



**US Army Corps  
of Engineers**®  
Galveston District

**General Conformity Determination  
for  
Houston Ship Channel Expansion Channel  
Improvement Project**

**Harris, Chambers, and Galveston Counties, Texas**

Prepared for:

U.S. Army Corps of Engineers, Galveston District

Provided by:

The Port of Houston Authority

Prepared by:

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**December 2019**

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Attachment A – Emission Estimation Details

## 1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Galveston District and the Non-Federal Sponsor (NFS), Port Houston, are proposing to implement the Recommended Plan (RP) to address reducing transportation costs while providing for safe, reliable navigation on the Houston Ship Channel (HSC) system. The RP resulted from the HSC Expansion Channel Improvement Project (HSC ECIP), a 4-year federal navigation megastudy conducted to address navigation problems and opportunities. The RP is a Federally-proposed action to dredge portions of the HSC to wider and deeper dimensions to address limitations in the existing channel that result in navigation restrictions and delays with the current and future forecasted vessel traffic and commodity movement. In accordance with the General Conformity (GC) regulations promulgated under the Clean Air Act in 40 CFR Part 93 Subpart B, Determining Conformity of Federal Actions to State or Federal Implementation Plans (EPA 2010a), this Draft General Conformity Determination (GCD) has been prepared to analyze and document the GC-related air emissions that will result from the RP and document that these emissions conform to the latest U.S. Environmental Protection Agency (EPA) approved State Implementation Plan (SIP) applicable to the Houston/Galveston/Brazoria (HGB) ozone non-attainment area (NAA).

### 1.1 Project Background

The HSC consists of a 50-mile, 45-foot deep, 530-foot wide channel through Galveston Bay, and upstream of Galveston Bay narrowing down and becoming shallower through segments that are 400 feet and 300 feet wide and from 45 feet down to 36 feet deep. The HSC system includes the side channels, Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC). Additionally, 250-foot wide barge lanes are currently maintained on the both sides of the HSC to separate the faster, deep-draft ship traffic from the slower, shallow-draft barge traffic. At each of these major components of the system, there are a variety of navigation features such as bend easings and turning basins to allow vessels to turn into channels and turn around. The last system-wide study of the HSC was completed in 1995, with the resulting project, the Houston and Galveston Navigation Channels (HGNC) Project being constructed primarily from 2000 to 2005. The study was completed almost 25 years ago, and initiated years prior to that at a time when major container terminals and vessel traffic had just started in the system (at Barbours Cut) and before the largest planned terminal (Bayport) was planned or built. The study was also complete before the continued and most recent exponential growth in crude and refined product shipping from Houston. Since then, industry trends in both containerized and bulk liquid or gas cargo have seen a shift to substantially larger vessels. This includes trends towards larger container vessels that have essentially doubled and tripled in capacity, growing from mean a new-build size of 3,000 Twenty-Foot Equivalent Units (TEU) to between a mean of 6,000 and 9,000 TEU, and largest sizes of upwards of 18,000 TEU. Locally, the HSC is beginning to experience vessel calls in the 10,000 TEU and higher class. Also, shifts in crude and refined product tanker size in the HSC is increasingly shifting from Panamax to larger Aframax and Suezmax vessel classes. These vessels come with a variety of transit restrictions related to vessel size and channel dimension due to vessel pilot rules designed to safely guide vessels. Additionally, the upper reaches of the HSC have -37.5 feet Mean Low Lower Water (MLLW) and -41.5 feet MLLW depths that are less than the maximum depth the main HSC provides, limiting vessel draft in these reaches. The HSC ECIP study addresses the delays, draft restrictions and other problems and opportunities related to navigation identified during the study, with an RP planned to address them.

## 1.2 Project Description, Purpose, and Need

The RP consists of dredging to widen the HSC through the Bay and through a limited segment above Morgans Point in the upper channel, deepen the draft-restricted upper channel, widen the BSC and BCC, and improve or construct new turning features throughout the system. The project also includes dredged material placement areas (PA) and beneficial use (BU) sites to manage material dredged for the project. During the feasibility study process, the various project alternatives formulated were evaluated and two were selected for advancement to detailed evaluation. One was the National Economic Development (NED) Plan, the plan that the USACE has identified as the plan that reasonably maximizes NED benefits consistent with protecting the Nation's environment. The other was the one that the NFS prefers, termed the Locally Preferred Plan (LPP). The LPP was selected as the plan recommended for implementation, and is therefore the RP. The NED Plan is a variant of the RP that omits widening of the HSC in the Bay from Redfish Reef northward to Morgans Point, and requires bend easing and further easing of the Bayport Flare at the confluence of the HSC with the BSC. Because the NED Plan is a smaller variant that omits two major widening segments, it requires fewer cubic yards of dredging, and fewer emissions, to construct. Therefore, the LPP represents the largest that emissions could be from the HSC ECIP project. Both plans are presented to the Assistant Secretary of the Army for Civil Works [ASA(CW)] for review and approval of the LPP as the RP. The LPP and NED Plan are illustrated in **Figure 1-1**. The following summarizes the channel improvement features of the LPP (which again, is the RP):

- Widen the HSC to 700 feet through Galveston Bay from Bolivar Roads near the Entrance Channel to the BCC, and provide bend easings at four bends along the channel. The NED Plan limits the widening to the lower section of the Bay from Bolivar Roads to Redfish Reef. The widening would include shifting the current shallow draft barge lanes outward of the widened channel.
- Widen the HSC from Boggy Bayou to Greens Bayou from its current 300 to 400-foot width to 530 feet.
- Widen the BSC and BCC to 455 ft wide, and construct a combination turning basin and bend easing at the BCC. The NED Plan requires further widening of the Bayport Flare.
- Deepen the HSC from Boggy Bayou to Hunting Bayou to -46.5 ft MLLW, and from Sims Bayou to the Main Turning Basin to -41.5 ft MLLW
- Expand and shift the Brady Island Turning Basin in the upper HSC to a larger diameter.
- Construct a shoaling attenuation feature, which is a groin or jetty-like structure to be modeled and designed during preconstruction engineering and design (PED) to address excessive shoaling occurring in the Bayport Flare.

