' in height with vertical dune scarps, up to 14' in height and up to 35' in width (mostly between 13th Ave. and 16th Ave.) Wave runup/tide to the upper beach/dune with some runup into the dunes. Most access impacted or closed and damaged between 2nd and 7th Ave. and between 13th Ave. and 16th Ave. **16th Ave. to Wildwood border:** Up to 80 feet of sloped erosion, up to 3' in height. Wave runup/tide to the upper beach/dune with some runup into the dunes and in-between the southern piers.	Major
WILDWOOD CITY	Up to 250' of sloped erosion, up to 3' in height and redistribution of sand. Wave runup/tide to the upper beach. Evidence of berm top ponding. No major incidents or damage observed or reported	Minor

WILDWOOD CREST	Up to 225' of sloped erosion, up to 3' in height and redistribution of sand. Wave runup/tide to the upper beach/dune. Evidence of berm top ponding. No major incidents or damage observed or reported	Minor
LOWER TWP. DIAMOND BEACH	Up to 200' of sloped erosion, up to 3' in height and redistribution of sand. Wave runup/tide to the upper beach. Evidence of berm top ponding. No major incidents or damage observed or reported	Minor
CAPE MAY CITY	Up to 15' of sloped erosion, up to 2' in height and redistribution of sand. Wave runup/tide to the upper beach/dune with some runup into the dunes. Evidence of berm top ponding at the Cove Beach.	Minor
LOWER TWP./WEST CAPE MAY	Minor sloped erosion and redistribution of sand. Wave runup/tide to the upper beach/dune. No major incidents or damage observed or reported. Evidence of berm top ponding.	Minor
CAPE MAY POINT	Minor sloped erosion and redistribution of sand. Wave runup/tide to the upper beach/dune. No major incidents or damage observed or reported.	Minor
LOWER DELAWARE BAY	**North Cape May/Villas:** Up to 20' of sloped erosion up to 2' in height with isolated vertical dune scarps up to 3' in height and 5' in width. Wave runup/tide to the upper beach/dune with some runup into the dunes and upland areas. No major incidents or damage observed or reported.	Minor
	Del Haven/Pierces Point/Reeds Beach: Up to 20' of sloped erosion up to 2' in height. Wave runup/tide to the upper beach with some runup into the dunes and upland areas. No major incidents or damage observed or reported.	Minor
DELAWARE BAY/RIVER	**East Point:** Minor sloped erosion and redistribution of sand with a small section of minor vertical scarping noted. Wave runup/tide to the upper beach with some runup onto the tubes and into areas upland of the beach. No major incidents or damage observed or reported.	Minor
	Heislerville Dike: Some sinkholes forming and increasing in size. New erosion noted near some drainage pipes. Some impacts to drainage may be occurring as a result.	Moderate
	Bivalve (Commercial): Some new erosion noted. Evidence of higher tidal elevations; may not be from this event. No major incidents or damage reported.	Minor
	Fortescue: Minor to moderate sloped erosion (up to 5' in height) and redistribution of sand. Wave runup/tide to the upper beach/dune. No major incidents or damages reported.	Minor
	Downe Township: **Gandy's Beach:** Minor sloped erosion and redistribution of sand. Wave runup/tide to the upper beach/dune. Wind-blown sand noted. No major incidents or damages reported. **Money Island:** Minor sloped erosion and redistribution of sand. Some minor additional scarping of the western end of the dune. Wave runup/tide to the upper beach/dune with some runup into the dunes. No major incidents or damages reported.	Minor

	Lawrence Twp. - (Bay Point): No major incidents or damage reported.	Minor
	Fairfield Twp. (Sea Breeze): Minor to moderate sloped erosion and redistribution of sand. Debris noted on entire beach. Little to no beach remains. Wave runup/tide to the upper beach with some runup to the dunes and upland areas.	Minor
	Oakwood Beach: Minor sloped erosion and redistribution of sand. Debris noted on entire beach. Little to no beach remains and some overtopping possible at the southern end. Wave runup/tide to the upper beach.	Minor

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Department of Environmental Protection

By: Dianna E. Shinn (242372017)
Deputy Attorney General
(609) 376-2789

SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. * ____-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **CERTIFICATION OF MICHELE S. KROPILAK IN SUPPORT OF PLAINTIFF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S ORDER TO SHOW CAUSE FOR PRELIMINARY INJUNCTION & TEMPORARY RESTRAINTS**

I, MICHELE S. KROPILAK, of full age, certify and say:

1. I am the Manager of the Bureau of Coastal and Land Use Compliance and Enforcement ("CLUE") at the Department of Environmental Protection ("DEP").

2. I have worked for DEP for more than 33 years, starting in July, 1989. I graduated from Drew University in May, 1989, with a Bachelor's degree in Biology.

3. Before I began this position in January, 2021, I was CLUE's Toms River field office Region Supervisor, a position held since 2012. I managed a staff of 10 whose responsibilities included ensuring compliance with and the enforcement of the DEP's land use regulations primarily along NJ's eastern coastline, from Monmouth County south to Cape May County. These laws/regulations include the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq.) and the regulations (N.J.A.C. 7:13-1.1 et seq.), the Waterfront Development Act (N.J.S.A. 12:5-1) and the regulations (N.J.A.C. 7:7-1 et seq.), and the Coastal Area Facilities Review Act (N.J.S.A. 13:19-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.), the Freshwater Wetland Protection Act (N.J.S.A. 13:9B-1 et seq.) and the regulations (N.J.A.C. 7:7A-1 et seq.), and the Wetlands Act of 1970 (N.J.S.A. 13:9A-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.). All these laws/regulations provide authority for the DEP to regulate development, including clearing of vegetation/grading and filling, within environmentally sensitive areas such as, but not limited to, beaches, dunes, wetlands and floodplains.

4. I started my recent position in January 2021, and my duties include, but are not limited to, managing a CLUE staff of 23 whose responsibilities include ensuring compliance with and enforcement of the DEP's land use regulations throughout New Jersey. These statutes/regulations include the Flood Hazard Area

Control Act ("FHCA", N.J.S.A. 58:16A-50 et seq.) and the regulations (N.J.A.C. 7:13-1.1 et seq.), the Waterfront Development Act ("WDA", N.J.S.A. 12:5-1) and the regulations (N.J.A.C. 7:7-1 et seq.), and the Coastal Area Facilities Review Act ("CAFRA", N.J.S.A. 13:19-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.), the Freshwater Wetland Protection Act ("FWPA", N.J.S.A. 13:9B-1 et seq.) the regulations (N.J.A.C. 7:7A-1 et seq.), and the Wetlands Act of 1970 ("WA", N.J.S.A. 13:9A-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.) and the Highlands Water Protection and Planning Act ("HPPA" N.J.S.A. 13:20 et. seq.) and the regulations (N.J.A.C. 7:38 et. seq.).

5. I make this certification in support of the DEP's request for a preliminary injunction and temporary restraints to halt North Wildwood ("NWW") from commencing with installation of any future bulkhead, including beach and dune disturbance, without DEP permit authorization.

6. I am familiar with North Wildwood's ("NWW") unauthorized DEP regulated activities along its oceanfront that came to the DEP's attention in 2020 and have continued to present. As outlined in further detail below, the DEP has issued NWW and its various contractors numerous Notices of Violation since 2020 for unauthorized regulated activities conducted along its oceanfront without DEP permit approval. These unauthorized activities include the installation of a steel and/or vinyl bulkhead from 3rd to 13th

Avenues on the oceanfront (approximately 2,729 linear feet in total), construction or placement of numerous unauthorized regulated structures on the oceanfront, and bulldozing, grading, excavation, clearing and removal of vegetated dunes, wetlands and critical wildlife habitat, as well as conducting beach and dune maintenance activities within the regulated oceanfront beach and dune areas throughout the City limits absent required DEP permits. On June 6, 2020, September 17, 2020 and October 5, 2020, Notices of Violation were issued by DEP to NWW for the installation of bulkhead and multiple structures and pathways, removal of vegetated dunes and wetlands, and excavation, filling and grading without DEP approval. On June 25, 2020, and September 17, 2020, Notices of Violation were issued by DEP to NWW's contractors, R.A. Walters & Sons Inc. and C. Abbonizio Contractors Inc for continuing unauthorized regulated activities without permit approval. In July, 2022, the DEP issued NWW a Notice of Violation as its beach and dune maintenance permit had expired in June 2022, and the City is not authorized to continue beach and dune maintenance without the required DEP permit approval. The DEP has again been forced to issue additional Notices of Violation to NWW on October 20, 2022, and to its contractor, H4 Enterprises, LLC, on October 28, 2022, for continuing to undertake unauthorized DEP regulated activities following Hurricane Ian that were specifically never requested by

NWW in its emergency authorization application and were in part denied DEP Emergency Authorization "EA" on October 12, 2022.

2020 Violations for Similar Illegal Activity

7. Attached to this certification as **Exhibit A** are two Notices of Violation ("NOV") the Department issued NWW on June 6, 2020. The first NOV, issued only to NWW, addresses NWW's installation (from 2012 to 2020) of a vinyl and steel bulkhead from 3rd to 13th Avenues without DEP permit approval. The NOV informed NWW that a permit is required for this work. NWW applied to legalize the installed bulkhead on November 20, 2020, however, the application was declared deficient on December 3, 2020, due to lack of property owner signatures and public newspaper notice, and NWW has not cured the permit application deficiencies since 2020 and it remains deficient at this time. The installation of the bulkhead without the required permits is a violation of the CAFRA, the FWPA, and the FHACA.

8. The June 6, 2020 NOV also includes violations for numerous other structures on the NWW oceanfront, including the construction of approximately 4, 216 square feet of concrete walkway and composite walkway at the Beach Patrol Building at 15th Avenue. NWW was issued a DEP jurisdictional determination on August 14, 2019, that specifically identified these walkways as requiring a CAFRA permit prior to construction, however, no permit has been obtained to date. In addition, approximately 4, 691 square

feet of storage sheds have been placed at the Beach Patrol Building, and these 3 storage sheds are still located at the site without DEP approval. NWW also illegally placed approximately 44,981 square feet of crushed clam fill material for the creation of a walkway between 15th and 21st along the oceanfront and constructed a composite bike path between 15th and 21st Avenues along the oceanfront. All are regulated activities that require a coastal permit pursuant to CAFRA, N.J.A.C. 7:7-2.2.

9. The June 6, 2020 NOV outlines that the DEP has determined that in early 2020, NWW and its contractor(s) removed over six acres of dunes, wetland, and critical wildlife habitat from 7th to 13th Avenues oceanfront in violation of the CAFRA, the FHCA and the FWPA. All the violations noted in the 2020 & 2022 NOVs to NWW and its contractors remain open and unresolved; however, the Department is not seeking to enforce these violations in this application, but merely highlight these existing violations to demonstrate NWW's continued repeated egregious behavior of engaging in DEP regulated activity on its beachfront without the required emergency approval(s) or permit(s). The second NOV issued to NWW and BG Capital LLC, outlines violations for the unauthorized and unpermitted construction on Seaport Pier, including the construction of a swim up bar and bathrooms at the pool club, a pool storage building, and other restaurant, bar and concert stage structures on the main pier.

Post-Ian Violations of the Emergency Authorization and CAFRA

10. On October 20, 2022, the Department issued NWW an NOV for excavating sand from the beach berm near 11th Avenue and transporting and placing the excavated sand on the beach between 14th and 16th Avenues. This regulated activity of excavating sand from 11th Avenue was never part of any request from NWW to the DEP for emergency authorization post Ian. Attached to this certification as **Exhibit B** is the October 20, 2022 NOV issued to NWW. The NOV states that the excavated sand is being graded towards the dunes between 14th and 16th Avenues. This regulated activity is a violation of CAFRA, N.J.A.C. 7:7-2.2. The NOV directs NWW to immediately cease any further regulated activities and submit the appropriate complete land use permit application to the Department to legalize or obtain approval for these activities.[1]

11. On October 28, 2022, the Department issued H4 Enterprises, LLC an NOV for performing unauthorized regulated activities within a CAFRA area without Department authorization. Attached to this certification as **Exhibit D** is the October 28,

[1] It should be noted that the Department issued NWW a NOV on July 27, 2022 because its beach and dune maintenance permit expired on June 8, 2022. To date, NWW does not have a valid beach and dune maintenance permit and as such, NWW cannot conduct any beach or dune maintenance, which includes the illegal activity outlined in the October 20, 2022 NOV. In the July 27, 2022 NOV the Department directed NWW to complete the appropriate application and obtain CAFRA permit approval prior to conducting any future beach and dune maintenance. Attached as **Exhibit C** is the July 27, 2022 NOV.

2022 NOV issued to H4 Enterprises, LLC. H4 Enterprises, LLC, "H4", is the contractor that performed the excavation of the sand from the beach berm located at and near 11th Avenue in NWW. H4 then placed this excavated sand waterward of the dune area between 14th and 16th Avenues in NWW and graded this sand landward towards the existing dune. As noted in the NOV, NWW did not submit any emergency request to excavate sand from 11th Avenue and relocate it to the area between 14th and 16th Avenues, and thus, the DEP did not approve this work. Additionally, NWW has no current beach and dune maintenance permit approval to conduct such regulated activities and NWW's EA application stated that there was no available sand source in the area for such work. This regulated activity is not only a violation of NWW's EA but also, CAFRA, N.J.A.C. 7:7-2.2 because NWW does not have a valid coastal permit for such activity.

12. On October 21, 2022, the Department received a response to the October 20, 2022 NOV from Neil Yoskin, Esq., counsel for NWW. Attached to this certification as **Exhibit E** is the October 21, 2022 letter from Neil Yoskin, Esq. to the Department. This letter indicates that NWW had completed the reshaping and regrading of the dune remnants on October 20, 2022. The letter also states NWW's intent to continue with bulkhead construction, specifically that the materials for the bulkhead are not yet available but should be within 30 days.

13. On November 13, 2022, I received a response to the NOV issued to H4 Enterprises, LLC. Attached as **Exhibit F**, is a copy of this response. In the response, H4 indicates that it was contacted by Jim Verna, City of North Wildwood Engineer, to perform the work conducted on October 20, 2022. H4 did not have any workplans or surveys for this work and completed the work on October 20, 2022. The invoice for this work indicated "dune sloping and sand moving - 16th to 13th Street, North Wildwood." H4 charged NWW $27,400.00 for this work.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Michele S Kropilak

Dated: 11/30/2022

Michele S. Kropilak
Manager Bureau of Coastal and Land Use Compliance and Enforcement

KROPILAK EXHIBIT A

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF COASTAL AND LAND USE COMPLIANCE AND ENFORCEMENT
Toms River Office
1510 Hooper Avenue, Suite 140
Toms River, New Jersey 08753
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PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

CATHERINE R. MCCABE
Commissioner

June 6, 2020

Via email & CERTIFIED MAIL/RRR
7019 2280 0001 6928 4759

The Honorable Patrick Rosenello
City of North Wildwood
901 Atlantic Avenue
North Wildwood, New Jersey 08260

RE: Notice of Violation
NJDEP File #: PEA200001 - 0507-03-0009.3
Block 291.01, Lot 1; Block 315.02, Lot 1;
Block 316.02, Lot 1; Block 317.02, Lots: 1 & 2;
Block 317.03, Lot 1
North Wildwood City, Cape May County, New Jersey

Dear Mayor Rosenello:

Enclosed for service upon you is a Notice of Violation issued by the Department.

If you have any questions concerning the enclosed Notice of Violation you may contact Danielle Campanella, Environmental Specialist, of my staff at Danielle.Campanella@dep.nj.gov, or at the address or telephone number above.

