



**US Army Corps
of Engineers®**

Charleston District

**CHARLESTON PENINSULA, SOUTH CAROLINA,
A COASTAL FLOOD RISK MANAGEMENT STUDY**

Charleston, South Carolina

ENVIRONMENTAL APPENDIX

April 2020

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FISH & WILDLIFE COORDINATION ACT LETTER



United States Department of the Interior



FISH AND WILDLIFE SERVICE

176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

January 31, 2019

Ms. Diane Perkins
Chief, Planning and Environmental Branch
U.S. Army Corps of Engineers
69A Hagood Avenue
Charleston, S.C. 29403-5107

Attn: Bethany Ward

Re: Charleston Peninsula Coastal Flood Risk Management Study, Charleston, South Carolina
FWS Log No. 2019-CPA-0006

Dear Ms. Perkins:

The U.S. Fish and Wildlife Service (Service) and NOAA's National Marine Fisheries Service (NMFS) recently attended the December 10, 2018, multi-agency meeting held by the U.S. Army Corps of Engineers-Charleston District (USACE), to appraise a proposed flood risk management study for the City of Charleston. The purpose of the study is to evaluate alternatives that are designed to alleviate persistent flooding on the peninsula of Charleston. There were six conceptual alternatives presented at the meeting. The USACE provided a brief overview of the alternatives and then requested preliminary input and comments from the agencies in attendance.

The Service and the NMFS do not find that any of the alternatives represent a significant threat to federally protected threatened or endangered (T&E) species, Essential Fish Habitat (EFH), or federally managed fishery species. The Service's database does not indicate known occurrences of T&E species on the peninsula. However, the West Indian manatee, Atlantic sturgeon, shortnose sturgeon, and loggerhead sea turtle may be found in the Charleston Harbor adjacent to the peninsula. Alternatives that alter tidal flow into contiguous salt marshes or drainages into the Charleston Harbor have a potential to affect these species. Even though there are no known American wood stork roosting areas or rookeries located on the peninsula, there is extensive potential foraging habitat enveloping downtown Charleston that could be affected by some of the alternatives.

At this early stage of the study, it is not possible for the Service or the NMFS to indicate a preferred alternative from those provided at the meeting. As a general recommendation, alternatives that avoid impacting any water features on or adjacent to the peninsula would be favored. Several examples displayed at the meeting included the use of green roofs, removal of impervious surfaces, rain barrel ordinances, cisterns, land preservation, and other

non-structural methods. We believe it is these alternatives that would provide the most effective flood attenuation for the peninsula of Charleston while preserving as much of the remaining natural aspects of Charleston as possible. One additional alternative would be to consider a construction moratorium for the entire peninsula, or at least prohibit new construction on currently vacant lands and require brownfield development to rebuild derelict properties.

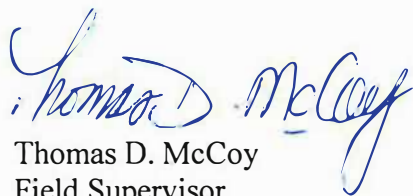
The Service also recommends the USACE consider the potential presence and project impacts to At-Risk-Species (ARS) that may be in the project area. Although no Federal protections are afforded to ARS, we recommend the USACE consider the potential impacts of this project in your evaluation of AIWW dredging project. We have included a list of the ARS that may occur in Charleston County, South Carolina. Incorporating proactive measures to avoid or minimize harm to ARS may improve their status and assist with precluding the need to list these species. Additional information on ARS can be found at:

<http://www.fws.gov/southeast/candidateconservation>

After consideration of the overall study and potential project alternatives the Service and the NMFS find that a full Fish and Wildlife Coordination Act (FWCA) investigation is not necessary. The preliminary alternatives do not represent potentially significant impacts relative to the heavily developed peninsula with its few remaining wetland resources. Several of the alternatives presented during the December 10, 2018, meeting either avoided those remaining wetlands and focused on upland activities or incorporated beneficial uses such as restoration and living shorelines. In addition, other than the transient aquatic species found in the adjacent Charleston Harbor, there are no known federally protected T&E species in the project study area. Our agencies will of course continue coordination under FWCA (16 U.S.C. § 661 *et seq.*) and provide input to the USACE when requested or as necessary.

Thank you for the opportunity to provide these comments in the early stages of the flood risk management study. If you should need further clarification regarding the Service's recommendations, please contact Mr. Mark Caldwell at (843) 727-4707 ext. 215 or by email at mark_caldwell@fws.gov, and reference FWS Log No. 2019-CPA-0006. If you should need further assistance regarding the NMFS's recommendations, please contact Ms. Cindy Cooksey at (843) 460-9922 or by e-mail at Cynthia.Cooksey@noaa.gov.

Sincerely,



Thomas D. McCoy
Field Supervisor
U.S. Fish and Wildlife Service

 for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division
NOAA/National Marine Fisheries Service

BIOLOGICAL ASSESSMENT (placeholder)

BIOLOGICAL ASSESSMENT WILL GO HERE WHEN COMPLETED

ESSENTIAL FISH HABITAT ASSESSMENT (placeholder)

ESSENTIAL FISH HABITAT ASSESSMENT WILL GO HERE WHEN COMPLETED

COASTAL ZONE MANAGEMENT/FEDERAL CONSISTENCY (placeholder)

FEDERAL CONSISTENCY DETERMINATION WILL GO HERE WHEN COMPLETED

DRAFT MITIGATION PLAN

Charleston Peninsula Coastal Flood Risk Management Study

Draft Mitigation Plan

April 2020

1.0 Mitigation Framework

This document describes the USACE and City of Charleston’s strategy for mitigating adverse environmental impacts that may result from implementation of the Tentatively Selected Plan (TSP) of the Charleston Peninsula Coastal Flood Risk Management Study (see more on the TSP in Section 2.0). This document will be updated and revised as optimization continues during the feasibility study with the Non-Federal Sponsor, and in consultation with environmental regulatory agencies, for the Final Report. It may also be revised during the Preconstruction, Engineering, and Design (PED) Phase of the project when the final engineering designs are provided and final jurisdictional determinations are made.

For ecological resources, the Water Resources Development Act (WRDA) of 1986 (Section 906) and as amended in 2007 (Section 2036) and in 2016 (Section 1163), the Water Resources Reform and Development Act (WRRDA) of 2014 (Section 1040), the National Environmental Policy Act (NEPA), and USACE Engineering Regulation (ER) 1105-2-100 Appendix C establish the mitigation framework for this Draft Mitigation Plan. They require that adverse impacts to ecological resources from Federal actions are avoided or minimized to the extent practicable, and that remaining, unavoidable impacts are compensated to the extent justified. For adverse impacts to wetlands which cannot be avoided or minimized, options include compensatory mitigation in the form of restoration, establishment, enhancement, and/or preservation (see Section 4.1 for more on compensatory mitigation regulations specifically for wetlands).

For historic and cultural resources, the Advisory Council on Historic Preservation’s Part 800 regulations provide the framework for this Draft Mitigation Plan. Specifically, 36 CFR 800.6(a) provides for continued consultation “to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize, or mitigate adverse effects on historic properties.” As part of that continued consultation, the parties will enter into a Programmatic Agreement (PA) to provide for additional avoidance and minimization as more detailed project designs are developed and appropriate compensatory mitigation once project features are optimized and sited.

This Draft Mitigation Plan identifies avoidance and minimization measures that would be employed to lessen impacts to ecological resources from the TSP. These are described in Section 3.0 below. While the primary focus of this Draft Mitigation Plan is on ecological resources, given the parallel process for addressing mitigation to historic and cultural resources under the PA, this Plan also includes reference to mitigation for historic and cultural resources where specifically noted (e.g.,

under Avoidance and Minimization Measures, below). Among ecological resources, the most significant of unavoidable adverse impacts expected are direct and indirect impacts to saltmarsh wetlands and mudflats (addressed together). The framework for compensatory mitigation for these and other ecological resources, and how it will be applied is described in Section 4.0. Impacts to historic and cultural resources have the potential to be significant, but will be addressed in the parallel process under the PA.

2.0 Summary of TSP and Impacts

The TSP for the Charleston Peninsula Coastal Flood Risk Management Study is Alternative 3, which is also the National Economic Development plan. It includes structural and nonstructural measures (see Figure 1). Alternative 3 would consist of construction of a storm surge wall with a conceptual footprint of approximately 7.8 miles long along the perimeter or nearshore of the Charleston Peninsula. For planning purposes at this stage of the feasibility study, the estimated elevation of the storm surge wall is 12 ft NADV88. Construction of the storm surge wall would be in the form of a T-wall on land, and of a combination-wall in the marsh environment. These are described in more detail in the Integrated Feasibility Report/Environmental Assessment (FR/EA). The storm surge wall would include access gates for pedestrians and traffic flow (auto and rail), and at tidal creeks and tributaries (referred to as storm gates). Two kinds of storm gates are currently proposed, sluice gates and a miter gate. In addition to the storm surge wall and associated gates, pump stations may be installed but are still being evaluated. A wave attenuation structure with a conceptual footprint of 4,000 feet long and 16 feet high (NAVD88) would be constructed in the Charleston Harbor south of the Battery, covering a total of approximately 15 acres of unconsolidated bottom. Finally, Alternative 3 would include implementation of nonstructural measures in select residential areas of the peninsula where it is not feasible to construct the storm surge wall. The types of non-structural measures are still being determined but options include relocation, home raising and/or flood proofing.

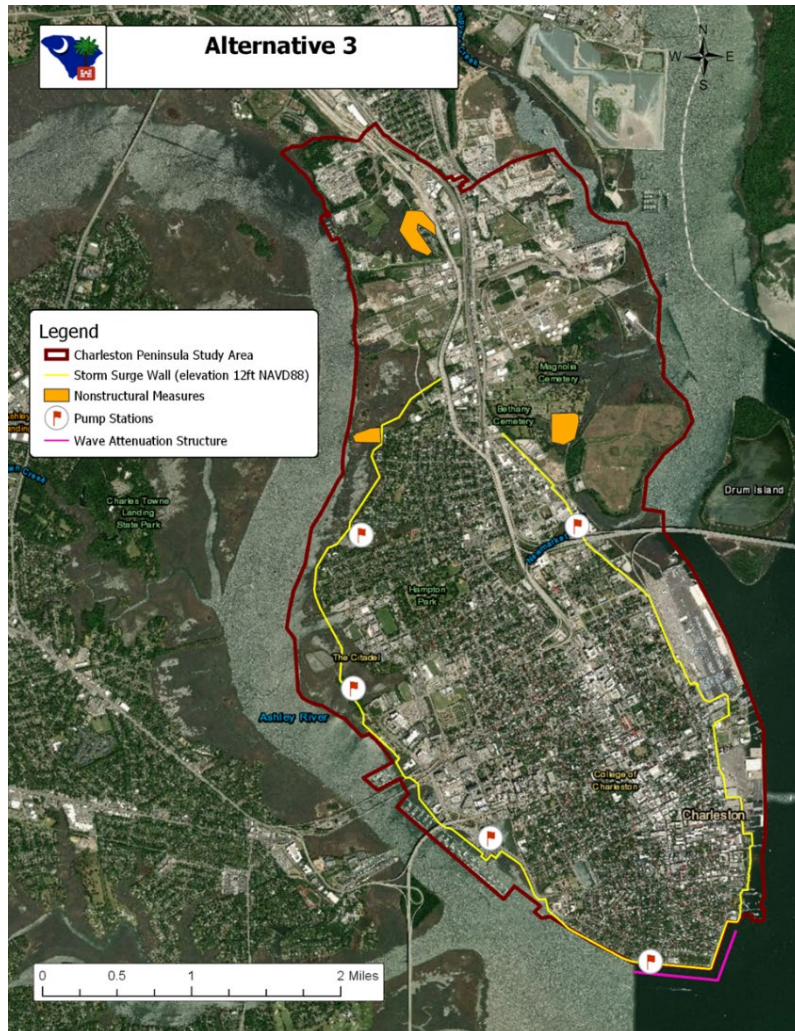


Figure 1. Map showing the structural and nonstructural measures and other potential features (e.g., pumps) in Alternative 3 of the Charleston Peninsula Coastal Flood Risk Management Study. Alternative 3 is the Tentatively Selected Plan. (Source: USACE)

The direct impacts from the TSP, as well as indirect impacts, to environmental resources are described in the Integrated FR/EA. Beneficial effects may result for a number of environmental resources through reduced storm surge flooding such as for floodplains, safety, historical/cultural resources, transportation and some land uses. Minor, temporary adverse impacts are expected across a number of resources during construction of the structural measures. No significant adverse effects are expected for any listed endangered or threatened species.