The RP would be constructed using hydraulic and mechanical dredges supported by various tender, boat, barges and scows. As discussed, the RP includes dredged material PAs and BU sites that would be constructed using the material or used to place the material. At the time of channel construction, material would be pumped by pipeline or transported by scow to upland or aquatic PA and BU sites to raise or build containment dikes, and fill the interior of sites. A variety of onshore equipment such as graders, excavators and dozers would be used to grade, shape and ditch the sites and dikes to build the features or dewater the material. Integral to the Dredged Material Placement Plan (DMMP)

planned for the RP, are a variety of BU sites that will use the dredge material to construct ecological restoration features such as tidal marsh and bird islands that have been coordinated with Federal and State resource agencies. To manage the new work dredged material generated from constructing the RP, the following existing and new PAs and BU sites are proposed to be used to accept the material. These are illustrated in **Figure 1-2** through **Figure 1-6** described from the Gulf of Mexico to landward:

- Use of the existing Offshore Dredged Material Disposal Site (ODMDS) No. 1.
- Use new work material to construct the base of oyster reef mitigation pads in lower and mid Galveston Bay.
- Construct the following BU sites: two new 6 and 8-acre bird islands in the lower Bay and a new 3-bird island/tidal marsh in the middle part of the Bay. Construct a new marsh cell M12 and an unconstructed, previously authorized marsh cell M11 in the upper part of the Bay.
- Use material to repair and rehabilitate dikes at existing marsh cell M7/8/9.
- In the upper HSC, raise dikes and fill in the existing Filterbed and Glendale PAs, construct and fill a new, one-time upland PA E2 Clinton on PHA property, and beneficially use material to raise the grade of PHA property for future terminal development at BW8.

Once the RP and the above placement features are constructed, the channel would be maintained periodically through maintenance dredging over the next 50 years using the existing PAs and some of the sites created with the project material. The purpose of HSC ECIP study is to evaluate Federal interest in alternative plans (including the No-Action Plan) for reducing transportation costs while providing for safe, reliable navigation on the HSC system. Economic conditions have changed significantly since the last HSC study for both the container and bulk industry. An increase in throughput tonnage and a significant shift in average fleet size render current channel dimensions incapable of accommodating the forecasted commodity and fleet growth without significant and system-wide inefficiencies. The study evaluates and recommends measures that address current and expected inefficiencies. The needs for this project are to address problems and opportunities identified during the study including the following problems:

- Inefficient deep and shallow-draft vessel utilization of the HSC system resulting from existing channel depth, width, and configuration;
- Navigation safety concerns for deep and shallow-draft vessel traffic; and
- A lack of environmentally acceptable dredged material placement (PA/BU) with capacity to service the system

The following opportunities were identified:

- Reduce transportation cost of forecasted commodity volume at HSC;
- Eliminate or reduce navigation inefficiencies at HSC for existing and forecasted fleet (i.e., reduce delay times, interport movements, and transit times);
- Eliminate or reduce beam, length, and draft restrictions at HSC for forecasted fleet;

- Optimize channel configuration/design in a cost effective and environmentally acceptable manner that improves safety;
- Establish environmentally suitable PAs/BU sites for new work dredged material, as well as maintenance-dredged material;
- Reduce the environmental impacts from a new project, or protect or improve environmentally sensitive areas in the vicinity of the Federal project through BU of dredge materials; and
- Study the configuration of barge lanes and further optimize them.

The study evaluated a wide variety of widening, deepening, turning, and anchoring measures to address the problems and opportunities. Economic analysis was performed using vessel traffic and transit cost modeling. Engineering analysis was performed to establish proper channel design through ship simulation, hydrodynamic modeling, calculation of dredging and placement quantities, and estimation of construction costs. Environmental evaluation was performed including National Environmental Policy Act (NEPA) analysis and documentation, oyster reef and wetland surveys, and other impact analysis. The cost and benefit analysis identified the plans that produced the most net benefits while meeting the other objectives of the study that addressed the aforementioned problems and opportunities. The plans were evaluated following the planning procedures in USACE planning regulations for Civil Works projects. A Final Integrated Feasibility Report and Environmental Impact Statement (FIFR-EIS) has been developed as the decision document to coordinate the RP for approval and provide NEPA documentation. The RP is the project resulting from the study proposed for implementation to address those problems and opportunities.