Sincerely,

(For)
Michele Kropilak, Region Supervisor
Bureau of Coastal and Land Use Compliance and Enforcement

Enclosure
c: Christopher Jones, NJDEP, DLUR
Judeth Yeany, NJDEP, Green Acres
Bill Dixon, NJDEP, Coastal Engineering

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF COASTAL AND LAND USE COMPLIANCE AND ENFORCEMENT
Toms River Office
1510 Hooper Avenue, Suite 140
Toms River, New Jersey 08753
Telephone: (732) 255-0787 Fax: (732) 255-0877
www.nj.gov/dep

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

CATHERINE R. MCCABE
Commissioner

Via email & CERTIFIED MAIL/RRR
7019 2280 0001 6928 4759

NOTICE OF VIOLATION

Responsible Entity:	City of North Wildwood
NJDEP File #:	PEA200001 - 0507-03-0009.3
Site Location:	Waterfront area, Surf Ave & 2nd Ave-22nd Ave North Wildwood, New Jersey 08260
Block and Lots:	Block 291.01, Lot 1; Block 315.02, Lot 1 Block 316.02, Lot 1; Block 317.02, Lots: 1 & 2; Block 317.03, Lot 1

You are hereby notified that the City of North Wildwood (City) is currently in violation of the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 et seq.) and the regulations (N.J.A.C. 7:7A-1 et seq.), the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq.) and the regulations (N.J.A.C. 7:13-1.1 et seq.), and the Coastal Area Facilities Review Act (N.J.S.A. 13:19-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.), and the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and the regulations (N.J.A.C. 7:15-1 et. seq.).

During compliance evaluations at the above location on April 28, 2020 and May 26, 2020, the New Jersey Department of Environmental Protection (Department) observed egregious and potentially knowing violations of the above-referenced laws, which exist to ensure the protection of public safety and the environment. As outlined further below, the City's unauthorized and unpermitted destruction of more than eight (8) acres of mature, densely vegetated natural dunes, including destruction of critical wildlife habitat, freshwater wetlands, unpermitted construction of more than 2,234 linear feet of bulkhead, unpermitted installation and construction of structures and walkways, and continued failure to comply with permit conditions through continued beach grading without proper regulatory oversight is detrimental to the environment and may have created conditions that threaten public safety. If immediate corrective action in accordance with this Notice is not completed, the Department may be required to take further enforcement action.

1. **Requirement: Pursuant to N.J.A.C. 7:7-2.2, no person shall engage in a regulated activity within a CAFRA area without a coastal permit.**

   Description of Noncompliance: The performance of unauthorized regulated activities within a CAFRA area. More specifically, the following activities have occurred without permit authorization from the Department's Division of Land Use Regulation:

A. The construction of approximately 617 linear feet of steel bulkhead from 5th to 7th Avenue, within a prior beach and dune area.

B. The removal of vegetation, filling and grading of the (now bulkheaded) beach and dune area (approx. 0.58 acres) from 5th to 7th Avenue, to create a park with playground, walkways and other amenities.

C. The construction of approximately 1,617 linear feet of steel bulkhead from 7th Ave to 13th Avenue along the oceanfront, within prior dune and freshwater wetland areas.

D. The placement of crushed clam fill material for the creation of a path through approx. 8,565 square feet of beach/dune/CAFRA area from Surf Ave to the Lou Booth Amphitheater.

E. The placement of an approx. 96 square foot concrete landing/flagpole adjacent to the Lou Booth Amphitheater.

F. The 1,084 square foot expansion of concrete sidewalk at Surf Avenue leading to the path through the dune that leads to the Lou Booth Amphitheater.

G. The placement of an approximately 165 square foot shed within a CAFRA Area at the beginning of the path on Surf Ave leading to the Lou Booth Amphitheater.

H. The placement of a 470 square of concrete path in a CAFRA area near the intersection of 2nd & Ocean. (adjacent to amphitheater)

I. The removal of vegetation, grading, and filling of a beach/dune/CAFRA area at the intersection of 1st & Surf: specifically, the placement of concrete & gravel for pathways and a bike rack area within a 4,234 square foot area.

J. The clearing of vegetation and grading of a beach/dune at the intersection of 1st & Surf: Specifically, the placement of an approx. 230 square foot platform with benches.

K. The construction of a 598 square foot gazebo at 1st & Surf.

L. The construction of a 357 square foot roof covered gazebo structure at the intersection of 2nd and JFK Blvd.

M. The construction of approx. 4,216 square feet of concrete walkway and composite walkway at the Beach Patrol building at 15th Avenue.

N. The placement/construction of approx. 4,691 square feet of storage sheds at the Beach Patrol building at 15th Avenue.

O. The placement/construction of an approx. 1,638' x 8' composite bike path between 15th & 21st along the oceanfront.

P. The placement of approx. 44,981 square feet of crushed clam fill material for the creation of a walkway between 15th and 21st along the oceanfront.

Q. The construction of 24,264 square feet of composite walkways/ shower platforms/ bench platforms etc. along the oceanfront at multiple street end entrances to the beach. The showers have been constructed outside of the sewer service area. (Also in violation of N.J.S.A. 58:10A-1 et seq. & N.J.A.C. 7:14 et. seq.)

R. The construction of approx. 495 linear feet of vinyl bulkhead along the oceanfront from 3rd to 5th Avenues along, water ward of the existing timber bulkhead.

2. **Requirement: Pursuant to N.J.A.C. 7:7A-2.2(a), the following activities are regulated when performed in a freshwater wetland and State open waters and require prior permit approval from the Department: the removal, excavation, disturbance or dredging of soil, sand, gravel, or aggregate material of any kind; the drainage or disturbance of the water level or water table so as to alter the existing elevation of groundwater or surface water, regardless of the duration of such alteration; the dumping, discharging, or filling with any material; the driving of pilings; the placing of obstructions, including depositing, constructing, installing or otherwise situating any obstacle which will affect the values or functions of a freshwater wetland; or the destruction of plant life which would alter the character of a freshwater wetlands, including killing vegetation by applying herbicides or by other means, the physical removal of wetland vegetation, and/or the cutting of trees; and the placement of any portion of a residential development project as defined at N.J.A.C. 7:7A-1.4.**

Description of Noncompliance: The performance of unauthorized regulated activities within a freshwater wetland area. More specifically, the following activities have occurred without authorization from the Department's Division of Land Use Regulation:

The vegetation removal, clearing, excavation, grading, removal of existing dunes, and stockpiling of sand has occurred within an approximately 6.7 acres area of prior beach/dune that also included areas of freshwater wetlands between 7th and 13th Avenue.

These dunes, freshwater wetlands, and freshwater wetlands transition area were previously identified and delineated under permit #:0507-03-0009.2 CAF140001 & FWW140001 & FWW140002, including Special condition #4, which stated, "Any additional unpermitted disturbance of freshwater wetlands, state open waters and/or transition areas besides that shown on the approved plans shall be considered a violation of the Freshwater Wetlands Protection Act Rules unless the activity is exempt or a permit is obtained from the Department prior to the start of the proposed disturbance.", and Special condition #6, which stated, "The construction activities shall not cause any change in pre-construction elevation of freshwater wetlands, transition areas, or state open waters." As stated above, these areas have been removed and filled, thus changing the elevation. All freshwater wetlands and transition areas have been disturbed/filled/removed.

3. **Requirement: Pursuant to N.J.A.C. 7:7A-2.3(a), the removal, excavation or disturbance of the soil; dumping or filling with any material; erection of structures; placement of pavements; destruction of plant life which would alter the existing pattern of vegetation; and placement of any portion of a residential development project as defined at N.J.A.C. 7:7A-1.4 within a freshwater wetland transition area are regulated activities which require prior permit approval from the Department.**

<u>Description of Noncompliance:</u> The performance of unauthorized regulated activities within a freshwater wetland transition area. More specifically, the following activities have occurred without authorization from the Department's Division of Land Use Regulation:

The vegetation removal, clearing, excavation, grading, removal of existing dunes, and stockpiling of sand has occurred within an approximately 6.7 acres area of prior beach/dune that also included freshwater wetland transition areas between 7th and 13th Avenue.

These dunes, freshwater wetlands, and freshwater wetlands transition area were previously identified and delineated under permit #:0507-03-0009.2 CAF140001 & FWW140001 & FWW140002, including Special condition #4, which stated, "Any additional unpermitted disturbance of freshwater wetlands, state open waters and/or transition areas besides that shown on the approved plans shall be considered a violation of the Freshwater Wetlands Protection Act Rules unless the activity is exempt or a permit is obtained from the Department prior to the start of the proposed disturbance.", and Special condition #6, which stated, "The construction activities shall not cause any change in pre-construction elevation of freshwater wetlands, transition areas, or state open waters." As stated above, these areas have been removed and filled, thus changing the elevation. All freshwater wetlands and transition areas have been disturbed/filled/removed.

4. **<u>Requirement:</u> Pursuant to N.J.A.C. 7:13- 2.1(a), no person shall engage in a regulated activity in a regulated area without a flood hazard area permit as required by this chapter, or a coastal permit as required by N.J.A.C. 7:7.**

   <u>Description of Noncompliance:</u> The performance of unauthorized regulated activities within a regulated flood hazard area without the required permit authorization. More specifically, the following flood hazard regulated activities have occurred without authorization from the Department's Division of Land Use Regulation:

   A. The construction of 617 linear feet of steel bulkhead between 5th & 7th Ave to create a park with playground/walkways /other amenities.

   B. The construction of 1,617 linear feet of steel bulkhead between 7th &13th Avenue.

   C. The placement of approx. 4,691 square feet of storage sheds at the Beach Patrol building at 15th Avenue.

5. **<u>Requirement:</u> Pursuant to N.J.A.C. 7:7-27.2(c) 8, failure to comply with the conditions of a CAFRA permit is a violation of the Coastal Zone Management Rules and is grounds for enforcement action under N.J.A.C. 7:7-29.**

   <u>Description of Noncompliance:</u> Failure to comply with the approved beach and dune maintenance permit and special conditions #'s 4, 10, and 13 of CAFRA Permit #: 0507-03-0009.3 CZM170001 (PERMIT 1).

   Special condition #4 states, "The proposed activities must be conducted in accordance with Best Management Practices as defined by the Department in the Rules on Coastal Zone Management in Standards applicable to routine beach maintenance (N.J.A.C. 7:7-10.2), Standards applicable to emergency post-storm beach restoration (N.J.A.C. 7:7-10.3) and Standards applicable to dune creation and maintenance (N.J.A.C. 7:7-10.4). Activities other than those outlined in these subchapters shall require additional authorization from the Program. Failure to receive such authorization prior to activities may warrant enforcement action by the Bureau of Coastal and Land Use Enforcement."

Special condition #10 states, "Bulldozing, excavation, grading, vegetation removal, or clearing and relocation of existing dunes, whether existing or constructed in conjunction with this permit are not authorized under this general permit."

Special condition #13 states, "Sand transfers to or from wetland areas that may exist on the beach are not authorized by this permit."

Per N.J.A.C. 7:7-10.2/10.3/10.4 -Standards for beach and dune activities: Bulldozing, excavation, grading, vegetation removal or clearing, and the relocation of the existing dunes is not authorized, and there shall be no disturbance to existing dunes.

The April 28, 2020 site inspection confirmed the following beach/dune activities are not in compliance with PERMIT 1 or the Coastal Zone Management rules:

A. The removal of vegetation, grading and filling, of 0.58 acres of prior beach/dune area between 5th and 7th Avenue for the installation of a bulkhead and creation of a park.

B. The vegetation removal, clearing, excavation, grading, removal of existing dunes, and stockpiling of sand has occurred within an approximately 6.7 acres area of prior beach/dune that also included areas of freshwater wetlands and freshwater wetland transition areas between 7th and 13th Avenue.

C. The removal of vegetation, filling, and grading of an approx. 0.57 acres beach/dune area adjacent to Seaport Pier.

The disturbed dune areas were previously identified under permit #: 0507-03-0009.2 CAF140001 & FWW140001 & FWW140002, which contained Special condition #1, which states, "This permit does not authorize any disturbance to the adjacent dune." As stated above, the dunes have been graded, excavated, and vegetation has been removed.

6. **Requirement: Pursuant to N.J.A.C. 7:7-27.2(c)8, failure to comply with the conditions of a CAFRA permit is a violation of the Coastal Zone Management Rules and is grounds for enforcement action under N.J.A.C. 7:7-29.**

   Description of Noncompliance: Failure to comply with the approved sand harvesting/sand transfer/beach fill permit and standard condition #12 of Permit #: 0500-07-0006.3 CAF180001 & WFD180001 (PERMIT 2), which authorizes the harvesting of sand from Wildwood, and transferring the sand to North Wildwood to be deposited along the beaches and dunes between 26th Avenue and 2nd Avenue, as beach fill.

PERMIT 2 states that the project does not propose disturbance within freshwater wetlands, and Standard condition #12 states, "The permittee and its contractors and subcontractors shall comply with all conditions, site plans, and supporting documents approved by the permit. Any noncompliance with a permit constitutes a violation of this chapter and is grounds for enforcement action under, as well as, in the appropriate case, suspension and/or termination of the permit."

On April 28, 2020, the following unauthorized activities were observed. These activities are not in compliance with the permit and approved plans, which do not authorize the disturbance of freshwater wetlands or existing dunes.

A. Sand has been transported between 7th Avenue & 13th Avenue and placed within an approx. 290,971 square foot (6.68 acres) vegetated dune area. The dunes included areas of freshwater wetlands and freshwater wetlands transition areas, which were critical wildlife habitat. The freshwater wetlands and prior existing densely vegetated dunes are no longer visible on site and have been removed.

B. Sand has been stockpiled within an approx. 24,971 square foot (0.57 acres) area of dune adjacent to Seaport Pier, which is outside of the approved areas depicted on the approved plans.

7. **<u>Requirement:</u> Pursuant to N.J.A.C. 7:7A-20.2(c) 8, any noncompliance with a permit, constitutes a violation of this chapter and is grounds for enforcement action under N.J.A.C 7:7A-22.**

   <u>Description of Noncompliance:</u> Failure to comply with the Bike Path, Sidewalk & Utility Reconstruction permit, approved plans, and pre-construction condition #2 of the CAFRA and Freshwater Wetlands Permit #:0507-03-0009.2 CAF140001& FWW140001 & FWW140002 (PERMIT4).

   Pre-construction condition #2 states, "Prior to site preparation, the permittee shall complete a transition area and adjacent freshwater wetland area conservation restriction and file the completed restriction with the Office of the Cape May County Clerk."

   This conservation restriction was required to preserve and document the location of freshwater wetlands and transition areas within the oceanfront existing dunes. Review of the Cape May County Clerk's Website found no record of the required freshwater wetland and transition area conservation restriction having been recorded.

ALL UNAUTHORIZED ACTIVITIES MUST CEASE IMMEDIATELY.

<u>Corrective Actions:</u>

a. Do not conduct any further regulated activities, except in compliance with a valid land use permit and approved plan(s) or Department approved restoration plan.

b. Within 10 days of receipt of this Notice of Violation, contact the Bureau with a proposal to address the above referenced violations and all information requested herein.

c. The proposal must address all conditions outlined herein, including the submission of complete application(s) to the Department's Division of Land Use Regulation for the appropriate CAFRA, Freshwater Wetlands and/or Flood Hazard permit(s) to attempt to authorize all unpermitted construction, grading, filling, excavation, and dune and freshwater wetlands and transition area removal, and/or submission of a restoration plan to the Department for review and approval to remove all unauthorized construction and restore the waterfront areas from Surf Ave, and 2nd Ave – 23nd Avenues to their pre disturbance condition.

d. Any activity and/or structure that does not receive permit approval must be removed and the area restored to its pre disturbance condition in accordance with the following:

1. The restoration of 6.68 acres of critical wildlife habitat dune, including areas of freshwater wetlands and freshwater wetlands transition area, between 7th and 13th Avenue. Such restoration of the dune and freshwater wetlands/transition area shall be to its original topography and include planting with appropriate native vegetation.

2. The restoration of an approximately 0.58 acres of beach and dune area from 5th to 7th Avenues through the removal of approximately 617 linear feet of steel bulkhead, playground equipment, walkways and other amenities and restoration of the beach/dune area to its original topography, as well as the planting of the dune with native vegetation.