The TSP has the potential to adversely affect a maximum of approximately 111 acres of salt marsh wetlands (approximately 26 acres directly, approximately 85 acres indirectly) without additional avoidance, minimization or mitigation measures. Direct impacts would occur through excavation and placement of the storm surge wall and storm gates along marshes, mudflats and tidal creeks. The storm surge wall and gates also have the potential alter flow and water quality in marshes and creeks landward of the wall and gates, and indirectly impact aquatic and benthic resources. Scouring

may also occur in marshes seaward of the wall. Impacts of the wave attenuation feature on aquatic or benthic resources are expected to be temporary or minor. The structural and nonstructural measures also have the potential to adversely affect historic and cultural resources; however, the significance of such impacts would vary by location and depends upon final designs, so this is still being assessed, as noted above.

3.0 Avoidance and Minimization Measures

The first step in mitigation planning involves efforts to avoid and/or minimize adverse effects on environmental resources. The study alternatives were discussed with key resource agencies during a number of informal consultation meetings and site visits. Primary concerns were centered around cultural/historic resources, including viewshed impacts to historical sites from the storm surge wall and the offshore breakwater, and on placement of the storm surge wall in saltmarsh wetlands. The USACE is taking the following planning actions to avoid and/or minimize effects of the TSP. Many of these will be realized during optimization of the TSP, prior to a Recommended Plan.

Size, placement, and design of the wave attenuation feature. The conceptual breakwater will be sited approximately 230 feet offshore of the Battery seawall to avoid potential entrapment of marine mammals, sea turtles, and large fish. It will also be sited where it will not intersect with Federal navigation channels in order to minimize impacts to water-borne transportation. During optimization, the USACE will examine the effects of reducing the height of the conceptual breakwater to bring it into better alignment with the height of the Battery sea wall. During PED, the USACE will consider alternate designs for a wave attenuation feature that perform the same function but potentially reduce visual and aesthetic effects of the conceptual breakwater. Adding natural and nature-based features that would be more visually appealing and provide additional ecosystem services will also be considered during the PED phase. If any modifications to the wave attenuation feature would result in any material environmental impacts not already identified, than supplemental NEPA documentation would be prepared.

Placement of storm surge wall. During optimization, USACE and City of Charleston will continue to assess the feasibility of moving portions of the storm surge wall from the saltmarshes and mudflats to the land. This would avoid direct impacts to wetlands and to aquatic and benthic resources in those locations. Due to limited construction space in an urbanized setting, this will not be feasible everywhere, but is still being assessed. Wetland impacts that cannot be avoided, both direct and indirect, will be addressed through compensatory mitigation (see Section 4.0). During optimization and PED phase, USACE and City of Charleston will also continue to assess placement of the storm surge wall on the land to further minimize impacts to historic and cultural resources, utilities, transportation, recreation, and existing land uses.

Design of storm surge wall. During optimization, USACE and City of Charleston will assess the addition of recreational features, such as a walking path similar to the promenade on the current Battery wall, which would be a beneficial effect of the TSP. During PED phase, USACE and City of Charleston will also consider design features for the storm surge wall that would maximize consistency with the history and culture of the peninsula to minimize impacts to historic and cultural resources.

Gate modifications. During optimization and PED phase, USACE and City of Charleston will continue to evaluate placement of the storm surge wall in a manner that minimizes the number of gates, while balancing it with the number necessary to sustain adequate hydrologic, pedestrian, and transportation flow. An alternate alignment of the storm surge wall that would eliminate the need for the miter gate is also being assessed during optimization to minimize impacts on aquatic and benthic resources in that location. Modeling and consultation with resource agencies will also continue through optimization and PED phase to refine the gate closure protocol in a manner that provides storm surge protection while minimizing impacts to interior drainage, water quality, salt marsh wetlands, and aquatic resources.

Pumps. Permanent and temporary pump stations are currently proposed in the TSP to efficiently move flood waters and minimize the potential for water quality impacts, but effectiveness of the pumps is still being assessed during optimization.

Construction Best Management Practices. Various best management practices (BMPs) would be implemented during construction and outlined in contractor construction plans. These may include use of erosion blankets, silt fences, settling basins, and cofferdams to minimize erosion, sedimentation, and turbidity impacts on water quality and aquatic resources. Best management for noise abatement would include limiting the days and times of days when construction would occur, and use of noise control techniques on equipment, such as mufflers and intake silencers.

The “Standard Manatee Construction Conditions” recommended by the U.S. Fish and Wildlife Service would be followed to reduce potential construction-related impacts to the manatee to discountable and insignificant levels (FWC, 2011). These recommendations will also help to reduce the potential for impacts to other listed aquatic species, such as loggerhead sea turtles.

Living shorelines. To minimize impacts to salt marshes seaward of the storm surge wall, including scouring, installation of reef-based living shorelines is being proposed. Reef-based living shorelines are a common, affordable, and desirable bank stabilization technique in the Charleston area, where conditions are suitable. This feature would only be needed where the storm surge wall is placed in the marsh, which is primarily on the Ashley River-side of the peninsula. The South Carolina Department of Natural Resources and The Nature Conservancy have suggested that living shorelines could be effective in this area (SCDNR and TNC, personal communication). Since placement of the storm surge wall in the marsh is still being assessed during optimization, the proposed locations for living shorelines will be identified during optimization. Final locations and design for the living shorelines will be determined during the PED phase. For planning purposes at this stage of the study, approximately 9,000 linear feet of reef-based living shorelines at a maximum cost of \$150/linear foot was estimated, for a rough order of magnitude cost of \$1,350,000. This estimate will likely be reduced as the need for living shorelines is reduced as the storm surge wall is moved from the marsh to the land during optimization, and with better local cost information.

4.0 Wetland Compensatory Mitigation

4.1 Wetland Mitigation Guidance

Section 2036(a) of Water Resources Development Act (WRDA) 2007 required, among other things, that USACE Civil Works mitigation plans meet the applicable mitigation standards and policies of the Regulatory programs administered by the Secretary of the Army. On April 10, 2008, USACE and U.S. Environmental Protection Agency (USEPA) published regulations entitled, “Compensatory Mitigation for Losses of Aquatic Resources” (“Mitigation Rule”). The primary goal of these regulations was to improve the quality and success of compensatory mitigation plans that are designed and implemented to offset impacts to aquatic resources authorized by Department of the Army regulatory permits. Subsequent guidance issued 31 August 2009 by USACE (CECW-PC Memorandum, Implementation Guidance for Section 2036 (a) of the Water Resources Development Act of 2007 (WRDA 07) - Mitigation for Fish and Wildlife and Wetlands Losses) concluded that Civil Works guidance on mitigation planning is consistent with the applicable standards and policies of the Corps Regulatory Program for wetlands mitigation.

The Mitigation Rule emphasizes the strategic selection of mitigation sites on a watershed basis and established equivalent standards for all types of compensatory mitigation (mitigation banks, in-lieu fee programs, and permittee-responsible mitigation plans). Per regulations 33 CFR Parts 325 and 332, compensatory mitigation means the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of wetlands for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. The three mechanisms for providing compensatory mitigation listed in order of preference as stated in the Mitigation Rule are the following: mitigation banks, in-lieu fee programs, and permittee-responsible mitigation. Compensatory mitigation is necessary to offset these unavoidable impacts to aquatic resource functions and services and to meet the programmatic goal of “no overall net loss” of aquatic resource functions and services.

While the focus of this section is on Wetlands Compensatory Mitigation, it is noted that the Mitigation Rule being applied is itself titled, “Compensatory Mitigation for Losses of Aquatic Resources.” Thus, the mitigation considered here would also address the effects of the proposed action on related aquatic resources occupying or using the impacted wetland areas, including the habitat of commercially and recreationally important species.

4.2 Mitigation Planning Objective

USACE and City of Charleston intend to compensate for adverse impacts to salt marsh wetlands through in-kind mitigation to the extent incrementally justified, and employing a watershed approach. The preliminary mitigation planning objective is to replace non-negligible direct loss, and indirect losses in habitat function and quality, of salt marsh wetlands (measured in habitat units) as a result of the TSP. The action to be taken to achieve the mitigation objective for wetland losses is anticipated to be either the purchase of credits from an approved Mitigation Bank and/or a Permittee-Responsible Mitigation alternative (to be determined).

A rough-order of magnitude (ROM) cost for mitigation was included for calculation of net benefits of each alternative, which was identical for both action alternatives. For deriving the ROM cost, the USACE Regulatory Framework for determination of wetland credits was used with a mitigation alternative of mitigation banking.

4.3 Areas of Potential Impact

Potential areas of impact are identified in this section. The extent of the wetland losses reflected in this Draft Mitigation Plan will be updated as the process of optimization and design evolves through the remainder of the feasibility study and agency consultation. **It should be noted that the compensatory wetland mitigation need is identical for the action alternatives that were a part of the final array of alternatives in this feasibility study, and thus were not part of the decision criteria for selecting the TSP.**

Consistent with USACE guidance and at this stage in the planning process, this Draft Mitigation Plan considers the wetland losses resulting from the proposed maximum footprint and dimensions of the structural measures in the TSP. During optimization and the PED phase, additional refinements and information will be used to avoid and minimize wetland impacts and to isolate the areas of impact, resulting in a reduction of wetland impacts. It is likely that the compensatory mitigation needs will be reduced, and the intent is that the Draft Mitigation Plan will be updated accordingly.