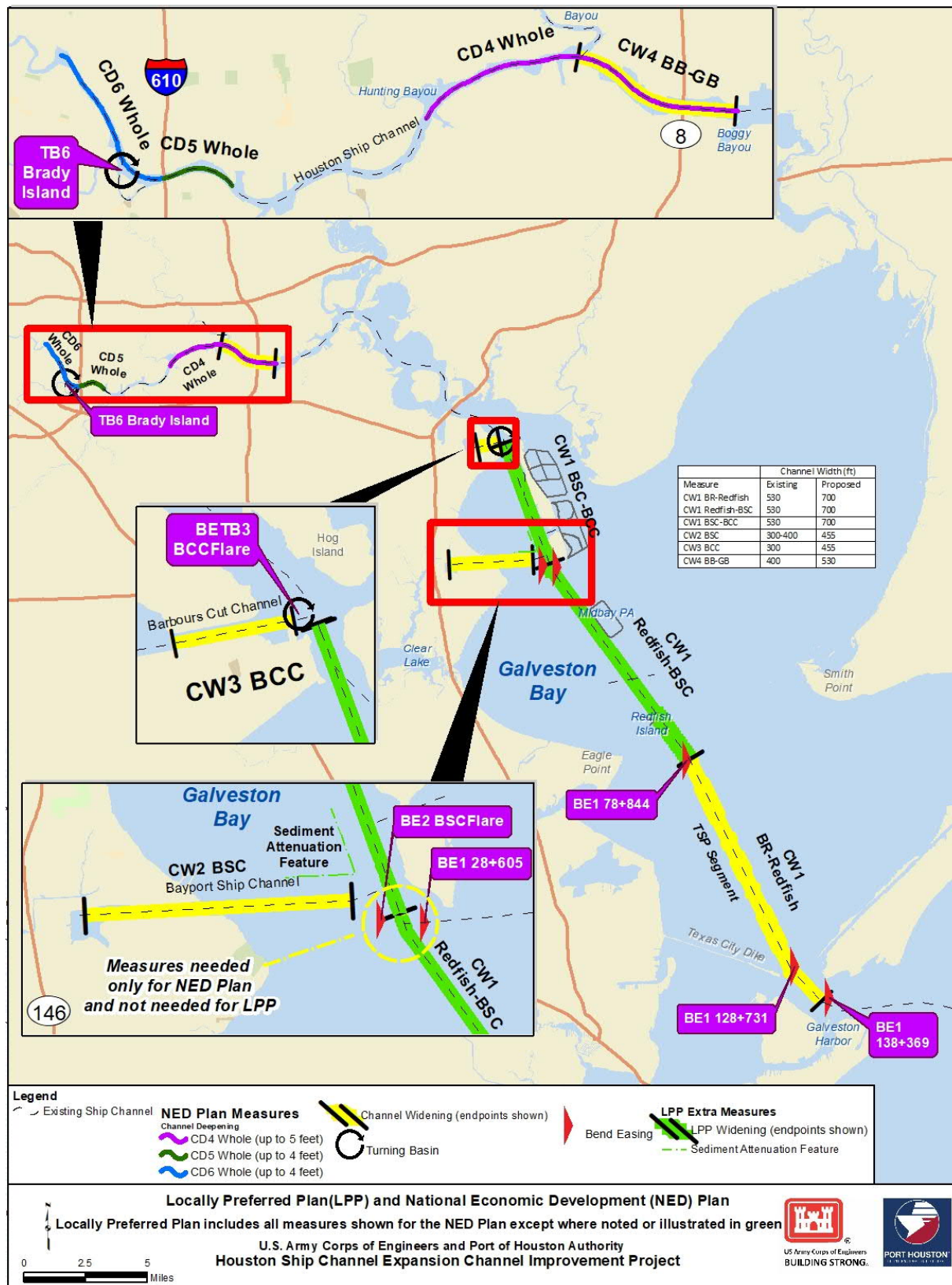


Figure 1-1: The Proposed LPP and NED Plan