3. The removal of the approximately 1,617 linear feet of steel bulkhead from 7th Ave to 13th Avenue along the oceanfront, within prior dune and freshwater wetland/transition areas.

4. The removal of the approximately 495 linear feet of vinyl bulkhead from 3rd to 5th Avenues, that has been constructed water ward of the existing timber bulkhead.

5. The restoration of 0.57 acres of the beach/dune area adjacent to Seaport Pier through the restoration of the dune to its original topography and planting the restored area with native vegetation.

6. The removal of crushed clam fill material from within the 8,565 square feet of beach/dune/CAFRA area from Surf Ave to the Lou Booth Amphitheater, and replant the area with native vegetation.

7. The removal of the approx. 96 square foot concrete landing/flagpole adjacent to the Lou Booth Amphitheater.

8. The removal of the 1,084 square foot expansion of concrete sidewalk at Surf Avenue leading to the path through the dune that leads to the Lou Booth Amphitheater.

9. The removal of the approx. 165 square foot shed within a CAFRA Area at the beginning of the path on Surf Ave leading to the Lou Booth Amphitheater.

10. The removal of the 470 square feet of concrete path in a CAFRA area near the intersection of 2nd & Ocean. (adjacent to amphitheater)

11. The restoration of the approximately 4,234 square foot of a beach/dune/CAFRA area at the intersection of 1st & Surf through the removal of concrete, gravel, pathways, and bike rack area, and replant with native vegetation.

12. The restoration of the approx. 230 square foot beach/dune area at the intersection of 1st & Surf through the removal of the platform and benches and replant with native vegetation.

13. The removal of the 598 square foot gazebo at 1st & Surf Avenue.

14. The removal of the 357 square foot roof covered gazebo structure at the intersection of 2nd and JFK Blvd.

15. The removal of the approximately 4,216 square feet of concrete walkway and composite walkway at the Beach Patrol building at 15th Avenue.

16. The removal of the approx. 4,691 square feet of storage sheds at the Beach Patrol building at 15th Avenue.

17. The removal of the approximately 1,638' x 8' composite bike path between 15th & 21st along the oceanfront.

18. The removal of the approx. 44,981 square feet of crushed clam fill material for the creation of a walkway between 15th and 21st Avenues along the oceanfront and replant with native vegetation.

19. The removal of 24,264 Square feet of composite walkways/ shower platforms/ bench platforms etc. along the oceanfront at multiple street end entrances to the beach.

For more information and guidance on preparing a restoration plan go to: ***http://www.nj.gov/dep/enforcement/clue-resources.html*****.**

e. The pre-construction condition #2 of the CAFRA and Freshwater Wetlands Permit #: 0507-03-0009.2 CAF140001 & FWW140001 & FWW140002 cannot be satisfied at this time, as the freshwater wetlands and freshwater wetlands transition areas have been destroyed within the dunes. Upon restoration of the impacted freshwater wetlands and freshwater wetlands transition areas, a conservation restriction shall be submitted to the Department for review and approval, and upon approval, the conservation restriction shall be recorded with the Cape May County Clerk's Office. If the freshwater wetlands and transition areas are not restored within the dunes, mitigation shall be required to compensate for the loss. Any mitigation required for the loss of freshwater wetlands and freshwater wetlands transition area will require the City to file a conservation restriction for the mitigation area.

In addition, please provide the Bureau:

1) Copies of all site/work plans, as built surveys, planning board and other local/county/state and federal approvals, associated with all of the unauthorized construction and activity outlined above, and

2) A list of all contractors with contact information/address, copies of all contracts, and specifically which project(s) the contractor completed for the City, for all of the work outlined above.

This **Notice of Violation** serves as notice that the Department's Bureau of Coastal and Land Use Compliance and Enforcement has determined that a violation has occurred. It does not constitute final agency action and may not be appealed or contested. The issuance of this Notice or compliance therewith does not preclude the State of New Jersey or any of its agencies from initiating formal administrative and/or judicial enforcement action (including assessment of penalties), with respect to the violations listed above or for any other violations. You may appeal or contest such formal actions. Penalties may be assessed daily for each violation.

Issued by: ________________________________(For) Date: June 6, 2020
Michele Kropilak, Region Supervisor
Bureau of Coastal and Land Use Compliance and Enforcement

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

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Lt. Governor

CATHERINE R. MCCABE
Commissioner

June 6, 2020

Via email & CERTIFIED MAIL/RRR
<u>7019 2280 0001 6928 4766</u>

The Honorable Patrick Rosenello

City of North Wildwood
901 Atlantic Avenue
North Wildwood, New Jersey 08260

CERTIFIED MAIL/RRR
<u>7019 2280 0001 6928 4473</u>

Joseph Byrne & Daniel Govberg

BG Capital LLC
9310 Keystone Street
Philadelphia, Pennsylvania 19114

RE: Seaport Pier Notice of Violation
NJDEP File #: PEA200001 - 0507-03-0009.4
Block 291.01, Lot 1; Block 317.03, Lot 1
North Wildwood City, Cape May County, New Jersey

Dear Mayor Rosenello, Messrs. Byrne and Govberg:

Enclosed for service upon you is a Notice of Violation issued by the Department.

If you have any questions concerning the enclosed Notice of Violation you may contact Danielle Campanella, Environmental Specialist, of my staff at Danielle.Campanella@dep.nj.gov, or at the address or telephone number above.

Sincerely,

Danielle Campanella (For)

Michele Kropilak, Region Supervisor
Bureau of Coastal and Land Use Compliance and Enforcement

Enclosure
c: Christopher Jones, NJDEP, DLUR
Judeth Yeany, NJDEP, Green Acres

State of New Jersey
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CATHERINE R. MCCABE
Commissioner

CERTIFIED MAIL/RRR
7019 2280 0001 6928 4766

CERTIFIED MAIL/RRR
7019 2280 0001 6928 4773

NOTICE OF VIOLATION

Responsible Entities:	City of North Wildwood & BG Capital LLC
NJDEP File #:	PEA200001 - 0507-03-0009.4
Site Location:	Seaport Pier at East 22nd Ave. North Wildwood, New Jersey 08260
Block and Lots:	Block 291.01, Lot 1; Block 317.03, Lot 1

You are hereby notified that the City of Wildwood and BG Capital LLC are in violation of the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq.) and the regulations (N.J.A.C. 7:13-1.1 et seq.), the Coastal Area Facilities Review Act (N.J.S.A. 13:19-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.), and the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and the regulations (N.J.A.C. 7:15-1 et. seq.).

During compliance evaluations at the above location on April 28, 2020 and May 26, 2020, the New Jersey Department of Environmental Protection (Department) observed egregious and potentially knowing violations of the above-referenced laws, which exist to ensure protection of public safety, public access and the environment. As outlined further below, BG Capital's and the City's unauthorized and unpermitted construction on Seaport Pier, including all the structures located on the main pier, and the unauthorized construction at the members only Starboard Swim Club, including a restaurant/bar/bathrooms/food trailer outside of a sewer service area and pool storage building, is detrimental to the environment and may have created conditions that threaten the public safety and reduce public access. If immediate corrective action in accordance with this Notice is not completed, the Department may be required to take further enforcement action.

1. **Requirement: Pursuant to N.J.A.C. 7:7-2.2, no person shall engage in a regulated activity within a CAFRA area without a coastal permit.**

   Description of Noncompliance: The performance of unauthorized regulated activities within a CAFRA area. More specifically, the following activities have occurred without permit authorization from the Department's Division of Land Use Regulation:

   The construction of a 23,136 square foot restaurant and bar building w/ bathrooms, a concert stage, additional storage building, and a tiki bar on the main Seaport Pier.

2. **<u>Requirement:</u> Pursuant to N.J.A.C. 7:13- 2.1(a), no person shall engage in a regulated activity in a regulated area without a flood hazard area permit as required by this chapter, or a coastal permit as required by N.J.A.C. 7:7.**

   <u>Description of Noncompliance:</u> The performance of unauthorized regulated activities within a regulated flood hazard area without the required permit authorization. More specifically, the following flood hazard regulated activities have occurred without authorization from the Department's Division of Land Use Regulation:

   > The construction of a 23,136 square foot restaurant and bar building, stage, tiki bar, and storage building on Seaport Pier and a pool equipment storage building & food trailer connected to the sewer on the Seaport Pier extension.

3. **<u>Requirement:</u> Pursuant to N.J.A.C. 7:7-27.2(c)8, failure to comply with the conditions of a CAFRA permit is a violation of the Coastal Zone Management Rules and is grounds for enforcement action under N.J.A.C. 7:7-29.**

   <u>Description of Noncompliance:</u> Failure to comply with the Seaport Pier expansion permit, permit modification and special conditions #'s 1 & 11 of permit #: 0507-03-0009.4 CZM170001.

   Special condition #1 states, "There shall be no construction of any sewage generating structures such as bathrooms and/or showers within the expanded pier on the beach within Block 291.01 Lot 1."

   Special condition #11 states, "The permittee and its contractors and subcontractors shall comply with all conditions, site plans, and supporting documents approved by the permit. Any noncompliance with a permit constitutes a violation of this chapter and is grounds for enforcement action."

   The site inspection conducted on April 28, 2020 determined the following unauthorized activities/noncompliance have occurred within the Seaport Pier expansion:

   A. The construction of a 1,404 square foot, members only swim club with swim up bar/restaurant, including bathrooms & sinks, and food trailer has been constructed outside of the sewer service area. This building was authorized as a storage building only, with no utilities. (This is also in violation of N.J.S.A. 58:10A-1 et seq. & N.J.A.C. 7:15 et. seq.)

   B. The construction of a 202 square foot pool equipment/storage building adjacent to the pool.

ALL UNAUTHORIZED ACTIVITIES MUST CEASE IMMEDIATELY.

<u>Corrective Actions:</u>

a. Do not conduct any further regulated activities, except in compliance with a valid land use permit and approved plan(s) or Department approved restoration plan.

b. Within **10** days of receipt of this Notice of Violation, contact the Bureau with a proposal to address the above referenced violations and all information requested herein.

c. The proposal must address all conditions outlined herein, including the submission of complete application(s) to the Department's Division of Land Use Regulation for the appropriate CAFRA and Flood Hazard permit(s) to attempt to authorize all unpermitted construction, and/or submission of a restoration plan to the Department for review and approval to remove all unauthorized construction and restore the pier to its pre disturbance condition.

d. Any activity and/or structure that does not receive permit approval must be removed and the area restored to its pre disturbance condition in accordance with the following:

1. The removal of the 1,404 square foot, members only swim club building with swim up bar/restaurant with bathrooms & sinks, and food truck located outside of the sewer service area. This building was authorized as a storage building only with no utilities.

2. The removal of the 202 square foot pool equipment storage building adjacent to the pool on the Seaport Pier expansion.

3. The removal of all structures on the main Seaport Pier, including the approximately 23,136 square foot restaurant and bar building w/ bathrooms, a concert stage, a tiki bar, and additional storage building.

For more information and guidance on preparing a restoration plan go to: ***http://www.nj.gov/dep/enforcement/clue-resources.html*****.**

In addition, please provide the Bureau:

1) Copies of all site/work plans, as built surveys, planning board and other local/county/state and federal approvals, associated with all of the unauthorized construction outlined above, and

2) A list of all contractors with contact information/address, copies of all contracts, and specifically which project(s) the contractor completed for BG Capital LLC & the City, for all of the work outlined above.

This **Notice of Violation** serves as notice that the NJDEP's Bureau of Coastal and Land Use Compliance and Enforcement has determined that a violation has occurred. It does not constitute final agency action and may not be appealed or contested. The issuance of this Notice or compliance therewith does not preclude the State of New Jersey or any of its agencies from initiating formal administrative and/or judicial enforcement action (including assessment of penalties), with respect to the violations listed above or for any other violations. You may appeal or contest such formal actions. Penalties may be assessed daily for each violation.

Issued by: ______________________________(For) Date: June 6, 2020

Michele Kropilak, Region Supervisor
Bureau of Coastal and Land Use Compliance and Enforcement

KROPILAK EXHIBIT B

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF COASTAL AND LAND USE COMPLIANCE AND ENFORCEMENT

PHILIP D. MURPHY
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Toms River, New Jersey 08753
Telephone: (732) 255-0787 Fax: (732) 255-0877
www.nj.gov/dep

SHAWN M. LATOURETTE
Commissioner

October 20, 2022

Via email only

The Honorable Patrick Rosenello
City of North Wildwood
901 Atlantic Avenue
North Wildwood, New Jersey 08260

RE: Notice of Violation
NJDEP File #: PEA220002 - 0507-03-0009.3
Oceanfront Beach
Block 317.03, Lot 1
North Wildwood City, Cape May County, New Jersey

Dear Mayor Rosenello:

Enclosed for service upon you is a Notice of Violation issued by the NJ Department of Environmental Protection. A written response is required immediately.

To respond to this Notice of Violation you may contact Michael Lutz, Environmental Specialist, at michael.lutz@dep.nj.gov, or at the address indicated at the top of this Notice.

Sincerely,

Michele Kropilak, Manager
Bureau of Coastal and Land Use Compliance and Enforcement

Enclosure

c: Neil Yoskin, Cullen & Dykman
Colleen Keller, DEP, DLRP
Jennifer Moriarty, DEP, DLRP
Kimberly Cahall, DEP, OEP
Janet Stewart, DEP, DLRP, Coastal Permitting

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF COASTAL AND LAND USE COMPLIANCE AND ENFORCEMENT

Toms River Office
1510 Hooper Avenue, Suite 140
Toms River, New Jersey 08753
Telephone: (732) 255-0787 Fax: (732) 255-0877
www.nj.gov/dep

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

October 20, 2022

<u>Via Email</u>

The Honorable Patrick Rosenello
City of North Wildwood
901 Atlantic Avenue
North Wildwood, New Jersey 08260

NOTICE OF VIOLATION

Responsible Entity: City of North Wildwood
Site Location: Oceanfront Beach
North Wildwood City, New Jersey 08260
Block 317.03, Lot 1
NJDEP File #: PEA220002 - 0507-03-0009.3

You are hereby notified that during a compliance evaluation at the above location on October 20, 2022, the Division of Land Resource Protection's Bureau of Coastal and Land Use Compliance and Enforcement ("Division") observed violations of the Coastal Area Facilities Review Act (N.J.S.A. 13:19-1 et seq.) and the Coastal Zone Management regulations (N.J.A.C. 7:7-1 et seq.). In the days prior to these violations, the Division was in contact with the City regarding post-storm restoration. Specifically, the City requested an Emergency Authorization ("EA") on October 5, 2022, seeking deployment of jersey barriers and associated removal of decking, reshaping of dune remnants, and installation of 404LF of bulkhead, all located between 15th and 16th Avenues, as well as reconstruction of accessways at 16th Avenue and 25th Avenue. By e-mail correspondence dated October 7th and October 12th, 2022, which are attached for reference, the Division approved deployment of jersey barriers and associated removal of decking but denied the remainder of the proposed activities due to lack of emergency conditions and concerns that the activities would exacerbate erosion. The denial **specifically stated that dune disturbance or reshaping was not authorized and, if undertaken, would warrant enforcement action.**

On October 20, 2022, the Division received a letter from the City's counsel advising that the City was beginning regrading and reshaping of the dunes and bulkhead construction, notwithstanding the Division's denial of the EA request. Division staff immediately inspected the site. The following violations were observed:

CAFRA AREA

Requirement: A CAFRA permit is required for any regulated activity on a beach or a dune. [N.J.A.C. 7: 7- 2.2]

Description of Noncompliance: North Wildwood has commenced the excavation of sand from the beach berm at and near 11th Street and is transporting and placing the excavated sand on the beach between 14th and 16th Streets. The sand is currently being graded towards the dunes located between 14th and 16th Streets. North Wildwood did not seek or obtain NJDEP approval to excavate sand from 11th Street, and the request to grade the sand to "reshape" the dune remnants was specifically denied by the Division on October 12, 2022.