For the preliminary analysis, potential areas of wetland impact were identified based on a visual assessment of geospatial data and local understanding of the sites. In general, these marshes and tidal creeks are relatively small and not well studied. Because the wetland areas are small, they were hand-digitized (leaving some room for inaccuracy) using current imagery, and spot-checked with 2017 NOAA Coastal Change Analysis Program (C-CAP) data. USFWS National Wetland Inventory (NWI) data was only used as a general guide since it is the least current of the data sets; however, NWI data confirmed, for estimation purposes, that only one wetland type, according to the Cowardin et al (1979) system, is present at the potential impact locations. The potential impact acreage was calculated based upon the intersection of the conceptual footprint of the storm surge wall and buffer with the digitized wetlands, including the wetland areas landward (behind) the wall. These effects only occur where the combination-wall is currently planned, which is primarily on the Ashley River-side of the study area. Since the combo-wall would not be continuous in the marsh (i.e., coming onto land in some areas), the wetlands impacted are also not continuous and can be isolated by location. Figure 2 shows the locations and labels of saltmarsh wetland areas potentially affected.



Figure 2. Areas of potential direct and indirect impacts to wetlands from the TSP. (Source: USACE)

The estimated acreages of potential impacted saltmarsh wetlands are presented in Table 1, with a total of 111 acres. As stated above, this is the maximum extent of wetlands that may need compensatory mitigation; however, the location and acreage of impacts will be refined during optimization of the TSP and with field assessment, and finalized during the PED phase.

Table 1. Estimated saltmarsh/mudflat/water quality (all EFH) impact locations that may require compensatory mitigation.

MARSH LOCATION	ESTIMATED DIRECT IMPACT (acres)	ESTIMATED INDIRECT IMPACT (acres)
Diesel Creek	3	7
Ashley River along Wagener Terrace – North end	4	4
Halsey Creek	1	17
Ashley River along Wagener Terrace – South end	3	3
Citadel channel and tributary	3	42
Ashley River along Lockwood Ave.	12	12
TOTAL	26	85

4.4 Wetland Functional Analysis

To meet the mitigation planning objective, the lost function and quality of the wetlands must be considered, not just the acreage. USACE has preliminary identified the Habitat Suitability Index (HSI) Model for white shrimp (Turner and Brody, 1983) to estimate the functional loss of wetlands, and for the associated mitigation alternatives and quantities that would occur with implementation of the TSP. This model is being considered because all of the saltmarshes in the study area are designated as be Essential Fish Habitat (EFH) for white shrimp (*Litopenaeus setiferus*) in the post-larvae to juvenile stage, as defined by the South Atlantic Fisheries Management Council in accordance with Magnuson-Stevens Act. This HSI Model is among the models approved for use by the USACE ECO-PCX; however, its appropriateness for application to this study should be done through concurrence with NOAA Fisheries and other jurisdictional agencies through the remainder of the feasibility study.

The output of the shrimp HSI model is an index between 0.0 and 1.0, which reflects total shrimp production or carry capacity for an area. The authors suggest that “generalized statements about habitat requirements cannot be applied equally to all populations,” and “each variable in the model should be evaluated and modified as necessary for best results in a local situation.” There are four habitat variables: V1 - percentage of marsh cover; V2 - substrate composition (soft, muddy, coarse); V3 - salinity (summertime mean); and V4 - Temperature (summertime mean). The first two variables relate to postlarvae and juvenile white shrimp life requisites for food and cover, and the last two relate to water quality life

requisites. The suitability index values are derived from graphical relationships with values for each habitat variable, and then are combined for the food/cover requisite component and for the water quality requisite component, respectively. The HSI is equivalent to the lowest value of either of the two life requisite values.

For this study, each of the potential wetland impact locations would be evaluated to determine the HSI value at each location. The HSI values would then be multiplied by the number of acres potentially impacted (see Table 2 in Section 4.5). At this stage in the planning process, the total acres for direct and indirect impacts at each location would be calculated and summed to represent the maximum extent of wetlands that may need to be mitigated. It is anticipated that the impact acreage will be reduced as modifications are made to the TSP during optimization (e.g., removing the wall from the marsh thus avoiding marsh impacts) and through consultation with natural resource agencies.

4.5 Mitigation Alternatives

For the Draft Mitigation Plan, two basic mitigation alternatives are under consideration – a Mitigation Banking Alternative and a Permittee-Responsible Mitigation Alternative. **The mitigation sites have not been identified, and are presented here for demonstration purposes only of the mitigation strategy.** The selection of a mitigation alternative and designation of appropriate sites cannot occur until optimization of the TSP is completed, including application of avoidance and minimization actions that will affect the total number of wetlands directly and indirectly impacted. In addition, actual selection of an appropriate permittee-responsible mitigation site would be done in coordination with natural resource agencies and based on selection criteria that are consistent with mitigation regulations.

Securing credits from an approved mitigation bank will mean that many of the prerequisites for an acceptable mitigation plan have already been addressed. Permittee-responsible mitigation would require acquisition of appropriate real estate interests and financial assurances for the mitigation site. If permittee-responsible mitigation becomes the selected mitigation alternative, then USACE and City of Charleston would work with local agencies to identify needed surveys and develop a mitigation work plan, maintenance plan, performance standards, monitoring requirements, long-term management plan, and adaptive management plan, all in accordance with mitigation regulations.

4.6 Determination of Mitigation Acreage

To calculate the amount of mitigation needed to meet the mitigation planning objective, the estimated wetland function at the impacted locations must be related to the estimated wetland function of the mitigation sites. The permittee-responsible mitigation site would be evaluated and scored with the white shrimp HSI model. To estimate the amount of compensatory mitigation based on the wetland functional assessment using the HSI, the following equation would be applied:

$$\text{Required Mitigation (acres)} = \text{Impacted Wetland HSI Score} \times \text{Acres Impacted} / \text{Mitigation Site HSI Score}$$

The required mitigation would be calculated with respect to the permittee-responsible site, and the mitigation bank site, as displayed in Table 2.

Table 2. Estimated maximum wetland compensatory mitigation with implementation of the TSP based on wetland functional assessment (*information to be filled in later*).

WETLAND LOCATION	IMPACTED WETLAND HSI SCORE	IMPACTED WETLAND ACRES (ESTIMATED)	MITIGATION ACRES NEEDED USING MITIGATION BANK SITE (ESTIMATED)	MITIGATION ACRES NEEDED USING PERMITTEE RESPONSIBLE SITE (ESTIMATED)
Diesel Creek	TBD	TBD	TBD	TBD
Ashley River along Wagener Terrace – North end	TBD	TBD	TBD	TBD
Halsey Creek	TBD	TBD	TBD	TBD
Ashley River along Wagener Terrace – South end	TBD	TBD	TBD	TBD
Citadel channel and tributary	TBD	TBD	TBD	TBD
Ashley River along Lockwood Ave.	TBD	TBD	TBD	TBD
Total Mitigation Required (acres)			TBD	TBD

However, by using the white shrimp HSI, the amount of mitigation that would result from the calculations would be less than what is currently accepted for wetland mitigation by the South Carolina Department of Health and Environmental Control (DHEC). As a result, additional wetland mitigation would be required to meet the state standard and obtain 401 Water Quality Certification for estuarine emergent wetlands.

Since the method used for determining wetland mitigation credits by USACE Charleston District for permitting is an accepted method by South Carolina DHEC, the Charleston District Regulatory Division’s Guidelines for Preparing a Compensatory Mitigation Plan (Guidelines) can be applied to this study to anticipate what the final compensatory mitigation requirement by the state would be. Appendix C of the Guidelines, Determination of Wetland Credits, also provides a reasonable method that can be used to generate

preliminary costs, and allow for a rough order of magnitude cost comparison of the mitigation alternatives to be done for this study at this time (see below).

4.7 ROM Cost Comparison Using USACE/State Regulatory Guidelines

For this stage in the planning process, the Charleston District Regulatory Division's Guidelines (USACE, 2010) was used to determine rough order of magnitude (ROM) costs for wetlands mitigation under the TSP. The Guidelines provides worksheets to determine the amount of required compensatory mitigation based on resource type, existing condition of the resource, impact type and duration, and cumulative impact. The Guidelines also provides guidance on preparing a permittee-responsible mitigation (PRM) plan and includes a worksheet to determine the amount of compensatory mitigation that will be generated by the PRM plan. The worksheet considers the net functional improvement that will be achieved, the amount of time it will take to achieve the functional improvement, the location of the mitigation site in regard to the impact site, and whether the resources that will be restored are of similar type and function.

For the ROM cost comparison, two wetland mitigation bank sites (Murray Hill Mitigation Bank and Clydesdale Mitigation Bank in Jasper County, SC) were evaluated for the Mitigation Bank Alternative. For the PRM Alternative, a potential site in the watershed for restoring impounded freshwater/brackish ponds and marshes to salt marsh was used for the PRM Alternative. The PRM site and preliminary cost information were developed from mitigation alternatives explored for the Charleston Harbor Deepening, Post 45 Project (USACE, 2015). A summary of the estimated costs for the PRM site is in Attachment 1, and encompasses real estate, construction, and monitoring costs. **Note that this specific PRM site is not necessarily being considered, it is for demonstration of cost comparison only at this stage.**

Mitigation credits were calculated for the two mitigation alternatives and for the direct and indirect wetland impact areas for this study using the Guidelines. The worksheets are provided in Attachment 3. The acres, estimated costs, and mitigation credits for the two Mitigation Alternatives and for the potentially impacted wetlands (direct and indirect) identified for this study are compiled in Attachment 2. A summary of the estimated wetland mitigation required to meet South Carolina DHEC requirements and the ROM costs are shown in Table 3. This method estimates that 1,358 credits would be needed for the 111 estimated impacted wetlands, which would cost approximately \$81.5M under the Mitigation Bank Alternative and cost approximately \$4.2M under the PRM Mitigation Alternative.

Table 3. Comparison of ROM costs for potentially impacted wetlands and the wetland Mitigation Alternatives based on mitigation credits requirements of the State of South Carolina.

WETLAND LOCATION	IMPACTED WETLAND CREDIT REQUIREMENTS	IMPACTED WETLAND ACRES (estimated)	MITIGATION ACRES NEEDED USING MITIGATION BANK SITE (estimated)	TOTAL MITIGATION BANK COSTS	MITIGATION ACRES NEEDED USING PRM SITE (estimated)	TOTAL PRM COST
Diesel Creek	123.9	10	36.6	\$7,434,000	33	\$389,080
Ashley River along Wagener Terrace – North end	102.8	8	30.4	\$6,168,000	27	\$318,339
Halsey Creek	212.9	18	63	\$12,774,000	56	\$660,257
Ashley River along Wagener Terrace – South end	77.1	6	22.8	\$4,626,000	20	\$235,806
Citadel channel and tributary	533.4	45	113.6	\$32,004,000	140.2	\$1,653,001
Ashley River along Lockwood Blvd.	308.4	24	91.2	\$18,504,000	81	\$955,016
TOTAL	1358.5	111	357.6	\$81,510,000	357.2	\$4,211,500

4.8 Selected Mitigation Alternative

Before a mitigation alternative can be selected, the “best-buy” mitigation plan would be identified after the functional analysis is performed as described in Section 4.4 and adjusted by the state’s standard mitigation requirement. A cost effective/incremental cost analysis (CE/ICA) would be performed, as described in USACE guidance ER 1105-2-100. For the incremental analysis, the total number of acres required for mitigation would be calculated based on the resulting average annualized habitat units. The CE/ICA would identify the least cost mitigation alternative that provides full mitigation of losses specified in the mitigation planning objective, and that is unconstrained except for required legal and technical constraints. The data used and methods for this analysis would be displayed here as the Draft Mitigation Plan is updated.