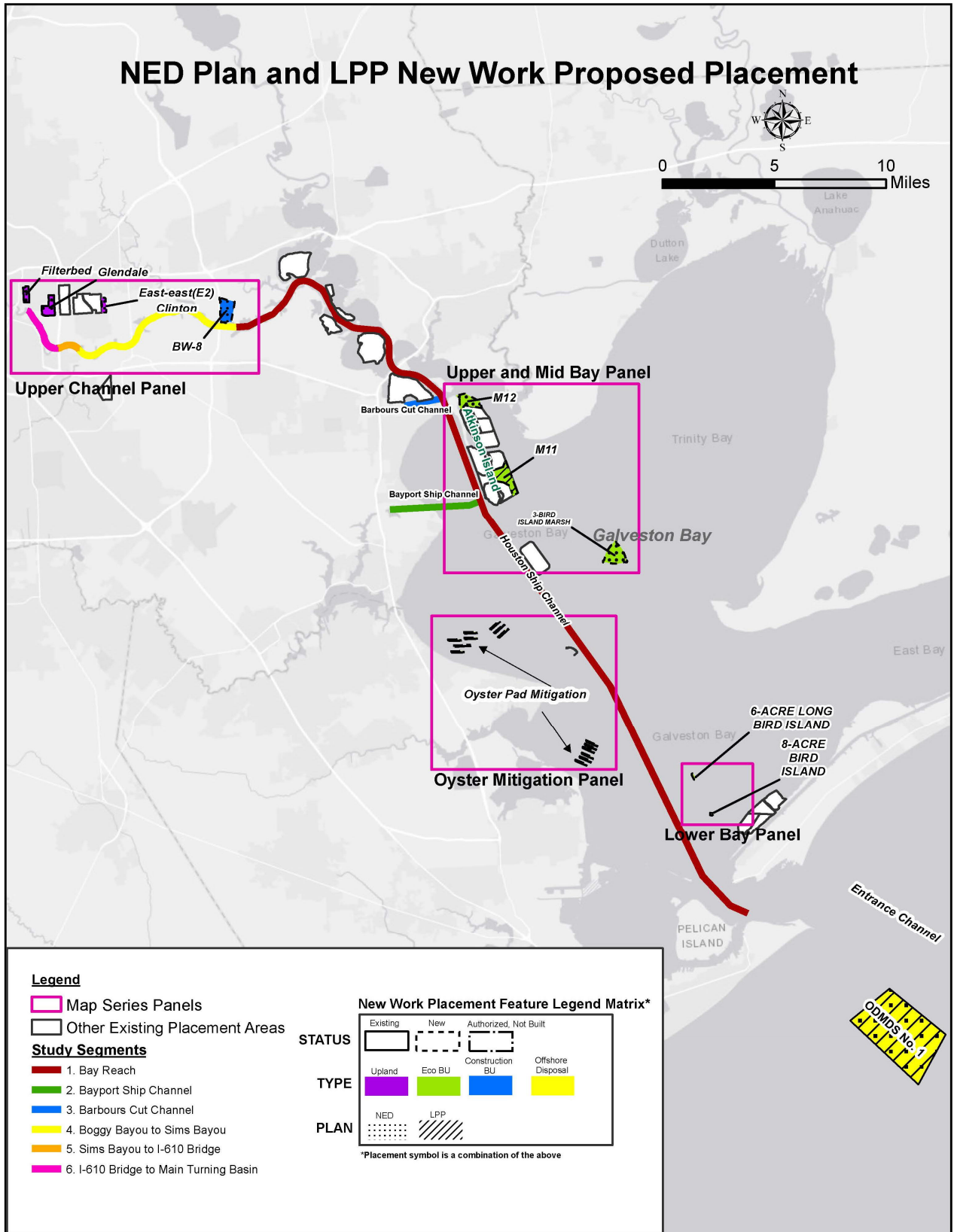
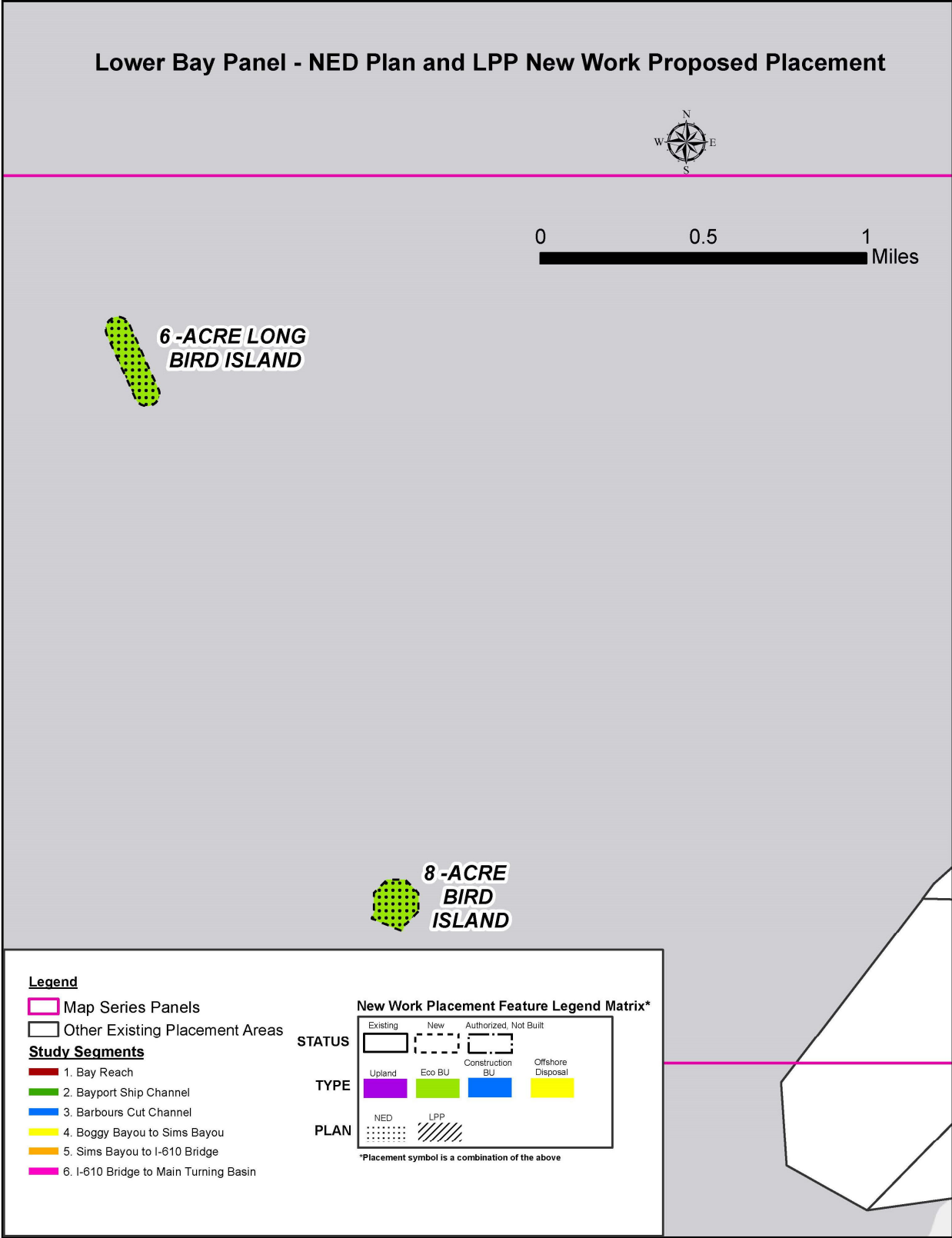
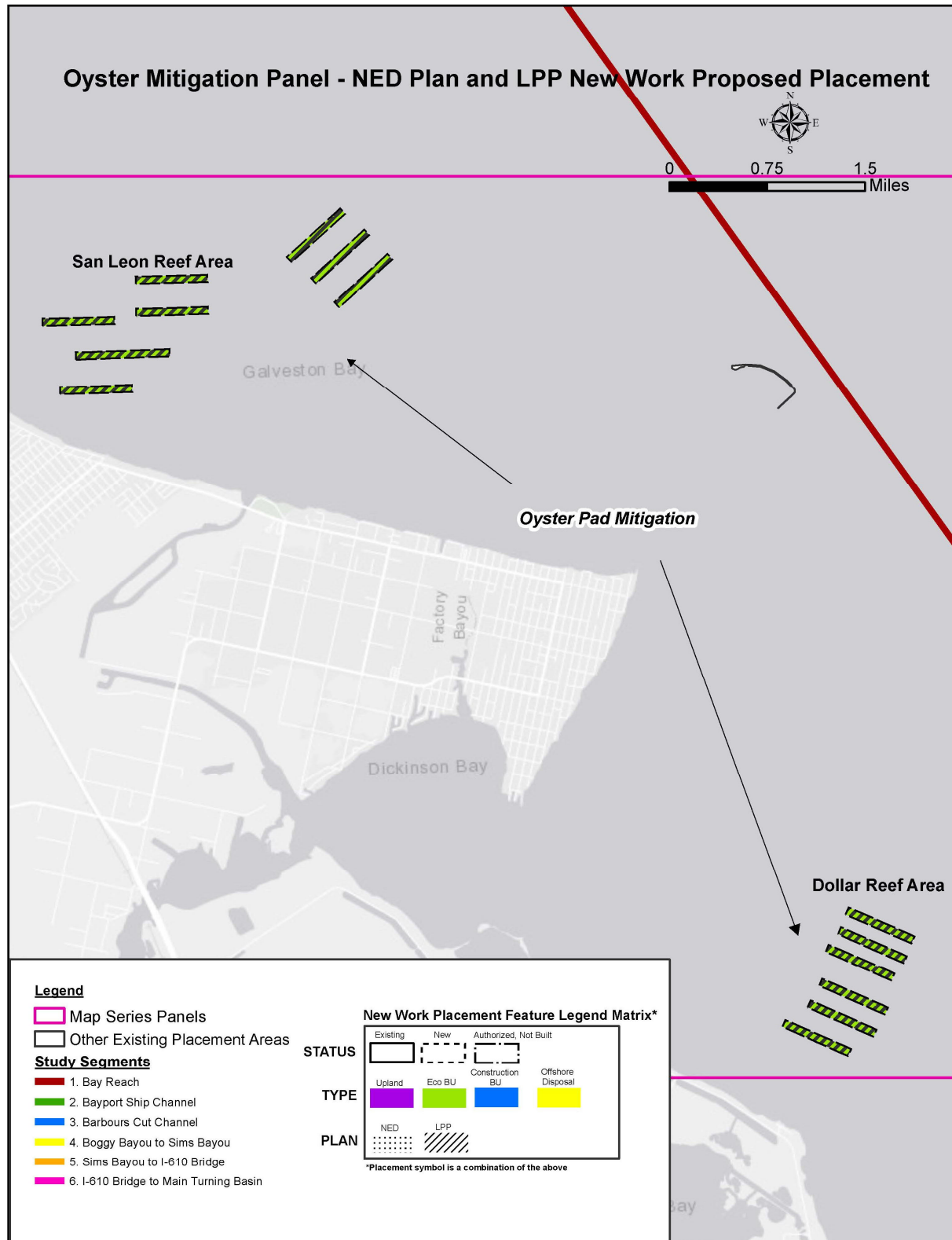