ALL UNAUTHORIZED ACTIVITIES MUST CEASE IMMEDIATELY

CORRECTIVE ACTION(S) REQUIRED:

Immediately cease any further regulated activities and submit the appropriate complete land use permit application(s) or emergency authorization request to the Department's Division of Land Resource Protection (DLRP) to attempt to legalize/obtain approval for the activities identified in this Notice.

Permit review may result in approval, partial approval, withdrawal or denial. Any regulated activity that does not receive permit approval must be restored. Information on DLRP permit application(s) and emergency authorizations can be found at www.nj.gov/dep/landuse/.

REQUIRED WRITTEN RESPONSE TO THIS NOTICE:

Immediately upon receipt of this Notice of Violation, submit **in writing** to Michael Lutz an explanation of the corrective actions you have taken or will take to achieve compliance in this matter. The response to this Notice of Violation may be submitted via email at michael.lutz@dep.nj.gov.

This **Notice of Violation** serves as notice that the NJDEP's Bureau of Coastal and Land Use Compliance and Enforcement has determined that a violation has occurred. It does not constitute a final agency action and may not be appealed or contested. The issuance of this Notice or compliance therewith does not preclude the State of New Jersey or any of its agencies from initiating formal administrative and/or judicial enforcement action (including assessment of penalties), with respect to the violations listed above or for any other violations. You may appeal or contest such formal actions. Penalties may be assessed on a daily basis for each violation.

Michele J Kropilak

Issued by: Date: 10/20/2022

Michele Kropilak, Manager
Bureau of Coastal and Land Use Compliance and Enforcement

KROPILAK EXHIBIT C

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF COASTAL AND LAND USE COMPLIANCE AND ENFORCEMENT

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

Toms River Office
510 Hooper Ave. Suite 140
Toms River, New Jersey 08753
Telephone: (732) 255-0787
www.nj.gov/dep

SHAWN M. LATOURETTE
Commissioner

July 27, 2022

Via email

Mayor Patrick Rosenello
City of North Wildwood
901 Atlantic Ave
North Wildwood, New Jersey 08260

RE: Notice of Violation Oceanfront Beach Maintenance
NJDEP File #: PEA220001 - 0507-03-0009.3
North Wildwood City, Cape May County, New Jersey

Dear Mayor Rosenello:

Enclosed for service upon you is a Notice of Violation issued by the NJ Department of Environmental Protection for your records.

Please note that an email response has already been received on July 27, 2022, from your environmental consultant, Peter Lomax, to this Notice of Violation (NOV), that he is currently preparing the required CAFRA permit application to address this matter.

If you have any additional questions, you may contact Michael Lutz, Environmental Specialist 3, at Michael.Lutz@dep.nj.gov, or at the address indicated at the top of this Notice.

Sincerely,

Robert H. Clark, Region Supervisor
Bureau of Coastal and Land Use Compliance and Enforcement

c: Ronald Simone, North Wildwood
Peter Lomax, Lomax Consulting Group
Wendy Walsh, USFWS, New Jersey Office
Todd Pover, Conserve Wildlife NJ
Kimberly Cahall, NJDEP, OEP
Colleen Keller, NJDEP, DLRP
Janet Stewart, NJDEP, DLRP
Becky Mazzei, NJDEP, DLRP

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF COASTAL AND LAND USE COMPLIANCE AND ENFORCEMENT
Toms River Office
510 Hooper Ave. Suite 140
Toms River, New Jersey 08753
Telephone: (732) 255-0787
www.nj.gov/dep

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

Via email

NOTICE OF VIOLATION

Responsible Entity: City of North Wildwood
Site Location: Oceanfront Beach
North Wildwood City, NJ 08260
Block 223, Lot 1; Block 224, Lot 1; Block 251, Lot 1; Block 252, Lot 1; Block 253, Lot 1; Block 254, Lot 1; Block 282, Lot 1; Block 283, Lot 1; Block 284, Lot 1; Block 285, Lot 1; Block 287, Lot 1; Block 290.01, Lot 1; Block 315.02, Lot 1; Block 316.02, Lot 1; Block 317.02, Lot 1; Block 317.03, Lot 1; Block 425, Lot 1; Block 426, Lot 1;

NJDEP File #: PEA220001 - 0507-03-0009.3

You are hereby notified that during a compliance evaluation at the above location on 07/20/2022, the following violation(s) of the Coastal Area Facilities Review Act (N.J.S.A. 13:19-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.) were observed.

CAFRA AREA

Requirement: Pursuant to N.J.A.C. 7:7-2.2, no person shall engage in a regulated activity within a CAFRA area without a coastal permit.

Description of Noncompliance: the performance of unauthorized regulated activities within a CAFRA area. The activities involve performing beach and dune maintenance without permit authorization from the Department.

A prior beach and dune maintenance permit expired on June 8, 2022, therefore no beach or dune maintenance is authorized at this time.

Upon CAFRA permit approval, please coordinate with the NJDEP and USFWS staff to ensure compliance with the City of North Wildwood's Beach Management Plan for the Protection of State and Federally listed species, dated December 2018, as raking and driving has occurred in 2022 within plant protection designated areas within the recreational beach zone.

ALL UNAUTHORIZED ACTIVITIES SHOULD CEASE IMMEDIATELY

CORRECTIVE ACTION(S) REQUIRED:

Upon receipt of this Notice of Violation:

Submit the appropriate complete permit application to the Department's Division of Land Resource Protection (DLRP) to address the activities identified in this Notice and obtain CAFRA permit approval prior to conducting any future beach and dune maintenance.

Ensure compliance with the CAFRA permit as well as the City of North Wildwood's Beach Management Plan for the Protection of State and Federally Listed Species, dated December 2018.

REQUIRED WRITTEN RESPONSE TO THIS NOTICE:

Within **5 calendar days** of receipt of this Notice of Violation submit **in writing** to Michael Lutz, an explanation of the corrective actions you have taken or will take to achieve compliance in this matter. The response to this Notice of Violation may be submitted via email at michael.lutz@dep.nj.gov.

This **Notice of Violation** serves as notice that the NJDEP's Bureau of Coastal and Land Use Compliance and Enforcement has determined that a violation has occurred. It does not constitute a final agency action and may not be appealed or contested. The issuance of this Notice or compliance therewith does not preclude the State of New Jersey or any of its agencies from initiating formal administrative and/or judicial enforcement action (including assessment of penalties), with respect to the violations listed above or for any other violations. You may appeal or contest such formal actions. Penalties may be assessed on a daily basis for each violation.

Issued by: Date: July 27, 2022

Robert H. Clark, Region Supervisor
Bureau of Coastal and Land Use Compliance and Enforcement

KROPILAK EXHIBIT D

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF COASTAL AND LAND USE COMPLIANCE & ENFORCEMENT

Toms River Office

1510 Hooper Avenue, Suite 140

Toms River, New Jersey 08755

Tel. (732) 255-0787

October 28, 2022

via CERTIFIED MAIL/RRR & email
7017 2620 0000 1757 9736

Victoria Heun Pierson
H4 Enterprises, LLC
PO Box 638
Cape May Court House, New Jersey 08210

RE: Notice of Violation
NJDEP File #: PEA220003 - 0507-03-0009.3
Oceanfront Beach Block 317.02, Lot 1
North Wildwood City, Cape May County, New Jersey

Dear Ms. Pierson:

Enclosed for service upon you is a Notice of Violation issued by the NJ Department of Environmental Protection. A written response is required within 5 days.

To respond to this Notice of Violation please contact Michael Lutz, Environmental Specialist, at michael.lutz@dep.nj.gov , or at the address indicated at the top of this Notice.

Sincerely,

Michele Kropilak

Michele Kropilak, Manager
Bureau of Coastal and Land Use Compliance and Enforcement

c: Neil Yoskin, Cullen & Dykman
Jennifer Moriarty, DEP, DLRP
Kimberly Cahall, DEP, OEP
Kevin Terhune, AG's Office, Div. of Law, EEEJ

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

BUREAU OF COASTAL AND LAND USE COMPLIANCE & ENFORCEMENT
Toms River Office
1510 Hooper Avenue, Suite 140
Toms River, New Jersey 08755
Tel. (732) 255-0787

SHAWN M. LATOURETTE
Commissioner

via CERTIFIED MAIL/RRR & email
7017 2620 0000 1757 9736

NOTICE OF VIOLATION

Responsible Entity: H4 Enterprises, LLC
Site Location: Oceanfront Beach -Block 317.03, Lot 1;
North Wildwood City, New Jersey 08260

NJDEP File #: PEA220003 - 0507-03-0009.3

You are hereby notified that during a compliance evaluation at the above location on October 20, 2022, the Division of Land Resource Protection's Bureau of Coastal & Land Use Compliance & Enforcement staff observed H4 Enterprises LLC conducting violation(s) of the Coastal Area Facilities Review Act (N.J.S.A. 13:19-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq).

In the days prior to these violations, the Division was in contact with North Wildwood City ("City") regarding post-storm restoration. Specifically, the City requested an Emergency Authorization ("EA") on October 5, 2022, seeking deployment of jersey barriers and associated removal of decking, reshaping of dunes, and installation of 404LF of bulkhead, all located between 15th and 16th Avenues, as well as reconstruction of accessways at 16th Avenue and 25th Avenue at the oceanfront. The City **did not** request emergency approval to excavate the sand from the beach berm at 11th Street and truck the sand to 14th – 16th Streets to grade into the existing dune and there is no current permit approval to conduct such regulated activities at the site which would lower the elevation of the beach berm at 11th Street. In fact, the City's emergency authorization request stated that there was no available sand source in the area.

The Division approved deployment of jersey barriers and associated removal of decking as a temporary action but denied the remainder of the City's proposed activities due to lack of emergency conditions and concerns that the activities requested would exacerbate erosion and because the proposed bulkhead was not an emergency remedy/not proposed to be immediately implemented. The Division's denial specifically stated that dune disturbance or reshaping was not authorized and, if undertaken, would warrant enforcement action.

On October 20, 2022, the Division received a letter from the City's counsel advising that the City has let contracts for the regrading and reshaping of the dunes and bulkhead construction, notwithstanding the Division's denial of the EA request, and that the regarding and reshaping of dunes would commence that day and will continue until completed. Division staff immediately inspected the site, and observed H4 Enterprises LLC conducting the following unauthorized CAFRA regulated activities:

CAFRA AREA

Requirement: Pursuant to N.J.A.C. 7:7-2.2, **no person** shall engage in a regulated activity within a CAFRA area without a coastal permit.

Description of Noncompliance: H4 Enterprises LLC's performance of unauthorized regulated activities within a CAFRA area without NJDEP authorization. The activities involve:

1) Excavation of sand from the beach berm located at and near 11th Street in North Wildwood

2) Placement of excavated sand waterward of the dune area between 14th and 16th Street in North Wildwood, and grading of this sand landward towards the existing dunes.

ALL UNAUTHORIZED ACTIVITIES MUST CEASE IMMEDIATELY

CORRECTIVE ACTION(S) REQUIRED:

1. Immediately cease all unauthorized NJDEP regulated activities.
2. Do not conduct any future NJDEP regulated activities at the site, including, but not limited to, bulkhead installation, except in compliance with a valid NJDEP Division of Land Resource Protection permit and approved plan(s).
3. Within 5 days, provide the Division copies of all site/work plans, before and after photographs, and as built surveys associated with H4 Enterprises, LLC's unauthorized excavation of sand from the 11th Street North Wildwood beach berm as well as the placement and grading of this excavated sand between 14th Street and 16th Street in North Wildwood. In addition, provide all correspondence, contracts, invoices, payment receipts and all records of communication, including emails and phone logs, between H4 Enterprises LLC and North Wildwood and/or any of its contracted engineering staff from Van-Note Harvey Associates related to the unauthorized work cited within this NOV.
4. Within 5 days, provide the Division with any/all information on H4 Enterprises LLC's point of contact(s) with the City of North Wildwood and all others for the work cited within this NOV, including specifically, who directed the work to be completed by H4 Enterprises, LLC, who inspected the work, and who authorized payment for said work. In addition, please provide a list of all H4 Enterprises LLC employees and their contact information, including address, phone number and email address who have knowledge of or performed the unauthorized work cited in this NOV.

REQUIRED WRITTEN RESPONSE TO THIS NOTICE:

Within **5 calendar days** of receipt of this Notice of Violation submit **in writing** to Michael Lutz an explanation of the corrective actions you have taken or will take to achieve compliance in this matter. The response to this Notice of Violation may be submitted via email at michael.lutz@dep.nj.gov.

This **Notice of Violation** serves as notice that the NJDEP's Division of Land Resource Protection has determined that a violation has occurred. It does not constitute a final agency action and may not be appealed or contested. The issuance of this Notice or compliance therewith does not preclude the State of New Jersey or any of its agencies from initiating formal administrative and/or judicial enforcement action **(including assessment of penalties),** with respect to the violations listed above or for any other violations. You may appeal or contest such formal actions. Penalties may be assessed on a daily basis for each violation.

Issued by: Michele S Kropilak

Date: 10/28/2022

Michele Kropilak, Manager
Bureau of Coastal and Land Use Compliance and Enforcement

KROPILAK
EXHIBIT E

Cullen Dykman

Cullen and Dykman LLP
229 Nassau Street
Princeton, NJ 08542
T: 609.279.0900
F: 609.497.2377

NEIL YOSKIN
PARTNER
NYoskin@cullenllp.com

October 21, 2022
Via e-mail

Colleen Keller, Ass't. Director (colleen.keller@dep.nj.gov)
Division of Land Resource Protection
New Jersey DEP
501 E State Street, Mail Code 501-02A
Trenton, NJ 08625

Michele Kropilak, Manager (Michele.Kropilak@dep.nj.gov)
Bureau of Coastal and Land Use Compliance
and Enforcement
New Jersey DEP
1510 Hooper Avenue; Suite 140
Toms River, NJ 08753

RE: City of North Wildwood, Cape May County
Shore Protection Emergency

Dear Ms. Keller and Ms. Kropilak:

This will acknowledge receipt of the Department's October 20, 2022 Notice of Violation (NOV). Please be advised that the reshaping and regrading of the dune remnants was completed yesterday, October 20, thereby eliminating for the moment the hazardous conditions that were present. Because of supply chain issues, the materials required for the proposed emergency construction of the bulkhead are not yet available. The City anticipates a 30 day period of time in which the matter of the bulkhead can be discussed further.

One additional matter that is ancillary to the immediate emergency requires a response. Several of the Department's communications have made reference to the City's prior construction of a protective bulkhead and to the fact that the application to legalize it remains administratively incomplete, and suggests that this is the City's fault. The City does not agree. The Department's review of the application has been ongoing, and the City has made every effort to comply with the Department's continued requests for additional information.

Cullen | Dykman

The same communications have repeatedly made reference to the Department's claims that the City disturbed upwards of 12 acres of dunes and wetlands in the course of building that bulkhead. That is highly inaccurate. The City has documented the fact that almost the entirety of the dune field was lost to natural erosional processes, and that the area of disturbed wetlands is in the range of 9000 s.f. It is misleading and unfair of the Department to state otherwise.

North Wildwood has always indicated its willingness to restore the wetland conditions and the dunes in question once the Corps and DEP meet their obligations to implement the shore protection project authorized by Congress in 2016. But until that occurs, restoration is impossible,

One final note. The City has now received communication from five different individuals in the Department, so please designate one single contact going forward.