4.9 Consistency with Mitigation Rule

Once a mitigation alternative is selected as described above, this section will be updated to document how it conforms with the Mitigation Rule and other related USACE guidance.

5.0 Monitoring and Adaptive Management

If mitigation banking is selected as the mitigation alternative, the approved mitigation bank would assume monitoring and adaptive management (and long term management which would normally be included as an O&M costs) of the compensatory site in accordance with their bank approval requirements. USACE and City of Charleston will have met their mitigation requirement once the mitigation banking credits are purchased (prior to project construction) and no further action is needed. If permittee-responsible mitigation is selected, then USACE and City of Charleston would work with natural resource agencies to identify success criteria for the saltmarsh restoration and develop a monitoring plan that includes realistic metrics for assessing those criteria, which will be included in this section. It will layout an overall duration and timeline for monitoring (such as annually for 10 years), although this may vary depending on individual metrics. The monitoring plan would also identify responsible parties for monitoring and long term maintenance costs. The plan would identify triggers for adaptive management, such as a percentage of plant mortality, and actions that would be taken to modify the mitigation work plan.

6.0 References

Florida Fish and Wildlife Conservation Commission (FWC). 2011. Manatee Standard Conditions for In-water Work.

Turner, R.E. and M.S. Brody. 1983. Habitat suitability index models: Northern Gulf of Mexico brown and white shrimp. U.S. Department of Interior, Fish and Wildlife Service. FWS/OBS-82/10.54. 24pp.

USACE. 2010. Guidelines for Preparing a Compensatory Mitigation Plan. Working Draft, Subject to Change, Last Revised October 7, 2010. U.S. Army Corps of Engineers, Charleston District.

USACE. 2015. Charleston Harbor Post 45 Final Integrated Feasibility Report and Environmental Impact Statement. U.S. Army Corps of Engineers, Charleston District. June 2015.

ATTACHMENT 1

Cost Estimate for Permittee-Responsible Mitigation Site, Mitigation Plan

Permittee Responsible Mitigation Plan	
Construction Activity	Estimated Cost Including Labor and Materials
Dike Removal and grading	\$132,500
Monitoring Plot Installation	\$13,000
Erosion Control	\$31,000
Well Installation	\$7,000
Survey	\$10,000
Total Construction Costs	\$186,500
Monitoring Activities	Annual Estimated Costs
Well Maintenance	\$1,000
Hydrology Monitoring	\$2,500
Vegetation Monitoring	\$5,500
Water Quality Monitoring	\$1,000
Total	\$10,000
5 years monitoring	\$50,000.00
Real Estate	Estimated Costs
530 acres @ \$7500	\$3,975,000.00
Total Construction, Monitoring, and Real Estate Costs for Mitigation	\$4,211,500

ATTACHMENT 2

Mitigation Credits and Cost Tables

Penninsula Study Mitigation Credits						
Wetland Impact Site	Direct Impact Credit Requirements	Direct Impact Acres	Indirect Impact Credit Requirements	Indirect Impact Acres	Total Impact Credit Requirements	Total Impact Acres
Ashley River North	56	4	46.8	4	102.8	8
Ashley River South	42	3	35.1	3	77.1	6
Ashley River Lockwood	168	12	140.4	12	308.4	24
Diesel Creek	42	3	81.9	7	123.9	10
Halsey Creek	14	1	198.9	17	212.9	18
Citadel Creek	42	3	491.4	42	533.4	45
Project Impact Requirements	364	26	994.5	85	1358.5	111

Penninsula Study Proposed Permittee Responsible Mitigation Credits and Acres			
Wetland Impact Site	PRM Mitigation Credits	PRM Mitigation Acres	PRM Mitigation Costs
Ashley River North	102.8	27	\$318,338.63
Ashley River South	77.1	20	\$235,806.40
Ashley River Lockwood	308.4	81	\$955,015.92
Diesel Creek	123.9	33	\$389,080.36
Halsey Creek	212.9	56	\$660,257.23
Citadel Creek	533.4	140.2	\$1,653,001.46
Proposed Mitigation Totals	1358.5	357.2	\$4,211,500.00

Penninsula Study Proposed Mitigation Bank Credits and Acres							
Wetland Impact Site	Murray Hill Mitigation Bank Credits	Clydesdale Mitigation Bank Credits	Murray Hill Mitigation Bank Acres	Clydesdale Mitigation Bank Acres	Total Cost Murray Hill	Total Cost Clydesdale	Total Mitigation Bank Costs
Ashley River North	102.8	0	30.4	0	\$6,168,000.00	\$0.00	\$6,168,000.00
Ashley River South	77.1	0	22.8	0	\$4,626,000.00	\$0.00	\$4,626,000.00
Ashley River Lockwood	308.4	0	91.2	0	\$18,504,000.00	\$0.00	\$18,504,000.00
Diesel Creek	123.9	0	36.6	0	\$7,434,000.00	\$0.00	\$7,434,000.00
Halsey Creek	212.9	0	63	0	\$12,774,000.00	\$0.00	\$12,774,000.00
Citadel Creek	384.15	149.25	113.6	45.228	\$23,049,000.00	\$8,955,000.00	\$32,004,000.00
Proposed Mitigation Totals	1209.25	149.25	357.6	45.228	\$72,555,000.00	\$8,955,000.00	\$81,510,000.00

ATTACHMENT 3

Wetland Mitigation Credit Worksheets

Required Wetland Mitigation Credit Table and Worksheet

Diesel Creek



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Required Wetland Mitigation Credit Table						
FACTORS	OPTIONS					
Lost Type	Type C 0.2		Type B 2.0		Type A 3.0	
Priority Category	Tertiary 0.5		Secondary 1.5		Primary 2.0	
Existing Condition	Very Impaired 0.1	Impaired 1.0		Partially Impaired 2.0	Fully Functional 2.5	
Duration	0 to 1 Year 0.2	1 to 3 Years 0.5	3 to 5 Years 1.0	5 to 10 Years 1.5	Over 10 Years 2.0	
Dominant Impact	Shade 0.2	Clear 1.0	Drain 2.0	Dredge 2.5	Impound/Flood 2.5	Fill 3.0
Cumulative Impact	< 0.25 Acre 0.1	0.25 - 0.99 Acres 0.2	1.0 - 2.99 Acres 0.5	3.0 - 9.99 Acres 1.0	≥ 10.0 Acres 2.0	

NOTE: The cumulative impact factor for the overall project should be included in the sum of factors for each impacted area on the Required Wetland Mitigation Credit Worksheet

Required Wetland Mitigation Credit Worksheet						
FACTOR	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6
Lost Type	Type A	Type A				
Priority Category	Primary	Primary				
Existing Condition	Partially Impaired	Partially Impaired				
Duration	Over 10 Years	0 to 1 Year				
Dominant Impact	Fill	Impound/Flood				
Cumulative Impact	≥ 10.0 Acres	≥ 10.0 Acres				
Sum of Factors	14	11.7				
Impacted Area	3	7				
R x AA=	42	81.9				
	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>

Required Wetland Mitigation Credits = $\sum (R \times A)$ = 123.9

Required Wetland Mitigation Credit Table and Worksheet

Halsey Creek



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Required Wetland Mitigation Credit Table						
FACTORS	OPTIONS					
Lost Type	Type C 0.2		Type B 2.0		Type A 3.0	
Priority Category	Tertiary 0.5		Secondary 1.5		Primary 2.0	
Existing Condition	Very Impaired 0.1	Impaired 1.0		Partially Impaired 2.0		Fully Functional 2.5
Duration	0 to 1 Year 0.2	1 to 3 Years 0.5	3 to 5 Years 1.0	5 to 10 Years 1.5	Over 10 Years 2.0	
Dominant Impact	Shade 0.2	Clear 1.0	Drain 2.0	Dredge 2.5	Impound/Flood 2.5	Fill 3.0
Cumulative Impact	< 0.25 Acre 0.1	0.25 - 0.99 Acres 0.2	1.0 - 2.99 Acres 0.5	3.0 - 9.99 Acres 1.0	≥ 10.0 Acres 2.0	

NOTE: The cumulative impact factor for the overall project should be included in the sum of factors for each impacted area on the Required Wetland Mitigation Credit Worksheet

Required Wetland Mitigation Credit Worksheet						
FACTOR	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6
Lost Type	Type A	Type A				
Priority Category	Primary	Primary				
Existing Condition	Partially Impaired	Partially Impaired				
Duration	Over 10 Years	0 to 1 Year				
Dominant Impact	Fill	Impound/Flood				
Cumulative Impact	≥ 10.0 Acres	≥ 10.0 Acres				
Sum of Factors	14	11.7				
Impacted Area	1	17				
R x AA=	14	198.9				
	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>

Required Wetland Mitigation Credits = $\sum (R \times A)$ = 212.9

Required Wetland Mitigation Credit Table and Worksheet

Ashley River - Wagener Terrace North



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Required Wetland Mitigation Credit Table						
FACTORS	OPTIONS					
Lost Type	Type C 0.2		Type B 2.0		Type A 3.0	
Priority Category	Tertiary 0.5		Secondary 1.5		Primary 2.0	
Existing Condition	Very Impaired 0.1	Impaired 1.0		Partially Impaired 2.0		Fully Functional 2.5
Duration	0 to 1 Year 0.2	1 to 3 Years 0.5	3 to 5 Years 1.0	5 to 10 Years 1.5	Over 10 Years 2.0	
Dominant Impact	Shade 0.2	Clear 1.0	Drain 2.0	Dredge 2.5	Impound/Flood 2.5	Fill 3.0
Cumulative Impact	< 0.25 Acre 0.1	0.25 - 0.99 Acres 0.2	1.0 - 2.99 Acres 0.5	3.0 - 9.99 Acres 1.0	≥ 10.0 Acres 2.0	


NOTE: The cumulative impact factor for the overall project should be included in the sum of factors for each impacted area on the Required Wetland Mitigation Credit Worksheet

Required Wetland Mitigation Credit Worksheet						
FACTOR	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6
Lost Type	Type A	Type A				
Priority Category	Primary	Primary				
Existing Condition	Partially Impaired	Partially Impaired				
Duration	Over 10 Years	0 to 1 Year				
Dominant Impact	Fill	Impound/Flood				
Cumulative Impact	≥ 10.0 Acres	≥ 10.0 Acres				
Sum of Factors	14	11.7				
Impacted Area	4	4				
R x AA=	56	46.8				
	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>

Required Wetland Mitigation Credits = $\sum (R \times A)$ = 102.8

Required Wetland Mitigation Credit Table and Worksheet

Citadel channel and tributary

 **TIP:** Leave cursor over each factor or option below to pop-up helpful information or definitions.

Required Wetland Mitigation Credit Table						
FACTORS	OPTIONS					
Lost Type	Type C 0.2		Type B 2.0		Type A 3.0	
Priority Category	Tertiary 0.5		Secondary 1.5		Primary 2.0	
Existing Condition	Very Impaired 0.1	Impaired 1.0		Partially Impaired 2.0		Fully Functional 2.5
Duration	0 to 1 Year 0.2	1 to 3 Years 0.5	3 to 5 Years 1.0	5 to 10 Years 1.5	Over 10 Years 2.0	
Dominant Impact	Shade 0.2	Clear 1.0	Drain 2.0	Dredge 2.5	Impound/Flood 2.5	Fill 3.0
Cumulative Impact	< 0.25 Acre 0.1	0.25 - 0.99 Acres 0.2	1.0 - 2.99 Acres 0.5	3.0 - 9.99 Acres 1.0	≥ 10.0 Acres 2.0	