Figure 1-2: Proposed New Work Placement of the LPP and NED Plan

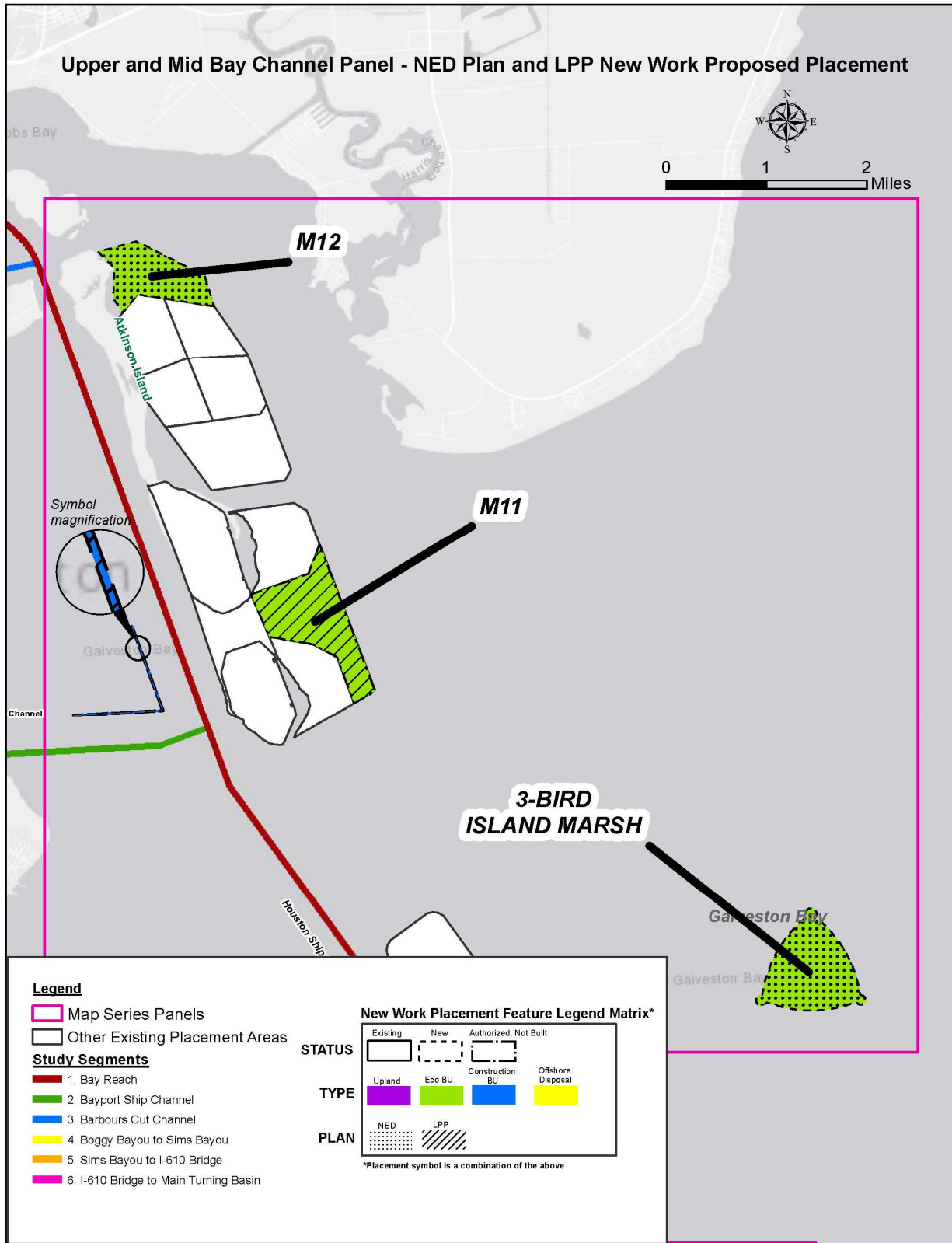




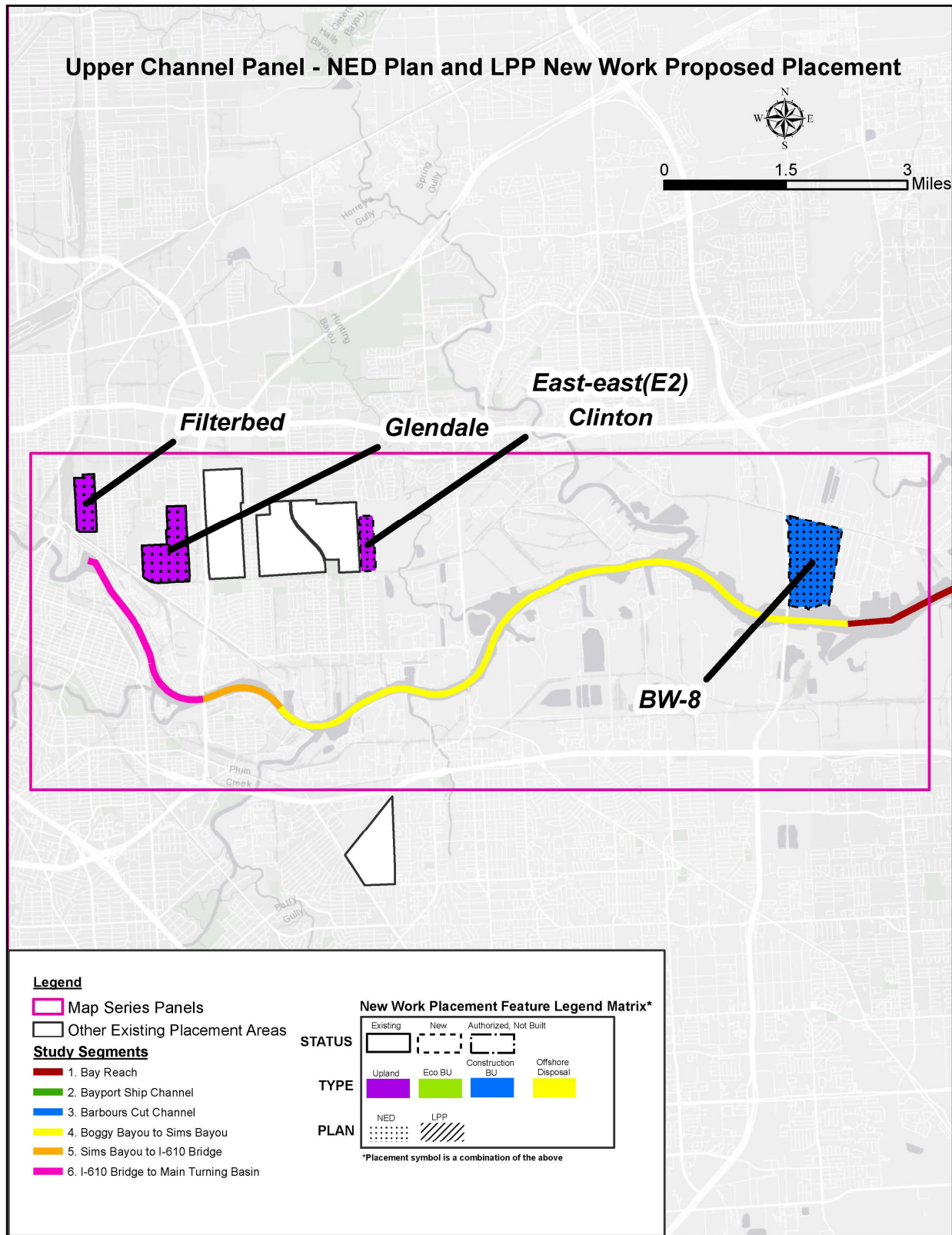
**Figure 1-3: Lower Bay – Proposed New Work Placement of the LPP and NED Plan**