Sincerely,
CULLEN AND DYKMAN LLP

Neil Yoskin

Neil Yoskin

NY/cl
cc (via e-mail):

Patrick Rosenello, Mayor, City of North Wildwood
Nick Long, City of North Wildwood
Michael Donohue, Esq.
James Verna, PE
Peter Lomax
Jennifer Moriarty, NJDEP
Janet Stewart, NJDEP
Michael Lutz, NJDEP
Robert Clark, NJDEP
Dennis Reinknecht, NJDEP
Kimberly Cahall, NJDEP
Dr. Stewart Farrell

KROPILAK EXHIBIT F

H4 Enterprises, llc
DBE, WBE, SBE

P.O. Box 638
Cape May Court House
New Jersey 08210

Phone: (609) 536-2776
Fax: (609) 536-8468

RECEIVED
NOV 14 2022

November 3, 2022

State of New Jersey
Department of Environmental Protection
Bureau of Coastal and Land Use Compliance & Enforcement
Toms River Office
Atten: Michele Kropilak, Manager
1510 Hooper Avenue, Suite 140
Toms River, NJ 08755

RE: Notice of Violation
NJDEP File #: PEA220003 – 0507 – 03 – 0009.3
Oceanfront Beach Block 317.02, Lot 1
North Wildwood City, Cape May County, New Jersey

Dear Ms. Kropilak,

I am in receipt of the Notice of Violation referenced above. H4 Enterprises LLC was contacted by Jim Verna, City of North Wildwood Engineer, concerning an emergency situation on the beach due to severe erosion. Phil Heun Jr. and Christopher Heun of H4 Enterprises LLC met with Jim Verna on site. Mr. Verna explained the work he would like completed. H4 Enterprises LLC provided a price and we were instructed by Mr. Verna to start work on October 20, 2022.

H4 Enterprises LLC was only on site for 1 day, October 20, 2022. There has been no other activity performed by H4 Enterprises LLC at this site. H4 Enterprises LLC does not have any site / work plans, before or after photographs, or as built surveys for this work. I did include an email with Price for this work, invoice, voucher, etc.

Point of Contact for City of North Wildwood – James Verna, City Engineer
Directed, Inspected and Authorized Payment for said work – James Verna, City Engineer

H4 Enterprises LLC Owners on Site –

Philip G. Heun III – P.O. Box 638, Cape May Court House, NJ 08210
(609) 374-7430 pgheunjr@aol.com

Christopher D. Heun – P.O. Box 638, Cape May Court House, NJ 08210
(609) 374-2995 heun13@hotmail.com

I am sending this response by certified mail and will email it to Michael Lutz at michael.lutz@dep.nj.gov.

Yours truly,

V. H. H

Victoria Heun Pierson

Enclosures

Dune Sloping and Sand Moving - 16th to 13th Street, North Wildwood

Vicki Heun Pierson <Vicki@h4enterprisesllc.com>

Wed 10/19/2022 8:36 AM

To: jverna@vannoteharvey.com <jverna@vannoteharvey.com>

Cc: Phil Heun Jr <pgheunjr@aol.com>

Good Morning Jim,

13th to 16th Street, North Wildwood, NJ

Dune Sloping and Sand Moving as discussed

Price
$27,400.00

Please let us know if you have any questions.
Thanks,
Vicki
H4 Enterprises LLC

H4 Enterprises LLC
P.O. Box 638
Cape May Court House, NJ 08210
Unites States

Voice: 609-374-7431
Fax: 609-463-1878

INVOICE

Invoice Number: 2356
Invoice Date: Oct 26, 2022
Page: 1
Duplicate

Bill To:	Ship to:
City of North Wildwood 901 Atlantic Avenue North Wildwood, NJ 08260	City of North Wildwood 901 Atlantic Avenue North Wildwood, NJ 08260

Customer ID	Customer PO	Payment Terms	
North Wildwood		Net 30 Days	
Sales Rep ID	**Shipping Method**	**Ship Date**	**Due Date**
			11/25/22

Quantity	Item	Description	Unit Price	Amount
		Dune Sloping and Sand Moving 13th to 16th Street, North Wildwood		27,400.00

Check/Credit Memo No:

Subtotal	27,400.00
Sales Tax	
Total Invoice Amount	27,400.00
Payment/Credit Applied	
TOTAL	**27,400.00**

Notice- Regular meetings are held on the first and third Tuesdays of each month. Bills to be considered for Payment must be presented to the Clerk properly signed and certified on this form before Thursday preceding the regular meeting day.

October 27, 2022

CITY OF NORTH WILDWOOD

CAPE MAY COUNTY. NEW JERSEY

To H4 Enterprises, LLC Dr.

Address PO Box 638, Cape May Court House, NJ 08210

10/27/22		Payment for the Emergency Dune Sloping and Sand Transfer between 12th and 16th Avenues, as per the attached Invoice #2356....... PO #22-02558 (46006-400-21)			$27,400	00
					$27,400	00

STATE OF NEW JERSEY, CAPE MAY COUNTY, S.S.

Delivery slips received and checked

(Date) (Signature)

OFFICER'S CERTIFICATION

I, having knowledge of the facts, certify that the materials and supplies have been received or the services rendered; said certification being based on signed delivery slips or other reasonable procedures.

(Signature) City Engineer (Title)

CLAIMANT'S CERTIFICATION & DECLARATION

I do solemnly declare and certify under the penalties of the Law that the within bill is correct in all its particulars; that the articles have been furnished or services rendered as stated therein; that no bonus has been given or received by any person or persons within the knowledge of this claimant in connection with the above claim; that the amount therein stated is justly due and owing; and that the amount charged is a reasonable one.

10/27/22 (Date) (Signature)

CHECK NO

(Official Position) Managing Member

APPROPRIATIONS OR ACCOUNTS CHARGED

APPROVED FOR PAYMENT

Finance Committee

CITY OF NORTH WILDWOOD
901 Atlantic ave
North Wildwood, NJ 08260
Phone: (609)522-2030

Purchase Order

THIS NUMBER MUST APPEAR ON ALL INVOICES, PACKING LISTS, CORRESPONDENCE, ETC.

NO. 22-02558

ORDER DATE: 10/19/22
DELIVERY DATE:
STATE CONTRACT:
REQUISITION NO:
VENDOR ACCT NUM:
VENDOR PHONE #:
VENDOR FAX #:

SHIP TO

NORTH WILDWOOD CITY HALL
901 ATLANTIC AVE
NORTH WILDWOOD, NJ 08260

VENDOR Vendor #: 08934

H4 ENTERPRISES LLC
PO BOX 638
638 Court House S. Dennis Rd
Cape May Court House, NJ 08210

PAYMENT RECORD

CHECK NO.

DATE PAID

NOTICE: TAX EXEMPT - TAX ID: 21-6000944

QUANTITY	DESCRIPTION	ACCOUNT NO	UNIT PRICE	TOTAL
1.00	Reshaping Dunes 13th-16th Ave	C-04-55-863-010	27,400.0000	27,400.00
		ORD 1863- BUILDINGS, GROUNDS, BEACH		
				=============
			TOTAL	27,400.00

CLAIMANT'S CERTIFICATION & DECLARATION

I do solemnly declare and certify under penalties; of the law that the within bill is correct in all its particulars; that the articles have been furnished or services rendered as stated therein; that no bonus has been given or received by any; person or persons within the knowledge of this claimant in connection with the above claim; that the amount therein stated is justly due and owing; and that the amount charged is a reasonable one.. All shipping terms for merchandise will be F.O.B. destination

VENDOR SIGN HERE

Managing Member 10/27/22

OFFICIAL POSITION DATE

21-3033069

TAX ID NO. OR SOCIAL SECURITY NO.

OFFICER'S CERTIFICATION

I, having knowledge of the facts, certify that the materials and supplies have been received or the services rendered; said certification being based on signed delivery slips or other reasonable procedures.

DEPT. HEAD DATE

VENDOR MUST SIGN CERTIFICATION STATEMENT ON THIS VOUCHER. MAIL VOUCHER & ITEMIZED BILLS TO:

CITY OF NORTH WILDWOOD
901 Atlantic ave
North Wildwood, NJ 08260

APPROVAL TO PURCHASE

DO NOT ACCEPT THIS ORDER UNLESS IT IS SIGNED BELOW

Todd N Burkey

Todd N Burkey, CFO

BUSINESS ENTITY DISCLOSURE CERTIFICATION

FOR NON-FAIR AND OPEN CONTRACTS

Required Pursuant To N.J.S.A. 19:44A-20.8

CITY OF NORTH WILDWOOD

Part I – Vendor Affirmation

The undersigned, being authorized and knowledgeable of the circumstances, does hereby certify that the <*name of business entity*> Hy Enterprises LLC has not made and will not make any reportable contributions pursuant to N.J.S.A. 19:44A-1 et seq. that, pursuant to P.L. 2004, c. 19 would bar the award of this contract in the one year period preceding *(date of award scheduled for approval of the contract by the governing body)* to any of the following named candidate committee, joint candidates committee; or political party committee representing the elected officials of the *City of North Wildwood* as defined pursuant to N.J.S.A. 19:44A-3(p), (q) and (r).

Mayor Patrick Rosenello	Councilman David Del Conte
Council President Zampirri	Councilman Joseph Rullo
Councilman Edwin Koehler	
Councilwoman Margaret Bishop	
Councilwoman Kellyann Tolomeo	
Councilman James Kane	

Part II – Ownership Disclosure Certification

☒ I certify that the list below contains the names and home addresses of all owners holding 10% or more of the issued and outstanding stock of the undersigned.

Check the box that represents the type of business entity:

☐ Partnership ☐ Corporation ☐ Sole Proprietorship ☐ Subchapter S Corporation

☐ Limited Partnership ☒ Limited Liability Corporation ☐ Limited Liability Partnership

Name of Stock or Shareholder	Home Address
Victoria Heun Pierson	200 Williamson Lane, Mullica Hill, NJ 08062
Phillip C. Heun III	479 Petersburg Road, Woodbine, NJ 08270
Christopher D. Heun	397 Court House S. Dennis Rd, Cape May Ct. Hse, NJ 08210

Part 3 – Signature and Attestation:

The undersigned is fully aware that if I have misrepresented in whole or part this affirmation and certification, I and/or the business entity, will be liable for any penalty permitted under law.

Name of Business Entity: Hy Enterprises LLC

Signature of Affiant: V. Heun Pierson Title: Managing Member

Printed Name of Affiant : Victoria Heun Pierson Date: 10/26/22

Subscribed and sworn before me this 26 day of October, 2022 My Commission expires: 11/2/2025	Amy M Versaggi (Witnessed or attested by) (Seal)

AMY M VERSAGGI
Notary Public
State of New Jersey
My commission expires November 2, 2025

BUSINESS ENTITY DISCLOSURE CERTIFICATION
FOR NON-FAIR AND OPEN CONTRACTS
Required Pursuant To N.J.S.A. 19:44A-20.8
CITY OF NORTH WILDWOOD

The following is statutory text related to the terms and citations used in the Business Entity Disclosure Certification form.

"Local Unit Pay-To-Play Law" (P.L. 2004, c.19, as amended by P.L. 2005, c.51)

19:44A-20.6 Certain contributions deemed as contributions by business entity.
5. When a business entity is a natural person, a contribution by that person's spouse or child, residing therewith, shall be deemed to be a contribution by the business entity. When a business entity is other than a natural person, a contribution by any person or other business entity having an interest therein shall be deemed to be a contribution by the business entity.

19:44A-20.7 Definitions relative to certain campaign contributions.
6. As used in sections 2 through 12 of this act:
"business entity" means any natural or legal person, business corporation, professional services corporation, limited liability company, partnership, limited partnership, business trust, association or any other legal commercial entity organized under the laws of this State or of any other state or foreign jurisdiction;
"interest" means the ownership or control of more than 10% of the profits or assets of a business entity or 10% of the stock in the case of a business entity that is a corporation for profit, as appropriate;

Temporary and Executing
12. Nothing contained in this act shall be construed as affecting the eligibility of any business entity to perform a public contract because that entity made a contribution to any committee during the one-year period immediately preceding the effective date of this act.

~~~~~~~~~~~~~~~~~~~~~~

The New Jersey Campaign Contributions and Expenditures Reporting Act (N.J.S.A. 19:44A-1 et seq.)

19:44A-3 Definitions. In pertinent part…

p. The term "political party committee" means the State committee of a political party, as organized pursuant to R.S.19:5-4, any county committee of a political party, as organized pursuant to R.S.19:5-3, or any municipal committee of a political party, as organized pursuant to R.S.19:5-2.

q. The term "candidate committee" means a committee established pursuant to subsection a. of section 9 of P.L.1973, c.83 (C.19:44A-9) for the purpose of receiving contributions and making expenditures.

r. the term "joint candidates committee" means a committee established pursuant to subsection a. of section 9 of P.L.1973, c.83 (C.19:44A-9) by at least two candidates for the same elective public offices in the same election in a legislative district, county, municipality or school district, but not more candidates than the total number of the same elective public offices to be filled in that election, for the purpose of receiving contributions and making expenditures. For the purpose of this subsection: …; the offices of member of the board of chosen freeholders and county executive shall be deemed to be the same elective public offices in a county; and the offices of mayor and member of the municipal governing body shall be deemed to be the same elective public offices in a municipality.

19:44A-8 and 16 Contributions, expenditures, reports, requirements.
While the provisions of this section are too extensive to reprint here, the following is deemed to be the pertinent part affecting amounts of contributions:
"The $300 limit established in this subsection shall remain as stated in this subsection without further adjustment by the commission in the manner prescribed by section 22 of P.L.1993, c.65 (C.19:44A-7.2)
~~~~~~~~~~~~~~~~~~~~~~

Form **W-9**
(Rev. October 2018)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

▶ Go to *www.irs.gov/FormW9* for instructions and the latest information.

Give Form to the requester. Do not send to the IRS.

Print or type. See Specific Instructions on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.
H4 Enterprises LLC

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☑ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ C

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is **not** disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any)

Exemption from FATCA reporting code (if any)

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.
P.O. Box 638

Requester's name and address (optional)
City of North Wildwood

6 City, state, and ZIP code
Cape May Court House, NJ 08210

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN,* later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

– –

or

Employer identification number

2 7 – 3 0 3 3 0 6 9

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here **Signature of U.S. person ▶** [signature] **Date ▶** 10/26/22

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9.*

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and

4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting,* later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.

2. The treaty article addressing the income.

3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.

4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,

2. You do not certify your TIN when required (see the instructions for Part II for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code,* later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships,* earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code,* later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C corporation, or S corporation.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester,* later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at *www.SSA.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/Businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. Go to *www.irs.gov/Forms* to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to *www.irs.gov/OrderForms* to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code,* earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLE accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account[1]
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor[2]
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee[1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner[1]
6. Sole proprietorship or disregarded entity owned by an individual	The owner[3]
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*

For this type of account:	Give name and EIN of:
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity[4]
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships*, earlier.

***Note:** The grantor also must provide a Form W-9 to trustee of trust.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov*. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at *spam@uce.gov* or report them at *www.ftc.gov/complaint*. You can contact the FTC at *www.ftc.gov/idtheft* or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see *www.IdentityTheft.gov* and Pub. 5027.

Visit *www.irs.gov/IdentityTheft* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

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SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. * ____-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **CERTIFICATION OF MICHAEL J. LUTZ IN SUPPORT OF PLAINTIFF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S ORDER TO SHOW CAUSE FOR PRELIMINARY INJUNCTION & TEMPORARY RESTRAINTS**

I, MICHAEL J. LUTZ, of full age, certify and say:

1. I am employed by the New Jersey Department of Environmental Protection ("DEP") as an Environmental Specialist III. I began working for DEP in January of 2005 after graduating from Richard Stockton College in Pomona, New Jersey with a Bachelor of Science degree in Environmental Science. During my time at DEP, I have worked for the Bureau of Coastal and Land Use Compliance and Enforcement ("CLUE") for over 8 years.

2. I make this certification in support of the DEP's request for a preliminary injunction and temporary restraints to halt North Wildwood City ("NWW") from commencing with installation of any future bulkhead, including beach and dune disturbance, without DEP permit authorization.

3. I have been the inspector assigned to inspect NWW's oceanfront since September 2020. I was also previously assigned as CLUE's Inspector for NWW from April 2012 to February 2013. In addition, I was assigned as Supervisor for Danielle Campanella during the years that she was assigned as the CLUE Inspector for NWW from February 2017 to September 2020.