NOTE: The cumulative impact factor for the overall project should be included in the sum of factors for each impacted area on the Required Wetland Mitigation Credit Worksheet

Required Wetland Mitigation Credit Worksheet						
FACTOR	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6
Lost Type	Type A	Type A				
Priority Category	Primary	Primary				
Existing Condition	Partially Impaired	Partially Impaired				
Duration	Over 10 Years	0 to 1 Year				
Dominant Impact	Fill	Impound/Flood				
Cumulative Impact	≥ 10.0 Acres	≥ 10.0 Acres				
Sum of Factors	14	11.7				
Impacted Area	3	42				
R x AA=	42	491.4				
	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>

Required Wetland Mitigation Credits = $\sum (R \times A)$ = 533.4

Required Wetland Mitigation Credit Table and Worksheet

Ashley River -Wagener Terrace South



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Required Wetland Mitigation Credit Table						
FACTORS	OPTIONS					
Lost Type	Type C 0.2		Type B 2.0		Type A 3.0	
Priority Category	Tertiary 0.5		Secondary 1.5		Primary 2.0	
Existing Condition	Very Impaired 0.1	Impaired 1.0		Partially Impaired 2.0		Fully Functional 2.5
Duration	0 to 1 Year 0.2	1 to 3 Years 0.5	3 to 5 Years 1.0	5 to 10 Years 1.5	Over 10 Years 2.0	
Dominant Impact	Shade 0.2	Clear 1.0	Drain 2.0	Dredge 2.5	Impound/Flood 2.5	Fill 3.0
Cumulative Impact	< 0.25 Acre 0.1	0.25 - 0.99 Acres 0.2	1.0 - 2.99 Acres 0.5	3.0 - 9.99 Acres 1.0	≥ 10.0 Acres 2.0	

NOTE: The cumulative impact factor for the overall project should be included in the sum of factors for each impacted area on the Required Wetland Mitigation Credit Worksheet

Required Wetland Mitigation Credit Worksheet						
FACTOR	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6
Lost Type	Type A	Type A				
Priority Category	Primary	Primary				
Existing Condition	Partially Impaired	Partially Impaired				
Duration	Over 10 Years	0 to 1 Year				
Dominant Impact	Fill	Impound/Flood				
Cumulative Impact	≥ 10.0 Acres	≥ 10.0 Acres				
Sum of Factors	14	11.7				
Impacted Area	3	3				
R x AA=	42	35.1				
	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>

Required Wetland Mitigation Credits = $\sum (R \times A)$ = 77.1

Required Wetland Mitigation Credit Table and Worksheet

Ashley River - Lockwood



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Required Wetland Mitigation Credit Table						
FACTORS	OPTIONS					
Lost Type	Type C 0.2		Type B 2.0		Type A 3.0	
Priority Category	Tertiary 0.5		Secondary 1.5		Primary 2.0	
Existing Condition	Very Impaired 0.1	Impaired 1.0		Partially Impaired 2.0		Fully Functional 2.5
Duration	0 to 1 Year 0.2	1 to 3 Years 0.5	3 to 5 Years 1.0	5 to 10 Years 1.5	Over 10 Years 2.0	
Dominant Impact	Shade 0.2	Clear 1.0	Drain 2.0	Dredge 2.5	Impound/Flood 2.5	Fill 3.0
Cumulative Impact	< 0.25 Acre 0.1	0.25 - 0.99 Acres 0.2	1.0 - 2.99 Acres 0.5	3.0 - 9.99 Acres 1.0	≥ 10.0 Acres 2.0	

NOTE: The cumulative impact factor for the overall project should be included in the sum of factors for each impacted area on the Required Wetland Mitigation Credit Worksheet

Required Wetland Mitigation Credit Worksheet						
FACTOR	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6
Lost Type	Type A	Type A				
Priority Category	Primary	Primary				
Existing Condition	Partially Impaired	Partially Impaired				
Duration	Over 10 Years	0 to 1 Year				
Dominant Impact	Fill	Impound/Flood				
Cumulative Impact	≥ 10.0 Acres	≥ 10.0 Acres				
Sum of Factors	14	11.7				
Impacted Area	12	12				
R x AA=	168	140.4				
	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>	<input type="button" value="Reset Column"/>

Required Wetland Mitigation Credits = $\sum (R \times A)$ = 308.4

PROPOSED WETLAND MITIGATION TABLE

Murray Hill Bank



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Factors	Options				
Net Improvement	0.0** <---- to ----> 3.0 (see Section 3.0 for examples of potential values)				
Upland Buffer	0.0 <---- to ----> 1.0 (see Section 3.0 for examples of potential values)				
Credit Schedule	Not Applicable 0**	After 0.1	Concurrent 0.3	Before 0.5	
Temporal Loss	Not Applicable 0**	0 to 5 Years - 0.1	5 to 10 Years - 0.2	10 to 20 Years - 0.3	Over 20 Years - 0.4
Kind	Out of Kind 0			In Kind 0.4	
Location	Case by Case 0	Drainage Basin 0.1	Adjacent 8-Digit HUC 0.2	8-Digit HUC 0.4	

** Use this option to calculate credit for Preservation

PROPOSED WETLAND MITIGATION CREDIT WORKSHEET

Complete Proposed Mitigation Credit Worksheet for all Permittee-Responsible Mitigation. This worksheet does not need to be completed if purchasing credits from a mitigation bank.

Factor	Area 1	Area 2	Area 3	Area 4	Area 5
Net Improvement	3.0	2.6	2.3		
Upland Buffer					
Credit Schedule	Before	Before	Before		
Temporal Loss	5 to 10 Years	5 to 10 Years	5 to 10 Years		
Kind	In Kind	In Kind	In Kind		
Location	Drainage Basin	Drainage Basin	Drainage Basin		
Sum of Factors	3.8	3.4	3.1		
Mitigation Area	4	326.3	27.3		
M x A =	15.2	1109.42	84.63		

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Proposed Wetland Mitigation Credits = $\sum (M \times A) =$ 1209.25

PROPOSED WETLAND MITIGATION TABLE

Clydesdale Bank



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Factors	Options				
Net Improvement	0.0** <---- to ----> 3.0 (see Section 3.0 for examples of potential values)				
Upland Buffer	0.0 <---- to ----> 1.0 (see Section 3.0 for examples of potential values)				
Credit Schedule	Not Applicable 0**	After 0.1	Concurrent 0.3	Before 0.5	
Temporal Loss	Not Applicable 0**	0 to 5 Years - 0.1	5 to 10 Years - 0.2	10 to 20 Years - 0.3	Over 20 Years - 0.4
Kind	Out of Kind 0			In Kind 0.4	
Location	Case by Case 0	Drainage Basin 0.1	Adjacent 8-Digit HUC 0.2	8-Digit HUC 0.4	

** Use this option to calculate credit for Preservation

PROPOSED WETLAND MITIGATION CREDIT WORKSHEET

Complete Proposed Mitigation Credit Worksheet for all Permittee-Responsible Mitigation. This worksheet does not need to be completed if purchasing credits from a mitigation bank.

Factor	Area 1	Area 2	Area 3	Area 4	Area 5
Net Improvement	2.5				
Upland Buffer					
Credit Schedule	Before				
Temporal Loss	5 to 10 Years				
Kind	In Kind				
Location	Drainage Basin				
Sum of Factors	3.3				
Mitigation Area	45.228				
M x A =	149.2524				

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Proposed Wetland Mitigation Credits = $\sum (M \times A) =$ 149.2524

PROPOSED WETLAND MITIGATION TABLE

PRM Site



TIP: Leave cursor over each factor or option below to pop-up helpful information or definitions.

Factors	Options				
Net Improvement	0.0** <---- to ----> 3.0 (see Section 3.0 for examples of potential values)				
Upland Buffer	0.0 <---- to ----> 1.0 (see Section 3.0 for examples of potential values)				
Credit Schedule	Not Applicable 0**	After 0.1	Concurrent 0.3	Before 0.5	
Temporal Loss	Not Applicable 0**	0 to 5 Years - 0.1	5 to 10 Years - 0.2	10 to 20 Years - 0.3	Over 20 Years - 0.4
Kind	Out of Kind 0			In Kind 0.4	
Location	Case by Case 0	Drainage Basin 0.1	Adjacent 8-Digit HUC 0.2	8-Digit HUC 0.4	

** Use this option to calculate credit for Preservation

PROPOSED WETLAND MITIGATION CREDIT WORKSHEET

Complete Proposed Mitigation Credit Worksheet for all Permittee-Responsible Mitigation. This worksheet does not need to be completed if purchasing credits from a mitigation bank.

Factor	Area 1	Area 2	Area 3	Area 4	Area 5
Net Improvement	3.0	2.6			
Upland Buffer					
Credit Schedule	Before	Before			
Temporal Loss	0 to 5 Years	0 to 5 Years			
Kind	In Kind	In Kind			
Location	8-Digit HUC	8-Digit HUC			
Sum of Factors	4.2	3.8			
Mitigation Area	3.2	354			
M x A =	13.44	1345.2			

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Proposed Wetland Mitigation Credits = $\sum (M \times A) =$ 1358.64

PRELIMINARY VISUAL ASSESSMENT

Visual Resources Assessment for the Charleston Peninsula Study

Guidance Referenced and Methods Used

This visual resources assessment was conducted according to ER 1105-2-100 (22 Apr 2000), Appendix C Environmental Evaluation & Compliance, section C-5 “Aesthetic Resources”, and utilized the procedure recommended there, which is the Visual Resources Assessment Procedure (VRAP) as described in the WES Instructional Report EL-88-1. As stated in the referenced ER, “The purpose of using a procedure is to have a systematic approach to consider aesthetic resources. Advantages of a systematic and quantifiable approach include the ability to assign a visual resource value to all of the landscape units within a study area, identify significant aesthetic resources, and to determine causes of adverse impact. Such a procedure provides a clear, tractable basis for including aesthetics in plan formulation, design, reformulation, and mitigation planning.”

The level of detail currently used in this feasibility study is limited to the Visual Impact Assessment (VIA) “General Procedure”. As stated in the referenced Instructional Report, the General Procedure is most suitable for things such as preliminary studies without identified alternatives; or studies with time, funding or data limitations that prevent use of the Basic or Detailed VIA Procedures. While the General Procedure is currently used in this feasibility study, use of the Detailed Procedure should be developed and implemented concurrent with continued preparation of the Feasibility Report to the extent that time, funding and data allow. The Detailed Procedure is recommended for things such as major projects; as well as for structures that are larger in scale, infrequent and novel in appearance in the landscape; and/or where there is high visual sensitivity in the landscape. The visual quality objectives of the Detailed Procedure would be all those of the general procedure but in a more detailed way, as well as to reduce visual contrast with landscape as much as possible unless the project has symbolic value, informative significance, and/or creative design; to borrow at least partly from visual elements of surrounding landscape; and mitigation may be necessary to assure compatibility.