**Figure 1-4: Oyster Mitigation – Proposed New Work Placement of the LPP and NED Plan**



**Figure 1-5: Upper and Mid Bay – Proposed New Work Placement of the LPP and NED Plan**



**Figure 1-6: Upper HSC – Proposed New Work Placement of the LPP and NED Plan**

### 1.3 Regulatory Background

General Conformity is a Federal regulatory program designed to ensure that actions taken by Federal entities, such as projects proposed by the USACE, do not hinder states' efforts to meet the national ambient air quality standards (NAAQS). The definition of a Federal action as specified in 40 CFR 93.152 includes "...any activity engaged in by a department, agency, or instrumentality of the Federal government, or any activity that a department, agency or instrumentality of the Federal government supports in any way, provides financial assistance for, licenses, permits, or approves, other than activities related to transportation plans, programs, and projects developed, funded, or approved under title 23 U.S.C. or the Federal Transit Act (49 U.S.C. 1601et seq.)"

With regard to a dredging project such as the Proposed Project, the Federal Action consists of a Federal project being funded and implemented by the USACE, which is subject to General Conformity review. Placement of dredged material is part of the proposed Federal Action, and is subject to General Conformity. Maintenance dredging is not subject to General Conformity review.

The EPA has established a series of steps to determine whether a given Federal Action is subject to General Conformity review as follows (EPA 2010b).

1. Whether the action will occur in a nonattainment or maintenance area (see Table 1-1 below for the attainment status of the project area);
2. Whether one or more of the specific exemptions apply to the action;
3. Whether the federal agency has included the action on its list of "presumed to conform" actions;
4. Whether the total direct and indirect emissions are below or above the *de minimis* levels (see Table 1-2 below for the *de minimis* levels); and/or
5. Where the facility has an emission budget approved by the state as part of the SIP, the federal agency determines if the emissions from the proposed action are within the budget.

Regarding the proposed Federal action to implement the RP,

1. The action will be occurring in the Houston-Galveston-Brazoria (HGB) ozone nonattainment area, which is designated as serious nonattainment for the 2008 ozone standard and marginal nonattainment of the 2015 ozone standard;
2. None of the specific exemptions apply to the action, except to the extent that any of the dredging to be carried out is maintenance dredging, which is specifically exempt;
3. The USACE has not included dredging projects on a list of "presumed to conform" actions;
4. Total direct and indirect emissions, as currently estimated, will exceed the *de minimis* level of 100 tons of oxides of nitrogen (NO<sub>x</sub>) in a marginal nonattainment area (NAA) and 50 tons of NO<sub>x</sub> in a serious NAA. (see Error! Reference source not found., Table 2-2, **Error! Reference source not found.**, and Table 2-4in Section 2 for estimated

project related emissions); and

5. The USACE does not possess an emissions budget approved as part of the HGB area SIP.

Based on the discussion presented above and the emissions presented below in Section 2, a General Conformity determination is required for NO<sub>x</sub> emissions from the RP. Since the action is required to demonstrate conformity, one or more of the following conditions must be met (EPA 2010b).

1. Demonstrating that the total direct and indirect emissions are specifically identified and accounted for in the applicable SIP;
2. Obtaining a written statement from the state documenting that the total direct and indirect emissions from the action, along with all other emissions in the area, will not exceed the SIP emission budget;
3. Obtaining a written commitment from the state to revise the SIP to include the emissions from the action;
4. Obtaining a statement from the metropolitan planning organization (MPO) for the area documenting that any on-road motor vehicle emissions are included in the current regional emission analysis for the area's transportation plan or transportation improvement program;
5. Fully offsetting the total direct and indirect emissions by reducing emissions of the same pollutant or precursor in the same nonattainment or maintenance area.

A sixth potential demonstration method, conducting air quality modeling that demonstrates that the emissions will not cause or contribute to new violations of the standards, or increase the frequency or severity of any existing violations of the standards, is not available for the RP, because modeling is not acceptable for ozone nonattainment areas due to the complexity of ozone formation from precursor pollutants and the limitations of current air quality models. Of the options detailed above, the USACE elected to utilize the second option, obtaining concurrence from the Texas Commission on Environmental Quality (TCEQ) that the total direct and indirect NO<sub>x</sub> emissions from the action will not exceed the applicable SIP emissions budget, because of the low level of emissions compared with the SIP budget, and the temporary nature of the emissions.

**Table 1-1: Attainment Status of Houston-Galveston-Brazoria Area**

Pollutant	Primary NAAQS	Averaging Period	Designation	Counties	Attainment Deadline
Ozone (O <sub>3</sub> )*	0.070 ppm (2015 standard)	8-hour	Marginal Nonattainment	Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery	August 3, 2021
	0.075 ppm (2008 standard)	8-hour	Serious Nonattainment	Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller	July 20, 2021
Lead (Pb)	0.15 µg/m <sup>3</sup> (2008 standard)	Rolling 3-Month Average	Unclassifiable/Attainment		
Carbon Monoxide (CO)	9 ppm	8-hour	Unclassifiable/Attainment		
	35 ppm	1-hour	Unclassifiable/Attainment		
Nitrogen Dioxide (NO <sub>2</sub> )	0.053 ppm	Annual	Unclassifiable/Attainment		
	100 ppb	1-hour	Unclassifiable/Attainment		
Particulate Matter (PM <sub>10</sub> )	150 µg/m <sup>3</sup>	24-hour	Unclassifiable/Attainment		
Particulate Matter (PM <sub>2.5</sub> )	12.0 µg/m <sup>3</sup> (2012 standard)	Annual (Arithmetic Mean)	Unclassifiable/Attainment		
	15.0 µg/m <sup>3</sup> (1997 standard)	Annual (Arithmetic Mean)	Unclassifiable/Attainment		
	35 µg/m <sup>3</sup>	24-hour	Unclassifiable/Attainment		
Sulfur Dioxide (SO <sub>2</sub> )	0.03 ppm**	Annual (Arithmetic Mean)	Unclassifiable/Attainment		
	0.14 ppm**	24-hour	Unclassifiable/Attainment		
	75 ppb	1-hour	Attainment/		
			Unclassifiable		