4. I am also familiar with NWW's previous unauthorized DEP regulated activities that came to the DEP's attention in 2020 as highlighted in further detail in the Certification of Michele Kropilak.

5. My present job duties include ensuring compliance with and enforcement of the DEP's land use regulations throughout Cape May County. These statutes/regulations include the Flood Hazard Area Control Act ("FHCA", N.J.S.A. 58:16A-50 et seq.) and the regulations (N.J.A.C. 7:13-1.1 et seq.), the Waterfront Development Act ("WDA", N.J.S.A. 12:5-1) and the regulations (N.J.A.C. 7:7-1 et seq.), the Coastal Area Facilities Review Act ("CAFRA", N.J.S.A. 13:19-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.), the Freshwater Wetland Protection Act ("FWPA",

N.J.S.A. 13:9B-1 et seq.) and the regulations (N.J.A.C. 7:7A-1 et seq.), and the Wetlands Act of 1970 ("WA", N.J.S.A. 13:9A-1 et seq.) and the regulations (N.J.A.C. 7:7-1 et seq.). All these laws/regulations provide authority for the DEP to regulate development, including clearing of vegetation, grading, and filling, within environmentally sensitive areas such as, but not limited to, beaches, dunes, wetlands and floodplains.

6. My position requires me to inspect properties in response to reports of such activities as development, vegetation removal, and filling within environmentally sensitive areas regulated by the Department, prepare detailed technical analyses and reports of my findings from inspections, and identify any violations of land use regulations present. I take photographs and collect GPS information as needed during my inspections to document current conditions and any violations that may be present. I also prepare enforcement documents for issuance by CLUE when appropriate.

Inspections Following NWW's EA Application

7. Following NWW's Emergency Authorization application ("EA") submitted to DEP on October 5, 2022, I was directed to inspect NWW's beachfront to determine if NWW started any work requested in the EA. Therefore, on the morning of October 6, 2022, I inspected all of NWW's beachfront, including 15th to 16th Avenues. Attached as **Exhibit A** are several of my photographs from

this inspection. The Beach Patrol Building at 15th Avenue is adjacent and to the west of me in photographs 18 & 19. I also took photographs looking south toward the Seaport Pier and North of 15th Avenue. In these photographs you can see previous impacts of Hurricane Ian, which caused some erosion of the beach berm. However, there was beach berm and dune remaining both to the North and South of 15th Avenue as illustrated in the photographs in **Exhibit A**. In photographs marked as 21 and 22, looking North of 18th Avenue, you can see the beach berm and dune in front of the Beach Patrol Building at 15th Avenue. During this inspection, I did not observe any regulated activity taking place.

8. On October 7, 2022, DEP authorized pursuant to the EA, the immediate placement of Jersey barriers in a 400 linear foot alignment extending from the 15th Avenue northern right-of-way limit line along the landward edge of dune to the 16th Avenue southern right-of-way limit line, and the removal and relocation of an existing composite/timber decking walkway to facilitate the Jersey barrier deployment.

9. I then went back out to conduct an inspection on October 14, 2022 to determine if NWW conducted any regulated activity in violation of the EA because on October 12, 2022, DEP denied the remainder of the NWW's EA application, which included the proposed installation of a bulkhead within the area of 15th and 16th Avenues, the scarp reshaping of the ocean side of the dune within this area,

and the repair of the 25th Avenue vehicular access point. On the morning of October 14, 2022, I conducted an inspection of NWW's beachfront including the area of 15th and 16th Avenues. Attached as **Exhibit B** are some of my photographs from my October 14, 2022 inspection. In photograph marked as Number 5 you can see the landward side of the dune at 16th Avenue. The Beach Patrol Building is located to the North at 15th Avenue. You can see that the jersey barriers had been installed pursuant to the EA authorized on October 7, 2022. I again walked out toward the beachfront at the access point on 15th Avenue and took photographs of the beach berm and dune to the North and South of 15th Avenue. The conditions of the beach berm looked substantially similar to the conditions of the beach berm from my inspection on October 6, 2022. In the photograph marked Number 8, you can see the vegetated dune with the storage sheds at 15th Avenue located behind the dune. You can also see the installation of the jersey barriers as authorized by the EA. In the photograph marked Number 9, you can see the vegetated dune to the North of 15th Avenue, which in part is previously delineated freshwater wetlands. Photograph marked number 10 provides a view of the Beach Patrol Building and the storage sheds at 15th Avenue. Here you can clearly see the jersey barriers authorized under the EA. In photographs marked 9, 12, and 14 a view of the previously delineated freshwater wetlands area located to the North of 15th Avenue is provided. You can also see from photograph marked number 10 that there was no erosion or flooding evident to the west of the vegetated dune area at 15th Avenue. In addition, you can see that the beachfront access point has been blocked with boards. Photographs 11 and 12 show inland of the dune line North and South of 15th Avenue. South of 15th Avenue you can see the boardwalk and buildings and North of 15th Avenue you can see the pedestrian walkway and hotels. During this inspection, I did not observe any regulated activity in violation of the EA.

10. The next time I went out to conduct an inspection of NWW's beachfront was on October 20, 2022. A copy of relevant photographs from this inspection are attached as **Exhibit C**.

11. On that day, photographs marked 3 through 9 were taken on the beachfront area south of 11th Avenue. In these photographs you can see an excavator excavating sand from a beach berm area and dumping the sand into a dump truck. I then observed the dump truck take this sand and dump it on the beach berm area waterward of the dune located between 14th Avenue and 16th Avenue. This is considered excavation and filling within a beach area, a regulated activity subject to CAFRA, and NWW did not have emergency authorization approval to move this sand from 11th Avenue to the beach area between 14th Avenue and 16th Avenue.

12. I then walked on the beachfront from 11th Avenue to the area of 15th Avenue. In the photograph marked 12 you can see the

dump truck unloading the sand between 15th Avenue and 16th Avenue. A grader was located at the beach berm near 15th Avenue and I observed that piece of equipment grade sand that had been dumped from 11th Avenue within the beach berm area towards the site's dunes. This was also a regulated activity in violation of CAFRA, specifically grading within a beach area, and was not authorized by the EA previously approved by the Division of Land Resource Protection. Photograph 15 provides a clear image of the sand from 11th Avenue graded towards the dune at 15th Avenue.

13. During this inspection I observed staff from NWW's Engineering Office observing this work. As noted in the certification of my supervisor, Michele Kropilak, NWW hired H4 Enterprises, LLC to complete this work. Photograph 24 is an image of an H4 Enterprises, LLC truck that was parked at the staging area near 15th Avenue, near the Beach Patrol Building.

14. I returned the next day on October 21, 2022 to determine if any additional regulated activity was taking place on NWW's beachfront. I walked again along the beachfront from 11th Avenue to the area of 15th Avenue. Attached as **Exhibit D** are relevant photographs from my inspection. Photograph 6 is an image south of 11th Avenue where NWW excavated the sand the day prior and moved it to the area between 14th Avenue and 16th Avenue. Photographs 12 and 13 are of the area North of 16th Avenue near the Beach Patrol Building. You can see that the jersey barriers are still in place

in Photograph 13. I did not observe any new violations or regulated activity during this inspection.

15. I was then directed to collect measurements of the dune between 14th and 16th Avenues using a Trimble Geo7X Global Positioning System Unit ("GPS)". I attempted to collect this information on October 28, 2022. However, the conditions that day did not make it safe for me to collect this information as there was a Nor-Easter occurring that day. Relevant photographs from my inspection that day are attached at **Exhibit E**.

16. The photograph marked 5 was taken looking South of 11th Avenue. This is the location where NWW excavated sand, moved it to the beach area between 14th Avenue and 16th Avenue and graded the sand towards the dune area. In this photograph you can see the Nor-Easter conditions in the water. I then proceeded toward the area of 15th Avenue near the Beach patrol Building. Photographs marked 10 and 22 depict the landward side of this area and you can see the jersey barriers are still in place. I then proceeded to walk toward the beachfront and took a photograph south of 14th Avenue, which is marked as Number 24. This photograph shows the beach berm and dune in front of the Beach Patrol Building. During this inspection, I observed some erosion of the beach berm.

Collection and Interpretation of GPS Data Regarding the Length and Width of Beach Berm/Dune From 14th to 16th Avenue(s)

17. In furtherance of my duties as an Environmental Specialist, I have developed expertise in utilizing DEP's GPS Units and ArcMap Geographic Information System ("GIS") software. The utilization of these technologies is a regular part of my job duties, and I have continued to pursue additional training and professional development to support these skills, including training in "Creating Web Maps and Apps" (NJDEP: November 2019), "Overview of LRP Internal Application & Web Mapping Tools" (NJDEP: January 2022), "ArcPro GIS Training" (NJDEP: October 2019), "CLUE In-House GIS Training" (NJDEP: January 2017), and internal DEP training for utilizing Trimble GPS Units and GPS Pathfinder Office Training.

18. In 2019, CLUE purchased Trimble Geo7x handheld GPS Units. Trimble is a leading manufacturer of GPS Units, and is the preferred manufacturer of DEP's GIS Bureau, which provides technical support for DEP's data collection and management activities. CLUE purchased the Geo7x GPS Units because they are the most accurate handheld data collectors available for field use, providing reliable measurement within a meter under optimal working conditions.

19. I use the Geo7x handheld GPS Unit to determine the location and area of regulated activities, or to determine the limits of an area regulated by CLUE, including a dune or wetland area. To measure, I keep the GPS Unit on me, and walk the length

of the object, activity, or area that I am trying to measure. For example, if I want to measure the length of a fence, I walk along the fence. If it is a multi-dimensional regulated activity or area, I walk along the boundaries of the regulated activity or area. I also make sure to have two control points to ensure accuracy. The data generated from the site inspection is then uploaded to DEP's "GPS Pathfinder Office" software.

20. The GPS Pathfinder Office software refines the data from the GPS Unit through a process called "differential correction." This employs a network of independently owned and operated Continuously Operating Reference Stations ("CORS") managed by the National Oceanic and Atmospheric Administration's National Geodetic Survey. CORS are fixed at known, surveyed points, and continuously record their Global Navigation Satellite System ("GNSS") positions. By comparing the positional data from the CORS to the nearest to the raw data from the GPS data collected, differential correction resolves errors in the raw data that may be introduced from atmospheric conditions, such as overcast skies.

21. The accuracy of the differentially corrected data is then verified in a data correction log generated by the GPS Pathfinder Office.

22. The GPS data is then exported to DEP's GIS software, Esri's "ArcGIS Pro" platform. Esri is a private software development corporation that specializes in the development of GID

software. Esri's products are among the most widely used in the environmental field, relied upon by local, state, and federal governments, environmental consultants, engineers, and others.

23. GIS software is used to create, display, analyze, and process maps, or any sort of visual data that has a geospatial component. For CLUE staff, GIS analyses commonly include review of aerial photography to determine land use change over time, a review of DEP-managed data to determine the extent of potential regulated areas (such as wetlands or beaches), and the analysis of collected GPS data.

24. DEP's GIS software uses, among other measures, the "New Jersey Plane," which, like latitude and longitude, is essentially New Jersey's own coordinate systems, and the "U.S. Survey Foot," to orient GPS data collected within GIS aerial photography. All GPS data is converted to this format to ensure that the GPS data and any pre-existing DEP data, such as aerial imagery, are referenced to the same coordinate system.

25. Therefore, the accuracy of the GPS data collected during site inspections can be assured by comparing lines and shapes generated during the site inspection with known, fixed location, such as a building corner or perimeter wall, as depicted on GIS aerial imagery. If the lines and shapes generated during the walk align with the measured objects as depicted on aerial photographs,

or other markers, then the measurements taken during the walk were accurate.

26. On November 1, 2022, I went back out to the NWW beachfront and in particular the area of 15th Avenue to collect data points to determine the approximate dimensions and limits of the site's beach berm/dune. I collected two GPS control points, which were the Northwest corner of the Beach Patrol Building and the large blue post located on the corner of 15th Avenue near the pedestrian walkway in front of the Beach Patrol Building. I then proceeded to walk the perimeter of the beach berm/dune system from 14th Avenue to 16th Avenue. This perimeter walk is highlighted in yellow on Slide 1 in the PowerPoint attached as **Exhibit F**.

27. I subsequently downloaded the GPS data collected on November 1, 2022 into GPS Pathfinder Office and conducted a differential correction of the data collected. I then exported the data to DEP's GIS software and overlaid the data points with Near Map imagery of the site taken on February 19, 2022.

28. I determined based on my data collection points collected on November 1, 2022 by way of the GPS Unit, and after overlaying these points on the most recent Near Map imagery from February 19, 2022, that there is approximately 70 feet of beach berm and dune directly in front of the Beach Patrol Building at 15th Avenue. See Slide 5 in the PowerPoint in **Exhibit F**. Immediately to the south of the storage units there is

approximately 103 feet of beach berm and dune. This determination was made utilizing the ArcMap GIS Measurement Tool to measure the width of the limits of the sites beach berm and dune system collected with the GPS Unit on November 1, 2022. I also determined that there was an approximate beach berm loss immediately south of 15th Avenue since February 19, 2022 of 30 feet, based on a comparison of the GPS data collected on November 1, 2022 and the approximate limits of the site's beach berm/dune depicted in the February 19, 2022 Near Map Imagery. This determination was made utilizing the ArcMap GIS Measurement Tool to measure the difference between the limits of the site's beach berm and dune GPS information collected on November 1, 2022 and the approximate limits of the site's beach berm/dune present on February 19, 2022. See Slides 2 through 4 in the PowerPoint in **Exhibit F**.

29. I also took photographs of the condition of the beachfront during my November 1, 2022 inspection. Relevant photographs from this inspection are attached as **Exhibit G**. In the photograph marked 6, you can see South of 11th Avenue toward the Beach Patrol Building. You can see the beach berm and dune system in front of the Beach Patrol Building. The photograph marked 14 was taken on the beachfront looking toward the beach berm and dune in front of the Beach Patrol Building. You can see the roof of the Beach Patrol Building over the dune. Photograph marked 16 provides a view of the beach berm and dune system closer to 16th

Avenue. In these photographs you can see erosion to the beach berm from the Nor-Easter. However, the recent erosion observed was limited to the bottom of the ocean-side slope of the beach berm.

30. Photographs marked 19, 20, and 22, also show the dune system directly in front of the Beach Patrol Building and the storage sheds at 15th Avenue. In these photographs you can see that the site's vegetated dune system is still in place protecting this area.

Aerial Photographs from Fly Over of NWW Beachfront on November 3, 2022

31. On the morning of November 3, 2022, I was directed by my management to take aerial photographs of the NWW beachfront and in particular the area of 15th Avenue to document current conditions. As such, I boarded a flight that morning that flew over the NWW beachfront for approximately seven minutes from 10:56 am through 11:03 am. While this was low tide, the photographs from my flight provide context of the current conditions of the site's dune and berm system and a review of the beach conditions from the authorized sand borrow area in Wildwood through the NWW oceanfront. Attached as **Exhibit H** are relevant photographs from this flight.

32. Photograph marked 33, provides an aerial view of the Beach Patrol Building and the storage units at 15th Avenue. You can see the jersey barriers are still up and directly behind the jersey barriers. In this photograph you can see that there is

substantial area behind the storage units to move those units back away from the jersey barriers and the dune system. The photograph marked 33 also shows the delineated freshwater wetlands area to the right of the Beach Patrol Building. To the right of the vegetated freshwater wetland area is the location of where NWW excavated sand and moved it and graded it towards the dune system between 16th Avenue and 14th Avenue.

33. In the photograph marked 45 and photograph marked 46, I was on the landward side of the beachfront, and you can see the Beach Patrol Building and the storage units. Behind the jersey barriers, you can see the dune system.

34. Photograph 76, is an aerial photograph covering approximately from 18th to 22nd Avenues. Photograph 79, is an aerial photograph of 15th Avenue. In this photograph you can see the jersey barriers, a portion of which are within the freshwater wetlands transition area located to the northeast of the Beach Patrol Building.