For the General Procedure contained herein, the visual quality objectives are limited to the following:

- Identify important visual resources (in a general way)
- Identify potential visual impacts in the study area (in a general way)
- Recommend a path forward for further visual analysis

If the analysis is progressed from the General Procedure toward the components of the Detailed Procedure determined to be suitable for this study, the analysis and presentation will be revised.

Abbreviated Management Classification System (MCS)

Before implementing the General VIA Procedure, an abbreviated MCS classification was performed.

Regional Landscape

The regional landscape provides a frame of reference for the inventory and evaluation of visual resources. The regional landscape covers a broad physiographic area in which landforms, water resources, vegetation, and climate tend to exhibit common characteristics. The regional landscape for the purposes of this report is defined as central and southern coastal South Carolina and coastal Georgia.

Similarity Zone

A similarity zone provides a more specific framework with which to define and evaluate the visual resources of the study area. The similarity zone represents a physiographic area of land that has common characteristics of landform, water resources, vegetation/ecosystems, land use, and land use intensity. The similarity zone concept is used because the character of the visual resources in a zone should be used as a basis for evaluating the visual impacts of projects in that zone. The similarity zone for the purposes of this report is defined as currently occupied urban landscapes with historic areas and structures.

Visual Resources Summary/Description for MCS

This similarity zone inventory provides a summary description of the zone as a visual resource, focusing on the elements that unify the area so that it can be considered a zone. Several viewpoints from and of the Charleston Peninsula were inventoried on March 1, 2020. The weather was generally sunny and cool, and it was a clear day with very good visibility to the distance.

The unifying visual elements were the following: This is a coastal landscape with large bodies of swiftly moving water, such as the Charleston Harbor and the Ashley and Cooper rivers, occasionally with small boat marinas present. In the places observed, these water bodies were often the visually dominant element, and had boats of various sizes and purposes on them. Scenery across the water bodies in the distance often consisted of a generally urbanized landscape. Percent vegetation cover varies widely depending on location and view. When present, the type of vegetation also varies from undeveloped woodlands and marshes to park trees and other urban plantings. Land uses in the areas observed were either primarily commercial and institutional buildings or had commercial and institutional substantially interspersed. Distinct attractive land uses included parks and recreational areas as well as historic steeples visible on the skyline from some locations. Unattractive land uses included industrial buildings and unsightly infrastructure in the skyline such as cell phone towers and directional highway signs.

Visual Resources Inventory/Forecast for MCS

This similarity zone inventory identifies those specific elements of the landscape that determine the landscape quality and thus the visual quality objectives of the zone.

Several viewpoints from and of the Charleston Peninsula that are accessible by the public for free were identified via internet searches for 'views' and for 'parks', with preference given to locations that could look across to each other. Brittlebank Park and Higgins Pier, which is at the terminus of the West Ashley Bikeway, were selected as a pair; as were Melton Peter Demetre Park with The Battery; and Waterfront Park with the USS Clamagore at Patriot's Point. Visual corridors within the peninsula itself still need to be identified and assessed, perhaps along historic King Street, historic Meeting Street, historic Market

Street, or similar, where there may be views down to the waterfront, and back up from the waterfront. However, with the predominance of elements such as buildings and trees (see screen views), any adverse impacts are anticipated to be infrequent.

The viewpoints already identified are presented below, and were inventoried on March 1, 2020. As stated above, the weather was generally sunny and cool, and it was a clear day with very good visibility to the distance.

Viewpoint: Brittlebank Park

Time: 12:45 PM



Figure 1. At Brittlebank Park, looking upstream toward Higgins Pier (terminus of West Ashley Bikeway)



Figure 2. At Brittlebank Park, looking downstream toward the Hwy 17 bridge crossing the Ashley

- Water – Ashley River, which visually appeared to be moving swiftly, and was of a large visual scale.
- Landform – Coastal.
- Vegetation – The view upstream across the river had a 75-100% vegetation cover of some diversity, appearing to be predominantly tree cover with marsh visible as well.
- Land/water use – Brittlebank Park is a recreational urban park with a natural feel and has views across to both undeveloped vegetation (upstream, as shown in image), as well as to primarily commercial urban scenery downstream.
- Access – Brittlebank Park is accessed from a secondary road and has walkways throughout. Direct access to the water was not observed during this visit, but may be present.
- User activity – There were visitors in Brittlebank Park and it felt like a medium level of use because there was activity but it was not crowded. Brittlebank Park does host events and can be very crowded at times.
- Litter/pollution – None noted.
- Adjacent scenery – The scenery is somewhat similar in that it is an urban environment in Charleston. However, it must be acknowledged that parks are special places within urban environments, and so the adjacent scenery may not be quite as attractive as the park itself. In addition to the scenery depicted in the image above, if one looks downstream, scenery is of an urban nature, with a hotel, a bridge (17), and a marina, overhead highway signs, etc.
- Sounds – Sounds were present but generally inconspicuous.
- Smells – Smells were present but generally inconspicuous.
- Visibility – Panorama views across the water are possible. These seemed like views between normal and superior in quality.
- Other significant attributes – None noted.

- Known for wildlife observation – No known organized tours are held here.
- Cultural or historic landmarks – None noted at time of visit.

Viewpoint: Higgins Pier (terminus of West Ashley Bikeway)

Time: 1:00 PM



Figure 3. At Higgins Pier, looking downstream towards Brittlebank Park.

- Water – Ashley River, which visually appeared to be moving swiftly, and was of a large visual scale.
- Landform – Coastal.
- Vegetation – The view when considering both sides of the river had a 25-50% vegetation cover of some diversity, appearing to be predominantly tree cover with marsh and Brittlebank Park across the river visible as well.
- Land/water use – Higgins Pier is a recreational pier set in marsh habitat at the terminus of the West Ashley Bikeway with a natural feel and has views across to primarily commercial urban scenery as well as to Brittlebank Park.
- Access – Higgins Pier is accessed by land from a trail and has a small boat dock as well for direct access to/from the water.
- User activity – There were visitors at Higgins Pier and it felt like a medium to high level of use because there were a number of people at the pier and along the trail, feeling full but not quite crowded.
- Litter/pollution – Present but limited.

- Adjacent scenery – The scenery is somewhat similar in that it is an urban environment in Charleston and marshes and tree cover were present onsite as well as visible in the distance, along with the urban elements. However, it must be acknowledged this is a special place within the urban environment, and so the adjacent scenery may not be quite as attractive as the park itself. Note the overhead highway signs and the construction cranes visible in the view shown above.
- Sounds – Sounds were present but generally inconspicuous.
- Smells – Smells were present but generally inconspicuous.
- Visibility – Panorama views across the water are possible. These seemed like views between normal and superior in quality.
- Other significant attributes – None noted.
- Known for wildlife observation – Though no known organized tours are held here, people often fish off of Higgins Pier, and cranes, egrets, etc. often are present in the surrounding marshes.
- Cultural or historic landmarks – None noted at time of visit.

Viewpoint: Melton Peter Demetre Park (James Island)

Time: 1:50 PM

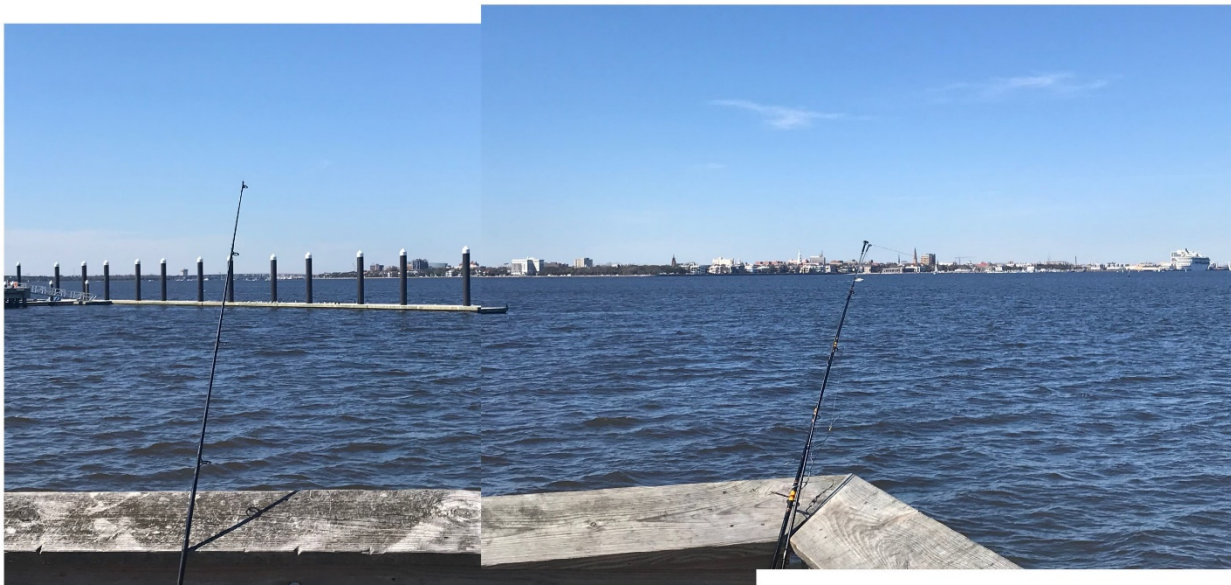


Figure 4. At Melton Peter Demetre Park, looking across the Charleston Harbor towards The Battery.

- Water – Looking across the Charleston Harbor with the mouth of the Ashley River at the left, which visually appeared to be moving swiftly, and was of a large visual scale.
- Landform – Coastal.
- Vegetation – The view had a 25-50% vegetation cover of some diversity, appearing to be predominantly tree cover with The Battery across the harbor visible at the center of the image above.

- Land/water use – Melton Peter Demetre Park is a recreational park with pavilions and piers set at the waters edge with a natural feel, and has views across the Charleston Harbor to primarily urban scenery with mixed commercial and historic elements, including a view of The Battery.
- Access – Melton Peter Demetre Park is accessed by a secondary street.
- User activity – There were visitors at the park and it felt like a medium to high level of use because there were a number of people throughout, feeling full but not quite crowded.
- Litter/pollution – None noted.
- Adjacent scenery – The scenery is somewhat similar in that it is an urban environment in Charleston and tree cover was present onsite as well as visible in the distance, along with the urban elements. However, it must be acknowledged this park is a special place within the urban environment, and so the adjacent scenery may not be quite as attractive as the park itself. Note the construction cranes visible in the view shown above.
- Sounds – Sounds were present but generally inconspicuous.
- Smells – Smells were present but generally inconspicuous.
- Visibility – Panorama views across the water are possible. These seemed like views between normal and superior in quality. The dominant element in this view was the cruise ship, but it is not there all the time.
- Other significant attributes – None noted.
- Known for wildlife observation – Though no known organized tours are held here, people were fishing off of the pier.
- Cultural or historic landmarks – The trees at The Battery were visible, as were the steeples of the Cathedral of St. John The Baptist, St. Michael’s Episcopal Church, and St. Philip’s Episcopal Church.