**Table 1-2: Significant Action Thresholds in Nonattainment Areas**

Ambient Pollutant	Nonattainment Status	Tons/yr
<b>Ozone (VOCs or NO<sub>x</sub>):</b>	<b>Serious NAA's</b>	<b>50</b>
	Severe NAA's	25
	Extreme NAA's	10
	Other ozone NAA's outside an ozone transport region	100
	Other ozone NAA's inside an ozone transport region	
	VOC	50
	NO <sub>x</sub>	100
Carbon monoxide:	All NAA's	100
SO <sub>2</sub> or NO <sub>2</sub>	All NAA's	100
PM-10:		
	Moderate NAA's	100
	Serious NAA's	70
PM-2.5:		
	Direct emissions	100
	SO <sub>2</sub>	100
	NO <sub>x</sub> (unless determined not to be a significant precursor)	100
	VOC or ammonia (if determined to be significant precursors)	100
Pb:	All NAA's	25

Source of table: 40 CFR §93.153 Applicability. (Amended to include PM2.5)

The HGB nonattainment status is now classified as serious as a result of the 2008 Eight-Hour Ozone Standard Designations. This designation brings the tons-per-year down to 50 for all Ozone emissions. This change which took effect September 23, 2019 has been reflected in this report. The attainment date for serious nonattainment areas is July 20, 2021 with a 2020 attainment year.



## 2 PROJECT CONSTRUCTION EMISSIONS

Project construction emissions of NO<sub>x</sub> and VOCs have been estimated because of the Project area's status as an ozone nonattainment area. The emission estimates are based on equipment and activity estimates provided by the project engineers and emission factors and other information from published sources, including the PHA's most recent air emissions inventory, *2013 Goods Movement Air Emissions Inventory* (Eastern Research Group, 2017). Use of the Goods Movement Emissions Inventory (GMEI) as a source of emission factors and other emissions-related information ensures that the emission estimates presented in this conformity determination are consistent with the PHA's port-wide inventory of air emissions.

Schedule and equipment information for the LPP has been provided by the Joint Venture of Turner Collie and Braden, Inc. and Gahagan and Bryant Associates, Inc. based on project design parameters for the plan. Information includes:

- Equipment type (dredge, barge, tug, dozer, etc.)
- Engine type (main, auxiliary, etc.)
- Engine horsepower and load factor (% of full load)
- Hours of operation for each vessel or piece of equipment

The following sections describe the different categories of emitting equipment that would be used to construct the LPP.

### 2.1 Dredging Equipment and Supporting Vessel Emissions

Emission sources on the dredge itself consist of diesel-fueled engines that provide power for the various operations required for dredging. The dredge is expected to be a cutter suction dredge equipped with a main engine to provide power to the cutterhead, an engine to power the ladder pump used to transport the dredged material from the substrate to the surface, an engine to move and position the ladder that guides and positions the cutterhead, and an auxiliary engine to produce electricity for power needs on the dredge. The dredging operation will also require various support vessels such as positioning tugs, crew boats, and survey boats.

The project engineers provided estimated characteristics of the diesel engines on board the dredge such as total horsepower, operating hours, and average operating loads. They also provided typical characteristics of the support vessels, including total installed horsepower and operating hours. Emission factors for all of these diesel engines were obtained from the "harbor craft" section of the GMEI, which lists emission factors for marine engines of various sizes and emission tier levels.

### 2.2 Dredged Material Placement Site Work

Once the dredged material has been placed in the placement area it will be moved and compacted by non-road equipment such as dozers and loaders. The project engineers provided typical horsepower, operating hours, and load factors for this type of equipment. Emission factors were based on the emission certification levels of Tier 1 non-road equipment. Dredged material placement and handling will account for a relatively small percentage (approximately 8%) of overall project construction NO<sub>x</sub> emissions and approximately 18% of VOC emissions.

## 2.3 Employee Vehicle Commuting

Employee vehicle commuting will make up a very small part of overall project construction emissions, and will represent a negligible percentage of SIP emissions. As an example, the latest EPA approved SIP documentation includes on-road emissions based on 169,918,016 miles per weekday (TCEQ 2016).<sup>1</sup> A 100-person work force making an average 50-mile round trip commute would drive 5,000 miles per day, or 0.003% of the on-road basis of the current SIP.

## 2.4 Emissions Calculations and Results

Emission estimates for each engine have been based on horsepower hours (hp hrs), calculated by multiplying horsepower by load factor by operating hours, multiplied by emission factors in units of grams per horsepower hour (g/hp hr). Emission factors have been chosen for marine and other nonroad engines to be relatively conservative (i.e., to be relatively high so as to calculate reasonably worst-case emission levels). Emission factors for marine engines (propulsion and auxiliary engines on dredges, tugs, work boats, etc.) are from Port Houston's most recent (2013) air emissions inventory and reflect average emissions from these engines in 2013. Emission factors for nonroad engines are based on the Tier 1 emission standards stratified by horsepower. The Tier 1 standards have been applicable since the late 1990s (year depending on horsepower) and so reflect the oldest equipment likely to be in use when the project elements take place and likely overestimate the age of equipment that will actually be used, consequently overestimating prospective emissions.

The emission factors used in calculating these emissions are presented in Table 2-1. As noted above, the emission factors are based on Tier 1 standards, which likely overestimate the emissions that would actually occur because of the introduction of Tier 2 and Tier 3 engines into the equipment that may be used on the project. While NO<sub>x</sub> and VOC emissions have been calculated for demonstration of General Conformity related emissions, other criteria pollutants have been included for completeness. The anticipated schedule of work was used to allocate emissions to each of the project years. Table 2-2 presents a summary of emissions by year for the LPP.