Most Recent Inspection(s) of NWW Beachfront Shows Conditions Have Remained the Same

33. I conducted another inspection of NWW's beachfront on November 16, 2022. Relevant photographs from this inspection are attached as **Exhibit I**. Generally, the conditions of the beach berm in the area of 15th Avenue have not changed since my last inspection. A healthy dune system still remains in front of the

Beach Patrol Building. Photograph marked 11 is of this dune system and you can see one of the storage sheds in the left corner of the photograph. I took the photograph marked 13 looking North of 16th Avenue on the oceanside of the beach berm and dune. This image provides a good idea of the condition of the beach berm and dune system in front of 15th Avenue and shows that further erosion has not occurred since my last inspection. I took photograph 20 looking South from 14th Avenue. In this photograph you can also get a good idea of the beach berm and dune system in front of 15th Avenue and you can see the storage sheds in the upper right-hand corner.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Dated: 12/6/22

Michael Lutz

Michael J. Lutz
Environmental Specialist III,
Bureau of Coastal and Land Use
Compliance and Enforcement

LUTZ
EXHIBIT A

EXHIBIT A
North Wildwood: 10/6/2022 Site photos
Taken between 9:10am – 10:48am
(South Fifteenth Avenue) M. Lutz #18

EXHIBIT A
North Wildwood: 10/6/2022 Site photos
Taken between 9:10am – 10:48am
(North of Fifteenth Avenue) M. Lutz #19

EXHIBIT A
North Wildwood: 10/6/2022 Site photos
Taken between 9:10am – 10:48am
(North of Eighteenth Avenue) M. Lutz #21

EXHIBIT A
North Wildwood: 10/6/2022 Site photos
Taken between 9:10am – 10:48am
(North of Eighteenth Avenue) M. Lutz #22

LUTZ
EXHIBIT B

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am
(South of Fifteenth Avenue) M. Lutz #5

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am

(South of Fifteenth Avenue) M. Lutz #6

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am
(North of Fifteenth Avenue) M. Lutz #7

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am
(South of Fifteenth Avenue) M. Lutz #8

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am

(North of Fifteenth Avenue) M. Lutz #9

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am

(Fifteenth Avenue) M. Lutz #10

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am

(South of Fifteenth Avenue) M. Lutz #11

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am
(North of Fifteenth Avenue) M. Lutz #12

EXHIBIT B
North Wildwood: 10/14/2022 Site photos Taken between 8:37am – 8:51am
(South of Twelfth Avenue) M. Lutz #14

LUTZ
EXHIBIT C

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Eleventh Avenue) M. Lutz #3

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Eleventh Avenue) M. Lutz #4

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Eleventh Avenue) M. Lutz #5

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Eleventh Avenue) M. Lutz #6

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Eleventh Avenue) M. Lutz #7

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Eleventh Avenue) M. Lutz #8

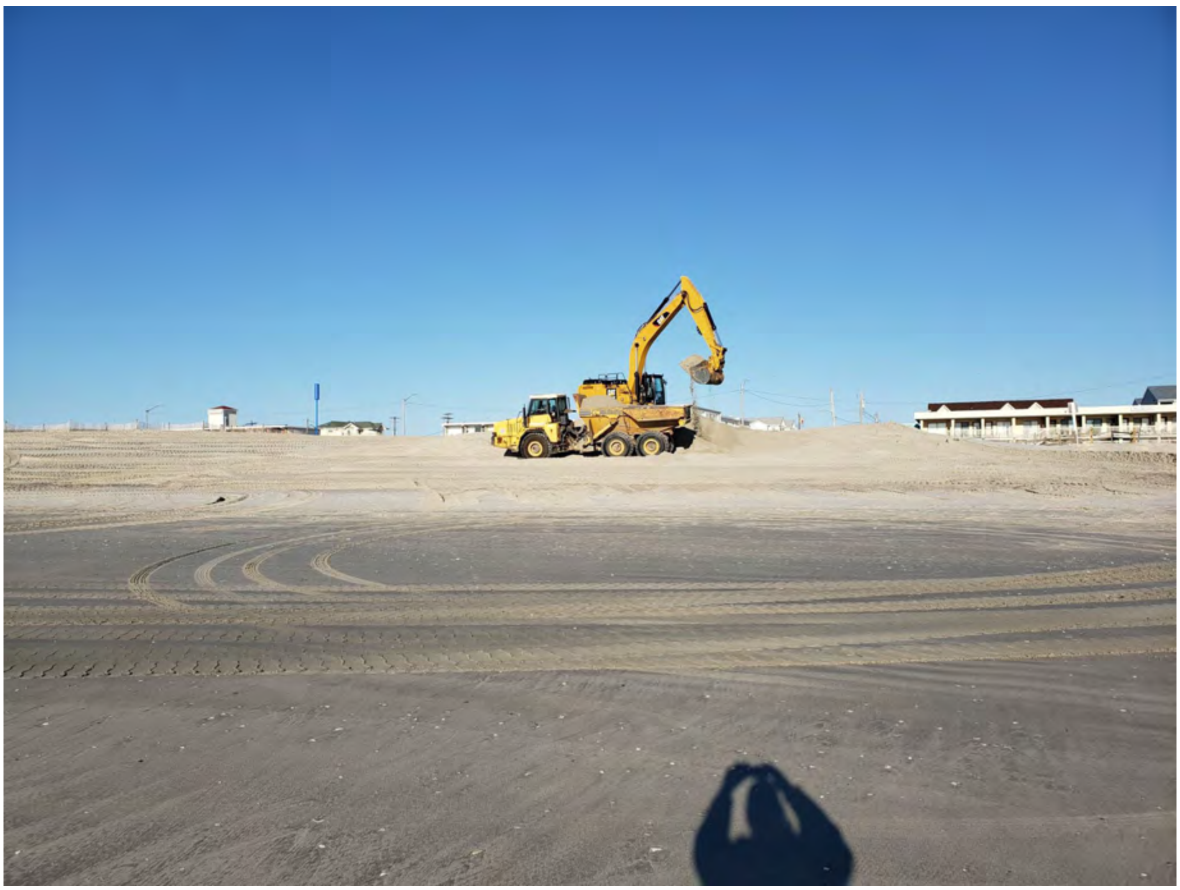

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Eleventh Avenue) M. Lutz #9

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Twelfth Avenue) M. Lutz #10

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(Fifteenth Avenue Area) M. Lutz #11

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(Fifteenth Avenue Area) M. Lutz #12

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(Fifteenth Avenue Area) M. Lutz #13

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(Fifteenth Avenue Area) M. Lutz #14

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(North of Sixteenth Avenue) M. Lutz #15

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Sixteenth Avenue) M. Lutz #17

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Sixteenth Avenue) M. Lutz #18

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(South of Sixteenth Avenue) M. Lutz #19

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(North of Fifteenth Avenue) M. Lutz #21

EXHIBIT C
North Wildwood: 10/20/2022 Site photos
Taken between 8:52am – 9:26am
(North of Fifteenth Avenue) M. Lutz #24

LUTZ
EXHIBIT D

EXHIBIT D
North Wildwood: 10/21/2022 Site photos
Taken between 8:46am – 9:15am
(South of Eleventh Avenue) M. Lutz #6

EXHIBIT D
North Wildwood: 10/21/2022 Site photos
Taken between 8:46am – 9:15am
(North of Sixteenth Avenue) M. Lutz #12

EXHIBIT D
North Wildwood: 10/21/2022 Site photos
Taken between 8:46am – 9:15am
(North of Sixteenth Avenue) M. Lutz #13

LUTZ
EXHIBIT E

EXHIBIT E
North Wildwood: 10/28/2022 Site photos
Taken between 9:46am – 10:38am
(South of Eleventh Avenue) M. Lutz #5

EXHIBIT E
North Wildwood: 10/28/2022 Site photos
Taken between 9:46am – 10:38am
(North of Sixteenth Avenue) M. Lutz #10

EXHIBIT E
North Wildwood: 10/28/2022 Site photos
Taken between 9:46am – 10:38am
(North of Sixteenth Avenue) M. Lutz #22

EXHIBIT E
North Wildwood: 10/28/2022 Site photos
Taken between 9:46am – 10:38am
(South of Fourteenth Avenue) M. Lutz #24

LUTZ
EXHIBIT F

City of North Wildwood, February 19, 2022 Near Map Imagery Depicting the GPS Data Collected by the NJDEP on November 1, 2022 & Roads ArcMap GIS Layer

City of North Wildwood, February 19, 2022 Near Map Imagery, Depicting the GPS Data Collected by the NJDEP on November 1, 2022 & Approximate Beach Berm Oceanward Limits in Spring 2022

City of North Wildwood, February 19, 2022 Near Map Imagery Depicting the GPS Data Collected by the NJDEP on November 1, 2022 & May 18, 2021 & Approximate Area of Beach Berm/Dune Loss Since February 2022

City of North Wildwood, February 19, 2022 Near Map Imagery, Depicting the GPS Data Collected by the NJDEP on November 1, 2022 & Approximate Beach Berm Oceanward Limits in Spring 2022 & Approximate Width of Beach Berm Loss that has Occurred Since the Spring of 2022

City of North Wildwood, February 19, 2022 Near Map Imagery Depicting the GPS Data Collected by the NJDEP on November 1, 2022 & Approximate Width of the Site's Beach Berm/Dune

LUTZ
EXHIBIT G

EXHIBIT G
North Wildwood: 11/01/2022 Site photos
Taken between 8:43am – 9:51am
(South of Eleventh Avenue) M. Lutz #6

EXHIBIT G
North Wildwood: 11/01/2022 Site photos
Taken between 8:43am – 9:51am
(Fifteenth Avenue Area) M. Lutz #14

EXHIBIT G
North Wildwood: 11/01/2022 Site photos
Taken between 8:43am – 9:51am
(Sixteenth Avenue Area) M. Lutz #15

EXHIBIT G
North Wildwood: 11/01/2022 Site photos
Taken between 8:43am – 9:51am
(Sixteenth Avenue Area) M. Lutz #16

EXHIBIT G
North Wildwood: 11/01/2022 Site photos
Taken between 8:43am – 9:51am
(North of Sixteenth Avenue) M. Lutz #19

EXHIBIT G
North Wildwood: 11/01/2022 Site photos
Taken between 8:43am – 9:51am
(North of Sixteenth Avenue) M. Lutz #20

EXHIBIT G
North Wildwood: 11/01/2022 Site photos
Taken between 8:43am – 9:51am
(North of Sixteenth Avenue) M. Lutz #22

LUTZ
EXHIBIT H

EXHIBIT H
North Wildwood: 11/03/2022 Air Flight photos Taken between 10:56am – 11:03am
(15th Avenue Area) M. Lutz #33

EXHIBIT H
North Wildwood: 11/03/2022 Air Flight photos Taken between 10:56am – 11:03am
(12th Avenue Area) M. Lutz #35

EXHIBIT H
North Wildwood: 11/03/2022 Air Flight photos Taken between 10:56am – 11:03am
(14th Avenue Area) M. Lutz #45

EXHIBIT H
North Wildwood: 11/03/2022 Air Flight photos Taken between 10:56am – 11:03am
(16th Avenue Area) M. Lutz #46

EXHIBIT H
North Wildwood: 11/03/2022 Air Flight photos Taken between 10:56am – 11:03am
(17th Avenue Area) M. Lutz #76

EXHIBIT H
North Wildwood: 11/03/2022 Air Flight photos Taken between 10:56am – 11:03am

(7th Avenue Area) M. Lutz #79

LUTZ
EXHIBIT I

EXHIBIT I
North Wildwood: 11/16/2022 Site photos
Taken between 8:37am – 9:20am
(North of Sixteenth Avenue) M. Lutz #11

EXHIBIT I
North Wildwood: 11/16/2022 Site photos
Taken between 8:37am – 9:20am
(North of Sixteenth Avenue) M. Lutz #13

EXHIBIT I
North Wildwood: 11/16/2022 Site photos
Taken between 8:37am – 9:20am
(South of Fourteenth Avenue) M. Lutz #20

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SUPERIOR COURT OF NEW JERSEY, CAPE MAY COUNTY
CHANCERY DIVISION
Docket No. * ____-22

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, Plaintiff, v. CITY OF NORTH WILDWOOD, "XYZ CONTRACTORS" 1-10, "JOHN AND/OR JANE DOES" 1-10, Defendants.	Civil Action **CERTIFICATION OF LAURANCE S. TOROK IN SUPPORT OF PLAINTIFF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S ORDER TO SHOW CAUSE FOR PRELIMINARY INJUNCTION & TEMPORARY RESTRAINTS**

I, LAURANCE S. DOYLE, of full age, certify and say:

1. I am a Research Scientist within the Bureau of Watershed Management in the Division of Watershed Protection and Restoration at the Department of Environmental Protection ("DEP"). I started my recent position in 2021 and my duties include, but are not limited to, serving as senior advisor to the Bureau's Endangered and Threatened Species Unit on regulatory issues involving endangered or threatened species rule compliance under the Freshwater Wetlands Protection Act, the Flood Hazard Control Act,

the Highlands Preservation Act, and the Coastal Zone Management Rules, acting as lead party on "legacy" projects and permits involving endangered or threatened species habitat compliance, providing expert recommendations on endangered and threatened species compliance issues for Water Quality Management Plan amendment applications, overseeing the management of federal grant funds and managing state funded contracts associated with coastal and watershed planning.

2. Before I began this position, I served as manager of the Bureau of Watershed Management/Technical services overseeing the Mitigation Unit, Endangered and Threatened Species Unit, the 319 Grant Unit, and the Administrative Support Unit for 2019 to 2021. Prior to this position, I spent 15 years supervising the operations of the Endangered and Threatened Species Unit within the Division of Land Use Regulation and was involved in all aspects of making regulatory compliance decisions for applications under the Freshwater Wetlands Protection Act, Flood Hazard Control Act, the Coastal Zone Management Rules and Highlands Preservation Act as they related to threatened and endangered species habitats. I have also worked for the NJDEP, Division of Fish and Wildlife, Endangered and Nongame Species Program as an Assistant Zoologist and the NJDEP, Office of Natural Lands Management, Natural Heritage Program as a contractual employee.

3. I have worked for DEP for 35 years, after graduating from the Ohio Wesleyan University with a Bachelor of Arts in General Zoology and the State University of New York, College of Environmental Science and Forestry with a Master's degree in Forest Biology.

4. I make this certification in support of the Department's request for a preliminary injunction and temporary restraints to halt North Wildwood ("NWW") from moving forward with installing a bulkhead as recently denied by the Department on October 12, 2022 in NWW's Emergency Authorization ("EA") application following the remnants of Hurricane Ian, and in violation of numerous Department statutes as NWW does not have an approved permit to conduct such regulated activity.

5. As noted above, my job duties require that I determine the resource value classification of freshwater wetlands and subsequent establishment of freshwater wetland transition areas pursuant to Freshwater Wetlands Act Rules N.J.A.C. 7:7-1 et seq.

6. Following NWW's 2020 submission of its CAFRA and Freshwater Wetland Protection Act #6 and #6a permit application to DEP, I reviewed the permit application to determine compliance with the Freshwater Wetlands Act Rules. This certification provides my analysis of the freshwater wetlands and freshwater wetlands transition area North of the Beach Patrol Building near 15th Avenue.

7. I determined that pursuant to the Freshwater Wetlands Act Rules, the freshwater wetlands and freshwater wetlands transition area in this location are of exceptional resource value. N.J.A.C. 7:7A-3.2(b)(c). As discussed in the certification of Jennifer Moriarty, the Department previously issued a Letter of Interpretation ("LOI") in 2019 for this area determining the resource value as intermediate. However, the LOI indicates that this classification can be revisited and changed by the Department at any time.

8. Based upon the information submitted in the 2020 permit application, upon further review of DEP's Landscape Project Maps, and the Department's protocols for the establishment of exceptional resource value for wetlands, I determined the resource value is no longer intermediate, but exceptional.