Viewpoint: The Battery

Time: 2:20 PM

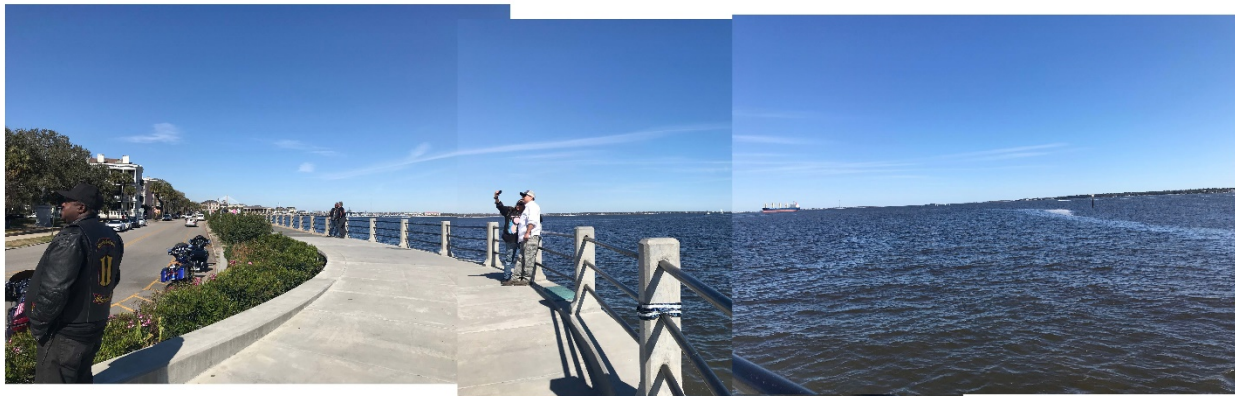


Figure 5. At The Battery, looking across the Charleston Harbor with Melton Peter Demetre Park at right.

- Water – Looking across the Charleston Harbor, which visually appeared to be moving swiftly, and was of a large visual scale.
- Landform – Coastal.

- Vegetation – The view had a 25-50% vegetation cover of some diversity, appearing to be predominantly tree cover with Melton Peter Demetre Park across the harbor visible at the far right of the image above.
- Land/water use – The Battery is a recreational park with a walkway set at the waters edge with an urban feel, and has views across the Charleston Harbor to primarily water scenery with natural looking elements in the distance due to tree cover.
- Access – The Battery is accessed by a secondary street.
- User activity – There were visitors at the park and it felt like a medium to high level of use because there were a number of people throughout, feeling full but not crowded.
- Litter/pollution – Present but limited.
- Adjacent scenery – The scenery is somewhat similar in that it is an urban environment in Charleston and tree cover was present onsite as well as visible in the distance, along with the urban elements. However, it must be acknowledged this park is a special place within the urban environment, and so the adjacent scenery may not be quite as attractive as the park itself. Note the presence of water towers, cell phone towers, and similar along the horizon line.
- Sounds – Sounds were present but generally inconspicuous.
- Smells – Smells were present but generally inconspicuous.
- Visibility – Panorama views across the water are possible. These seemed like views between normal and superior in quality. The dominant element in this view, besides the harbor itself, was the commercial ship passing through.
- Other significant attributes – None noted.
- Known for wildlife observation – No known organized tours are held here for wildlife observation.
- Cultural or historic landmarks – The Battery is a cultural and historic landmark itself, and tours often include it. On a clear day one can see Ft. Sumter and possibly Castle Pinkney on the horizon, though with the naked eye only as small elements.

Viewpoint: Waterfront Park

Time: 2:40 PM

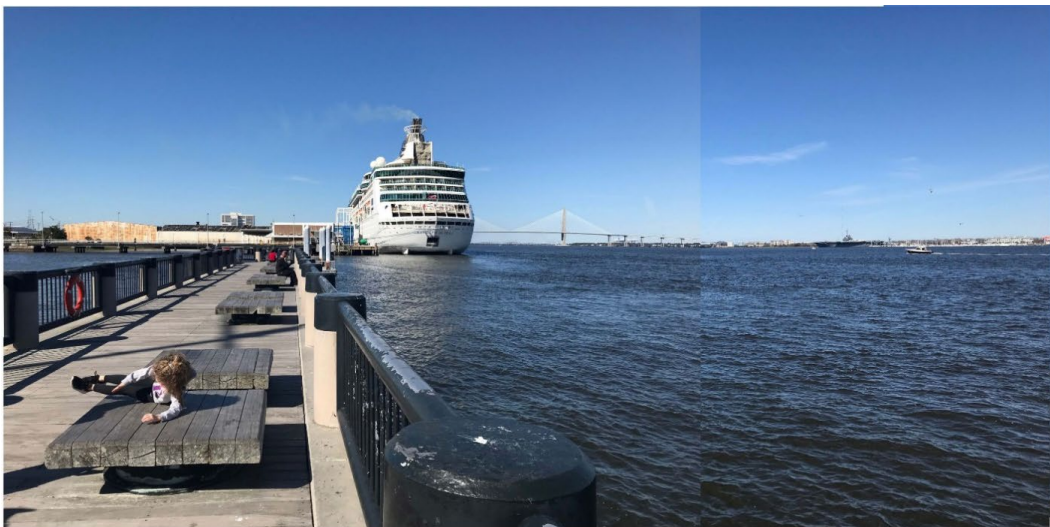


Figure 6. At Waterfront Park, looking across the Charleston Harbor towards Patriot's Point.



Figure 7. At Waterfront Park, looking across the Charleston Harbor towards Fort Sumter.

- Water – Looking across the Charleston Harbor with the mouth of the Cooper River in the center, which visually appeared to be moving swiftly, and was of a large visual scale.
- Landform – Coastal.
- Vegetation – The view had a 0-25% vegetation cover, appearing to be tree cover.
- Land/water use – Waterfront Park is a recreational park with pavilions and piers set at the waters edge with an urban feel, and has views across the Charleston Harbor to primarily urban scenery with primarily commercial elements, including a view of Patriot’s Point.
- Access – Waterfront Park is accessed by a secondary street.
- User activity – There were visitors at the park and it felt like a medium to high level of use because there were a number of people throughout, feeling full but not quite crowded.
- Litter/pollution – Present but limited.
- Adjacent scenery – The scenery is somewhat similar in that it is an urban environment in Charleston, here dominated by urban elements and the water. Even though this park is a special place within the urban environment, the adjacent scenery is not as attractive as the park itself. Note the rusted industrial building at the left of the image, construction cranes, power stations and other industrial elements in the view, as well as the large cruise ship shown above.
- Sounds – Sounds were present but generally inconspicuous.
- Smells – Smells were present but generally inconspicuous.
- Visibility – Panorama views across the water are possible. These seemed like views between normal and superior in quality. The dominant element in this view, other than the water, was the cruise ship, but the ship is not always there.

- Other significant attributes – None noted.
- Known for wildlife observation – No known organized wildlife tours are held here.
- Cultural or historic landmarks – On a clear day one can see Ft. Sumter and Castle Pinkney on the horizon, though with the naked eye only as small elements. (see figure below)

Viewpont: USS Clamagore at Patriot’s Point (Mount Pleasant)

Time: 3:20 PM



Figure 8. At USS Clamagore, looking across the Charleston Harbor towards Waterfront Park.

- Water – Looking across the Charleston Harbor with the mouth of the Cooper River at the right, which visually appeared to be moving swiftly, and was of a large visual scale. However, the water inside the marina was moving very little.
- Landform – Coastal.
- Vegetation – The view had a 0-25% vegetation cover of trees in the distance.
- Land/water use – The USS Clamagore is a recreational feature with the bridge from the dock to it providing a free opportunity to take in a view across the harbor. It is next both to Patriot’s Point and a marina with a number of docks, all set at the waters edge with an urban feel.
- Access – The USS Clamagore is accessed by a walkway from a neighboring hotel, or if one has a ticket from The Yorktown (military ship at Patriot’s Point) then the walkway from there can be used.
- User activity – There were a few visitors and it felt like a low to medium level of use.
- Litter/pollution – None noted.
- Adjacent scenery – The scenery is somewhat similar in that it is an urban environment in Charleston, here dominated by the marina in the foreground, but also with urban elements, and the water. Even though this recreational feature is a special place within the urban environment, the adjacent scenery is not particularly attractive. Note the large cruise ship shown above, as well as the construction cranes, overhead highway signs, power stations and other industrial elements in the view.

- Sounds – Sounds were present but generally inconspicuous.
- Smells – Smells were present but generally inconspicuous.
- Visibility – Views across the water are possible, but they are often partially screened by marina elements in the foreground. Views across the Charleston Harbor are to primarily urban scenery with mixed commercial and industrial elements, but also includes a glimpse of Waterfront Park behind the cruise terminal, and a few historic church steeples. These views are somewhere between inferior and normal.
- Other significant attributes – None noted.
- Known for wildlife observation – No known organized tours are held here.
- Cultural or historic landmarks – The steeples of the Cathedral of St. John The Baptist, St. Michael’s Episcopal Church, and St. Philip’s Episcopal Church, possibly others, seem to be partially visible from here.

Regionally Applicable Assessment Framework

A preliminary professional assessment framework is developed as a basis for the assessment that determines the existing visual quality and classifies the study area into a management class.

Definitions

Distinct – something that is considered unique and is an asset to the area. It is typically recognized as a visual/aesthetic asset and may have many positive attributes. Diversity and variety are characteristics in such a resource.

Average – something that is common in the area and not known for its uniqueness, but rather is representative of the typical landscape of the area.

Minimal – something that may be looked upon as a liability in the area. It is basically lacking any positive aesthetic attributes and may actually diminish the visual quality of surrounding areas.

Table 1. Regionally Applicable Assessment Framework			
	Distinct 3	Average 2	Minimal -1
Water Resources	x	Large bodies of swiftly moving water, such as the Charleston Harbor and the Ashley and Cooper Rivers. Small boat marinas.	x
Landform	x	Coastal landscape.	x
Vegetation	x	Percent cover varies from close to 0% to close to 100% depending on location and view. Type varies from undeveloped woodlands and marshes to park trees	x

		and other urban plantings.	
Landuse	Parks and recreational areas, historic steeples visible on skyline	Commercial buildings	Industrial buildings, unsightly infrastructure
User Activity	Park events, historic tours	General river and harbor viewing, land based recreation, fishing off of piers, boating	construction activities
Subtotals	6	10	-2
Total	14		

[The Management Classification Assigned](#)

The assignment of a class is a reflection of the visual resources present in the zone or study area as well as recognition of the visual quality of those resources. The MCS classes provide general guidelines as to the degree and nature of visual change acceptable in a landscape.

A similarity zone having a total assessment value of 14-16 is included in the Retention Class. These areas are regionally recognized as having distinct visual quality, but may not be institutionally protected. Project activity may be evident, but to the extent possible would not attract attention. Structures, operations, and use activities should remain subordinate to the existing visual resources and should repeat the form, line, color, texture, scale, and composition characteristics of the resource. Projects in these zones should have VIA Values no lower than -2.

While the general management classification is Retention Class, there may be places along the project that should be considered for an approach according to the Partial Retention Class. These areas are locally valued for above average visual quality, but are rarely protected by institutional policies. In these places, the project may be evident and begin to attract attention, but to the extent possible would remain subordinate to the existing visual resources. Form, line, color, texture, scale, and composition may differ from but should be compatible with the visual characteristics of the existing resource. Partial Retention Class should have VIA Values no lower than -5.