9. The wetlands and wetlands transition area North of the Beach Patrol Building are mapped as rank 4 (state endangered) wetlands, which includes wetland habitat for several beach associated birds and for migratory raptor concentration. See attached Figure One as **Exhibit A**.

10. For a wetland to be designated as being of exceptional resource value it must "remain suitable for breeding, resting, or feeding by these species during the normal period these species would use the habitat." N.J.A.C. 7:7A-3.2(b)3. DEP's Protocols for the Establishment of Exceptional Resource Value Wetlands provides

the parameters suitable for the habitat for migratory raptors. These parameters generally include (1) deciduous, mixed, or evergreen wetland forest; (2) deciduous, mixed, or evergreen scrub-scrub wetlands; and (3) freshwater or tidal emergent wetlands. Attached as **Exhibit B** is DEP's Migratory Raptor Protocol. I determined that the wetlands remaining between 15th and 14th Avenues provide habitat for at least three listed species which/that is suitable for resting or feeding by songbirds upon whom migratory raptors prey upon and would therefore, be suitable resting or foraging habitat for migratory raptors. State listed species for which these habitats would be most suitable for include the peregrine falcon (state endangered), norther harrier (state endangered), and the American kestrel (state endangered). As a result, I determined that the mapped freshwater wetlands between 15th and 8th Avenues to be of exceptional resource value.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements by me are willfully false, I am subject to punishment.

Dated: 12/2/2022

Laurance S Torok
Laurance S. Torok

TOROK EXHIBIT A

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:622

Hydr_NHD_2015_Net Flow Analysis Find Common Ancestors

Editor

Drawing Arial 24 B I U DEP Data Data Layers : Imagery : County/Muni Selector :

Identify

Identify from: <Visible layers>

- Migratory Raptor Concentration Site
- Migratory Raptor Concentration Site
- coastal_v3_3
  - VEGETATED DUNE COMMUNITIES
    - sptbl_01
      - Migratory Raptor Concentration Site
      - Red Knot
      - Sanderling
      - Common Tern
      - Least Tern
      - Piping Plover
      - Least Tern
      - Gull-billed Tern
      - Semipalmated Sandpiper
      - American Oystercatcher
    - r1tbl_01
  - HERBACEOUS WETLANDS
    - sptbl_01
      - Yellow-crowned Night-heron
      - Common Tern
      - Migratory Raptor Concentration Site
      - Piping Plover
      - Tricolored Heron
      - Snowy Egret
      - Gull-billed Tern
      - Black-crowned Night-heron
      - American Oystercatcher
    - r1tbl_01

Location: 407,042.250 57,813.586 Feet

Field	Value
C_FED_STAT	NA
C_LNDR	4
C_NJ_STATU	NA
CLASS	Aves
COMNAME	Migratory Raptor Concentration Site
ELEMENT_ID	10412
EO_ID	6656
EO_NUM	1
FEAT_DESC	Non-breeding Concentration
FED_STATUS	NA
FID	32577
LAST_OBS	2013-??-??
LINK_ID	35701
LNDR	4
LNDR_3_5	yes
LUC_DESC	Nonbreeding
NJ_STATUS	NA

Identified 21 features

407187.421 58073.166 Feet

TOROK EXHIBIT B

PROTOCOLS FOR THE ESTABLISHMENT OF EXCEPTIONAL RESOURCE VALUE WETLANDS PURSUANT TO THE FRESHWATER WETLANDS PROTECTION ACT (N.J.S.A. 13:9B-1 ET SEQ.) BASED ON DOCUMENTATION OF STATE OR FEDERAL ENDANGERED OR THREATENED SPECIES

JANUARY 2013

A cooperative effort of
THE DIVISION OF LAND USE REGULATION

OFFICE OF NATURAL LANDS MANAGEMENT
DIVISION OF PARKS AND FORESTRY
and
THE ENDANGERED AND NONGAME SPECIES PROGRAM
DIVISION OF FISH AND WILDLIFE
http://www.nj.gov/dep/landuse/

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Appendicies

Name: Migratory Raptors

Status: State Endangered

Bald Eagle (*Halieetus leucocephalus*) ***
Northern Harrier (*Circus cyaneus*) **
Peregrine Falcon (*Falco peregrinus*)
Red-Shouldered Hawk (*Buteo lineatus*) **

State Threatened

Osprey (*Pandion haliaetus*) **
Long-eared owl (*Asio otus*)
American kestrel (*Falco sparvius*)

** State listing for breeding status only; species breeds, migrates and/or overwinters in Cape May.
*** Breeding population endangered, wintering population threatened.

Habitat:

Types of habitat expected to be used during the migration period, from September 1 to December 1, by each of the six species identified above are described below. Unless otherwise noted, migratory raptors are associated with vegetative communities structurally similar to those used during the breeding season. Factors which affect the suitability of a habitat for breeding use are human disturbance, competition, and predation. The fore mentioned factors, however, do not have a large role in the determination of the suitability of a particular habitat for use by migrating birds.

American Kestrel

Kestrels are commonly associated with open areas with few trees containing cavities; wet meadows; forest edges; and orchards (DeGraaf and Rudis 1986). Wintering kestrels have been shown to favor disturbed grassland habitats but will also use undisturbed grassland, old fields and plowed fields in Missouri (Toland 1987). Habitat use in Kentucky followed a similar pattern with pastureland and old field being the primary habitats used (Sferra 1984). Roost locations for wintering birds in Pennsylvania included tree branches (maples, pines and oaks), tree cavities and multible human structures (Ardia 2001).

Bald Eagle

The preferred foraging habitat of the bald eagle is open water: rivers, lakes, and estuaries (DeGraaf et al. 1980). The primary prey item for eagles is fish though they will take various species of birds, reptiles, mammals, and invertebrates (Retfalvi 1970; Dunstan and Harper 1975; DeGraaf et al. 1980; Cline and Clark 1981; Todd et al. 1982; Frenzel 1984).

Trees in proximity to water are the favored perch site for eagles (Stalmaster and Neuman 1979; Steenof et al 1980; Chester et al. 1990). Perch sites generally consist of tall (mean 21.1 m / 69 ft), large (mean 42.3 cm / 17 in) trees featuring stout, horizontal branches with at least one side facing an open area (Steenof et al. 1980).

Roosting habitat tends to be located near water and features mature living or dead hardwoods or softwoods (Steenof 1978; Keister and Anthony 1983; Stalmaster and Gessaman 1984; Keister et al. 1985; Buehler et al 1991)

Long-eared owl

In general, long-eared owls are associated with open field or meadow habitats interspersed with hedge rows, wood lots, conifer groves or plantations for breeding and winter roosts (Bent 1938; Craig and Trost 1979: Wijnandts 1984; DeGraaf and Rudis 1986; Marks 1986; Kren 1987: Bosakowski et al. 1989a). Evergreen species are favored for roosting habitat though hardwood stands may also be used (Randle and Austing 1952: Smith 1981; Craig et al. 1985; Bosakowski et al. 1989b:). Getz (1961) found long-eared owls to feed over open field habitats because of the low amount of cover available for microtine prey. Areas less favored included bog, marsh, and several forested habitats. In Cape May, owl banding stations captured long-eared owls in various habitats, including a red cedar (*Juniperus virginiana*) grove, hay fields and brackish marsh (Duffy and Kerlinger 1993)

Norther Harrier

Northern harriers are primarily a species of the open country; occurring in such habitats as farm fields, salt and freshwater marshes, swamps, bogs, and wet meadows (Hall 1983; Laughlin and Kibbe 1985; Serrentino 1989). Freshwater wetland vegetation occurring in northern harrier habitats include meadowsweet (*Spiraea latifolia*), red-osier dogwood (*Cornus stolonifera*), sedges (*Carex* spp.), bulrushes (*Scirpus* spp.), goldenrod (*Solidago* spp.), willow (*Salix* spp.) and wet hayfields dominated by reed canary grass (*Phalaris arundinacea*) (Serrentino 1987; Hamerstrom and Kopeny 1981; Laughlin and Kibbe 1985). Coastal habitats feature northern bayberry (*Myrica pensylvanica*), black huckleberry (*Gaylussacia baccata*), wild rose (*Rosa* spp.), common reed (*Phragmites australis*), salt hay grass (*Spartina patens*), smooth cordgrass (*S. alterniflora*), and poison ivy (*Toxicodendron radicans*) (Holt and Melvin 1986; Dunne 1984; England 1989).

Osprey

Ospreys primarily feed upon fish and forage in estuarine, river, and lake habitats during migration. Water bodies should be free of dense emergent or subemergent vegetation as well as dense, overhanging vegetation from the banks or shore (Hynes 1970; Postupalsky and Stackpole 1974; Prevost 1977). Favored perch sites are similar to nest sites, principally being live or dead trees, but also buoys, channel markers, nest platforms, or utility poles (Berger and Mueller 1969; Wiemeyer 1971; MacCarter 1972; Prevost 1977; Rhodes 1977). Little is documented in regard to osprey roost habitat.

Peregrine Falcon

Peregrine falcons in New Jersey feed primarily on avian prey (Steidl 1989). Foraging habitats are usually open areas such as lakes, rivers, and marshes where prey are abundant and vulnerable (Evans 1982; Palmer 1988). During migration, peregrines will use open areas (e.g. fields), forest and ecotones to forage on passerine prey (K. Clark pers. comm).

Red-Shouldered Hawk

A review of the literature indicates that red-shouldered hawks are commonly associated with habitats varying from lowland hardwood, mixed, and conifer forests to upland mixed and conifer forests (Henny et al. 1973; Bednarz and Dinsmore 1981; Titus and Mosher 1981; Crocoll and Parker 1991). Surrounding habitats were almost always characterized by nearby waterbodies (e.g. swamps, rivers, ponds) and tracts of forest (Kimmel and Fredrickson 1981; Morris and Lemon 1983; Bosakowski et al.1992a). In a study of southern New Jersey breeding habitats, red-shouldered hawks were commonly associated with younger wetland forests typified by Atlantic white cedar, red maple (*Acer rubrum*), black tupelo (*Nyssa sylvatica*), sassafrass (*Sassafras albidum*) and sweetbay (*Magnolia virgiana*) with surrounding habitats of oak-pine forest and agricultural fields (Dowdell and Sutton 1992).

Survey Methodologies:

Additional information regarding the techniques used for the Cape May studies cited above and their applicability to a particular site may be obtained from the:

Endangered and Nongame Species Program
NJDEP
Division of Fish, Game, and Wildlife
501 East State Street, Trenton, New Jersey 08625

Regulatory Guidelines:

1. Area of documentation: The lower 10 kilometers (6 miles) of the Cape May peninsula. Identifiable by Universal Transverse Mercator line 43.18 on U.S.G.S. suvey quadrangles Rio Grande and Stone Harbor.

2. Suitable habitat: Vegetational communities featuring the following characteristics will be considered to provide habitat for one or more of the species described above.

a. Deciduous, mixed, or evergreen wetland forest:
   - i. Mature trees of a dbh of 20 cm (8 in) or greater
   - ii. Canopy height of 6.1 m (20 ft) or greater
   - iii. Snags, dead, or down material

vi. Shrubby understory vegetation. The density of the shrub layer affects raptor foraging habitat suitability.

b. Deciduous, mixed, or evergreen scrub-shrub wetlands:

i. Overstory height of < 6.1 m (20 ft)

ii. Songbird food and cover plants including, but not limited to:

winterberry holly (*Ilex verticillata*)
poison ivy (*Toxicondendron radicans*)
elderberry (*Sambucus canadensis*)
willow oak (*Quercus phellos*)
red maple (*Acer rubrum*)
honeysuckle (*Lonicera* spp.)
red cedar (*Juniperus virginiana*)
Virginia creeper (*Parthenocissus quinquefolia*)
wild cherry (Prunus spp.)
winged sumac (*Rhus copallina*)
hackberry (*Celtis* spp.)
grape (*Vitis* spp.)
holly (*Ilex opaca*)
pokeweed (*Phytolacca americana*)
sourgum (*Nyssa silvatica*)
sassafras (*Sassafras albidum*)
waxmyrtle (*Myrica certifera*)
goundsel tree (*Baccharis halimifolia*)

(Sutton 1989)

c. Freshwater or tidal emergent wetlands:

i. ground cover plants such as:

phragmites
sedges
rushes
salt meadow cordgrass
saltmarsh cordgrass
tall cordgrass (Spartina cynosuriodes)
cattails (*Typha* spp.)
hightide bush (*Iva frutescens*)
red cedars
red maple

ii. Any of the songbird food plants described above.

iii. Interspersed open water areas.

Wetland complexes that feature an interspersion and juxtaposition of the forementioned habitat types are of greater value than monotypic stands. Maintained areas (e.g. lawns, detention basins) will not be considered as suitable habitats.

3. Other factors affecting habitat suitability: The size of the wetland complex associated with a property and the amount of human disturbance present will impact the suitability of the site for use by migratory raptors. As a rule, isolated wetland habitats less than 0.4 ha (1 ac) in size will not be considered suitable habitat unless: (a) the wetland is a component (i.e. within 150 feet) of a larger wetland complex; (b) the wetland and entire area of the 150 buffer is a component of a larger upland forest complex (see above description) and/or (c) a listed migratory raptor is observed using the wetland for "resting or feeding" during the migratory season as defined above. For monotypic wetland communities dominated by phragmites or cattails, the structural diversity of the upland buffer community and level of development or disturbance on and adjacent to the property will affect the suitability of the wetland habitat.

Varying levels of human activity have been demonstrated to alter migratory raptor use of fields and displace prey species at Higbee Beach Wildlife Management Area (Clark and Niles 1986; Niles and Clark 1987). As a result, the intensity of human disturbance experienced by an onsite wetland and the degree of surrounding development must be evaluated, on a case-by-case basis, when determining the suitablity of wetland habitats for migratory raptor use.

Rationale:

The wetlands of the Cape May peninsula have been documented as providing critical habitat for migratory raptors in studies conducted by the staff of the Cape May Bird Observatory and the Division of Fish, Game, and Wildlife (DFGW). Between 47,000 and 88,000 raptors occur on or above the peninsula during the fall migration period (Dunne and Sutton 1986). Kerlinger (1989) listed Cape May as one of the most significant locales for migratory birds in the world. At least eleven species of raptor have been documented during the migrations including both federal (peregrine falcon, bald eagle) and state (red-shouldered hawk, osprey, northern harrier) listed species. As much as 90% of these birds are immature (Niles 1989).

Research conducted by the DFGW's Endangered and Nongame Species Program has further defined the importance of wetland habitats in the lower 10 km of the Cape May peninsula. Studies conducted for a 30 kilometer portion of the peninsula and, subsequently, the lower 10 kilometers have reached the following conclusions:

1. Accipiters, falcons, and ospreys generally increase, significantly, within 10 kilometers of the point while harrier and buteo numbers are evenly distributed throughout the entire peninsula (Niles 1986);

2. A 30% increase in residental development between 1972 and 1986 has resulted in a significant loss of natural habitats available for use by migratory birds in the lower 10 kilometers (Niles 1989);

3. A statisical analysis of raptor observation data indicates that migratory raptor numbers are evenly distributed throughout the lower 10 kilometers and that species tend to be

associated with similar structural habitats as those used by breeding birds (L. Niles pers. comm.);

4. Rather than simply flying over the peninsula and continuing south across the Delaware Bay, raptor numbers concentrate in the lower 10 kilometer, generally, and along the western half of the peninsula, specifically. They forage and roost for varying periods before continuing south (Holthuijzen et al. 1982; Niles 1986).

Based on these findings, the Department has concluded that wetland habitats in the lower 10 kilometers of the Cape May peninsula are of local, statewide and regional signficance to the maintenance of North American raptor populations. As a result, suitable wetland habitats within this area are determined to be of exceptional resource value.

Primary Authors:

Larry Torok, NJDEP, Division of Land Use Regulation
Larry Niles, NJDEP, Endangered and Nongame Species Program.

DRAFT DATE: 08/08/94 UPDATE: 12/15/2012

Literature Cited:

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