Similarly, there may be places along the project that should be considered for an approach according to the Preservation Class. The places that would be considered for the Preservation Class approach will likely be protected by Federal and State policies and laws, such as historic districts. In these places, to the extent possible, the project would appear to be extensions of the protected resource and should faithfully represent, repeat, or reinforce the visual character of that resource. Preservation Class should have VIA Values of 0.

Because some of the most celebrated parks and viewpoints are what was assessed to establish the management class, and were found to generally be in the Retention Class, it is anticipated that any variability from the Retention Class is more likely to be in the Partial Retention Class than in the Preservation Class. Additionally, it is important to remember that the visual quality objectives of the Detailed Visual Impact Assessment Procedure, once undertaken, would be to reduce visual contrast with the landscape as much as possible unless the project has symbolic value, informative significance,

and/or creative design; to borrow at least partly from visual elements of surrounding landscape; and to determine if mitigation may be necessary to assure compatibility.

General VIA Procedure

The General VIA Procedure is outlined in the figure below, taken from the referenced Instructional Report.

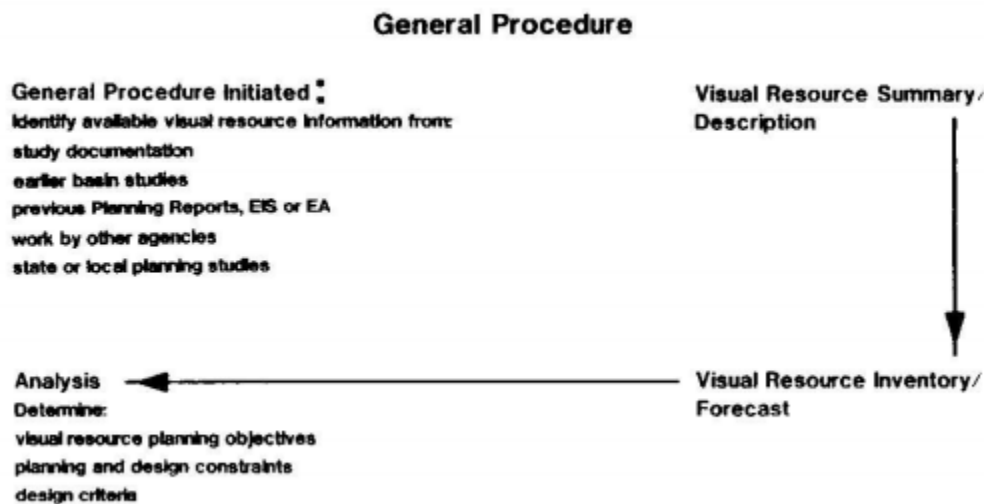


Figure 9. General VIA Procedure

Available Visual Resource Information Utilized

The MCS conducted for this visual assessment was used, as well as other study documentation available at the time of this general procedure.

Visual Resource Summary/Description

The same information developed in the MCS can be applied directly to the study area inventory of existing landscape conditions. In summary, this is a coastal landscape with large bodies of swiftly moving water, such as the Charleston Harbor and the Ashley and Cooper rivers, occasionally with small boat marinas present. In the places observed, these water bodies were often the visually dominant element, and had boats of various sizes and purposes on them. Scenery across the water bodies in the distance often consisted of a generally urbanized landscape. Percent vegetation cover varies widely depending on location and view. When present, the type of vegetation also varies from undeveloped woodlands and marshes to park trees and other urban plantings. Land uses in the areas observed were either primarily commercial and institutional buildings or had commercial and institutional substantially interspersed. Distinct attractive land uses included parks and recreational areas as well as historic steeples visible on the skyline from some locations. Unattractive land uses included industrial buildings and unsightly infrastructure in the skyline such as cell phone towers and directional highway signs.

Inventory/Forecast of Important Visual Resources

Future Without Project Conditions

A few things are likely to happen to change the visual resources in the study area in the future without project condition. As relative sea level rises and storm surge affects the study area more frequently and with increasing intensity, the Ashley and Cooper Rivers will be in a flood state more often, and the landscapes at the rivers' and harbor's edges will increasingly experience storm surge damages. Those parts of the urbanized landscape closest to the water's edge would need to be periodically rebuilt or restored after storm surge damages, and if they didn't then the visual quality of the landscape would progressively degrade. This would likely adversely affect the user's experience of the site they were visiting more than it would affect their experience of views across a water body.

Similarly, park trees and other urban plantings will experience storm surge damages and, dependent on the severity, may need to be replaced. Additionally, the type and distribution of vegetation in open spaces such as undeveloped woodlands and marshes may change over time due to relative sea level rise and storm surge damages, with these places gradually being lost and/or their visual character changed.

The without-project future conditions could also lead to tourism facilities, including commercial and institutional buildings as well as historic areas or buildings, being closed more often and for longer periods due to storm surge flooding and/or recovery efforts. This may adversely affect visitors' experience of the landscape as they move across it to get to the water's edge, but once at the water's edge it may not affect their experience of views across water bodies. The storm surge damages wouldn't be limited to touristic and commercial/institutional areas either, since residential neighborhoods would be equally subject, and the visual impact of the damages would be adverse there as well, unless or until restoration and repair were undertaken. Because the Charleston Old and Historic District, which is a major draw for tourism, contains primarily residential buildings in addition to the commercial, ecclesiastical and government-related buildings that are there, restoration and repair not undertaken by individual property owners could degrade the visual quality of the historic peninsula. Finally, if damaged, unattractive land uses including industrial buildings and unsightly infrastructure in the skyline such as cell phone towers and directional highway signs would likely be restored to similar low visual quality/condition, but could have opportunities for improvement.

In the future without-project condition, places such as Brittlebank Park could erode away under repeated storm surge damages, and the park events that currently happen there would have to scale down over time or, perhaps, relocate – whether they would stay in the Charleston metropolitan area or relocate outside the region is unknown. Historic tours along the water's edge of The High Battery, if it was declared unsafe due to gradually crumbling away, would have to relocate to The Low Battery or elsewhere. General river and harbor viewing would move inland as the water's edge did, new piers for fishing and docks/marinas for boating would eventually have to be built. Construction activities there and throughout the receding city would be ongoing to continually make the remaining city anew.

Future With Project Conditions

The forecast of with-project conditions can be no more detailed than the level of proposed alternatives. At the time this draft was written the plan for the storm surge wall was still being conceptualized, with the nonstructural plan to follow. Additionally, the breakwater was very conceptual.

Forecasting the with-plan conditions for the study area, a few things could happen to change the visual resources. As relative sea level rises and storm surge affects the study area more frequently and with increasing intensity, the Ashley and Cooper Rivers will be in a flood state more often, and the landscapes at the rivers' and harbor's edges will be protected from storm surge damages up to the design level of the protection provided. However, the storm surge wall and/or breakwater that is providing protection will be visible to varying degrees depending on location and view, and may in some cases have an adverse impact to visual resources, while in others it may not.

Those parts of the urbanized landscape closest to the water's edge would need to rebuild or restore less often than in the without-project future due to being protected from storm surge damages up to the level of protection designed. This includes but is not limited to park trees and other urban plantings. This means the visual quality of the landscape would be maintained more consistently for a longer period of time with-project than without-project. However, the presence of the storm surge wall and/or breakwater could affect the visitors' experience of some places they would visit more than others, depending on location. Generally, though, the storm surge wall and/or breakwater is not anticipated to affect their experience of views across water bodies.

In the with-project future condition, the type and distribution of vegetation in open spaces such as undeveloped woodlands and marshes may change based on the placement of the storm surge wall, either due to its presence or due to its absence, changing the visual character of some places.

The with-project future conditions would lead to tourism facilities, including commercial and institutional buildings as well as historic areas or buildings, being protected by the storm surge wall and/or breakwater, up to the designed level of protection, and would likely shorten the time needed for recovery from storms. Relative to the without-project condition, this would improve visitors' experience of the landscape as they move across it to get to the water's edge, but may also affect their experience of views across water bodies, depending on their location relative to the location of the storm surge wall and/or breakwater. The residential neighborhoods would also be protected up to the designed level, and the visual impact of the damages similarly shortened/reduced, with them and visitors enjoying the benefit. Yet, their experience of views may also be adversely impacted depending on their location relative to the location of the storm surge wall and/or breakwater. Unattractive land uses including industrial buildings and unsightly infrastructure in the skyline such as cell phone towers and directional highway signs would likely remain unchanged.

Depending on the location of the wall, places such as Brittlebank Park could be protected from storm surge, and the park events that currently happen there could remain. Historic tours along the water's edge of The Battery could continue, with their experience changing very little. General river and harbor viewing could continue in generally the same locations, but their experience in some cases could change, dependent upon location. Existing piers for fishing and docks/marinas for boating would largely remain where they are. Construction activities throughout the city could continue according to current city plans.

Visual Resource Analysis

The detail and type of analyses and conclusions depend on the requirements of the study. Due to anticipated public interest, a more detailed analysis of the potential visual impacts will be conducted during a Detailed VIA Procedure that is recommended to include at a minimum, but is not limited to, conceptual simulations of the with-project future condition at selected viewpoints.

A preliminary identification of the kinds of significant visual resources in the study area is given below.

- Historic neighborhoods and sites on the National or State Register of Historic Places
- Parks, especially those that are important to the area's tourism
- Key visual corridors between the above

Potential Visual Impacts in the Study Area

Potential Visual Impacts in the study area were outlined in a general fashion in the preceding section titled "With-Project Future Conditions". As the wall siting and height dimensions are further developed, along with information on the breakwater and nonstructural measures, a more detailed visual impact analysis can be completed. The visibility analysis of the breakwater measure that has already been done will be taken into further consideration at that time. This visibility analysis, "Visibility Analysis of Breakwater Measure: Charleston Peninsula Study", unpublished, USACE Charleston District, December 2019, is incorporated here by reference.

Conclusions and Next Steps

It is recommended that a Detailed VIA Procedure including, but not limited to, selected viewpoint simulations, visual impacts assessment, visual resource planning objectives, constraints, and planning and design criteria, etc. be developed and implemented concurrent with continued preparation of the Feasibility Report.

It is important that visual resources considerations be included in the planning process on a level comparable to other environmental resources, such as cultural resources, for a few reasons:

- Visual resources considerations were identified early on as a potential area of high public interest in the Charleston Peninsula study.
- Visual resources costs have not been identified separately in the first cost of the tentatively selected plan.
 - It is possible that most of the project requirements associated with visual resources considerations, and their costs, could be met by taking them into consideration during planning and design of the basic engineering project,
 - It is also possible that most of the project requirements associated with visual resources considerations, and their costs could be met by the mitigation work for other environmental resources, especially cultural resources.
 - While it is possible that the policy-driven project requirements for visual resources, and their costs, could be met in these other ways, there is also a chance that there will be separate visual resources policy requirements to be met, and associated costs.
 - However, this cannot be known if the visual resources analysis is not being conducted concurrent with the rest of the feasibility study.

CLEAN WATER ACT SECTION 404(b)(1) EVALUATION (placeholder)

CWA 404 EVALUATION WILL GO HERE WHEN COMPLETED

ENVIRONMENTAL CORRESPONDENCE (placeholder)

COPIES OF CORRESPONDENCE WILL GO HERE WHEN COMPLETED