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<sup>1</sup> HGB 2008 Eight-Hour Ozone RFP SIP Revision Adopted by TCEQ 15 December 2016 and approved by EPA on 13 February 2019. See: [https://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/HGB\\_2016\\_AD\\_RFP/RFP/Adoption/16017\\_SIP\\_HGBRFP\\_Ado.pdf](https://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/HGB_2016_AD_RFP/RFP/Adoption/16017_SIP_HGBRFP_Ado.pdf) Accessed 11 July 2019

Table 2-1: Emission Factors Used for Nonroad and Marine Engines

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Tier 1 nonroad						
(11 ≤ hp < 25)	7.1	0.60	0.58	0.004	1.0	4.9
(25 ≤ hp < 50)	7.1	0.60	0.58	0.004	1.0	4.1
(50 ≤ hp < 100)	6.9	0.60	0.58	0.004	1.0	8.5
100 ≤ hp < 175	6.9	0.60	0.58	0.004	1.0	8.5
175 ≤ hp < 300	6.9	0.40	0.39	0.004	1.0	8.5
300 ≤ hp < 600	6.9	0.40	0.39	0.004	1.0	8.5
600 ≤ hp < 750	6.9	0.40	0.39	0.004	1.0	8.5
>750	6.9	0.40	0.39	0.004	1.0	8.5
Marine Cat 1 & Cat 3						
Dredging	9.3	0.23	0.22	0.004	0.1	1.80
Miscellaneous	9.1	0.23	0.22	0.004	0.1	1.78
Tug	8.7	0.23	0.22	0.004	0.1	1.74

Table 2-2: Estimated Tier 1 Emissions from LPP, tons per year

		Estimated emissions, tons per year					
Year		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Year 1	2023	850	32	31	0.47	49	470
Year 2	2024	1,330	54	52	0.77	93	870
Year 3	2025	565	22	21	0.32	35	337
Year 4	2026	535	22	21	0.30	36	340
Year 5	2027	243	11	10	0.14	19	177
Year 6	2028	129	6	5	0.08	10	94
Total		3,652	146	141	2.08	243	2,288

The results indicate that NO<sub>x</sub> emissions will be above the lowest *de minimis* threshold of 50 TPY in all 6 years for the LPP. Therefore, a formal determination of conformity would be required.

Tier 2 emissions standards for the various categories of marine engines became effective in different years dependent on the size category of the engine, with Category 2 becoming effective as late as 2007, and Category 3 in 2011. Dredge main engines displacement and horsepower typically fall into either Category 2 or 3. With more than a decade since initial effective dates, Tier 2 dredges are becoming a more common part of the national large dredge fleet. Also, Tier 2 standards for nonroad equipment, although a minor part of emissions in this project, were effective in the 2003 to 2006 range. Therefore, to provide a range of emission estimation that might be more reflective of equipment ultimately used, emissions have also been estimated for the use of Tier 2 engines rather than the Tier 1-based estimates presented above. While it is not possible to predict the actual equipment that will be brought to the project by contractors who have yet to be selected, it is more likely that equipment will be Tier 2 or newer based on when the standards were

implemented. Tier 3 dredges are newer and fewer in number than Tier 2 in the domestic fleet with only a few spread amongst approximately 3 companies (some are under construction). Tier 3 push or tow boats, although expected to be a smaller percentage of the available fleet, are present in the regional fleet. To analyze the benefit to further reducing construction emissions, Tier 3-associated emissions were also estimated.

The 2013 Goods Movement Air Emissions Inventory does not include Tier 2 or 3 emission factors. Therefore, the marine factors were selected from another recent emissions inventory released by a Texas port, the 2013 Air Emissions Inventory for Port Corpus Christi, July 2015 (Port of Corpus Christi Authority 2013). Nonroad Tier 2 emission factors were based on the Tier 2 emission standards since more precise modeling would require detailed model year and other engine information that is not available. The Tier 2 emission factors used in calculating these emissions are presented in **Table 2-3** below. **Table 2-4** presents the results for the LPP using Tier 2 emission factors. The Tier 3 emission factors used in calculating these emissions are presented in Table 2-5 below. Table 2-6 presents the results for the LPP using Tier 3 emission factors.

Table 2-3: Tier 2 Emission Factors, g/hp-hr

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Tier 2 nonroad						
(11 ≤ hp < 25)	5.6	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	5.6	0.45	0.44	0.005	1.0	4.1
(50 ≤ hp < 100)	5.6	0.30	0.29	0.005	1.0	3.7
>750	4.9	0.22	0.21	0.005	1.0	3.7
100 ≤ hp < 175	4.9	0.15	0.15	0.005	1.0	2.6
175 ≤ hp < 300	4.8	0.15	0.15	0.005	1.0	2.6
300 ≤ hp < 600	4.8	0.15	0.15	0.005	1.0	2.6
600 ≤ hp < 750	4.8	0.15	0.15	0.005	1.0	2.6
Cat 1 and Cat 2 Tier 2						
Dredge main	6.9	0.37	0.36	0.004	0.1	1.8
Dredge aux	5.2	0.15	0.14	0.004	0.1	1.8
Tug main	6.1	0.37	0.36	0.004	0.1	1.8
Tug aux	5.2	0.15	0.14	0.004	0.1	1.8
Miscellaneous	5.2	0.15	0.14	0.004	0.1	1.8

Table 2-4: Estimated Tier 2 Emissions from LPP, tons per year

		Estimated emissions, tons per year					
Year		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Year 1	2023	583	28	27	0.47	49	228
Year 2	2024	915	41	40	0.77	93	378
Year 3	2025	393	18	17	0.32	35	155
Year 4	2026	372	16	16	0.30	36	151
Year 5	2027	167	7	7	0.14	19	72

Year 6	2028	88	4	4	0.08	10	39
Total		2,517	113	111	2.08	243	1,023

**Table 2-5: Tier 3 Emission Factors, g/hp-hr**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 3 nonroad</b>						
(11 ≤ hp < 25)	5.6	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	5.6	0.45	0.44	0.005	1.0	4.1
(50 ≤ hp < 100)	5.6	0.30	0.29	0.005	1.0	3.7
100 ≤ hp < 175	4.9	0.22	0.21	0.005	1.0	3.7
175 ≤ hp < 300	4.9	0.15	0.15	0.005	1.0	2.6
300 ≤ hp < 600	4.8	0.15	0.15	0.005	1.0	2.6
600 ≤ hp < 750	4.8	0.15	0.15	0.005	1.0	2.6
>750	4.8	0.15	0.15	0.005	1.0	2.6
<b>Marine</b>						
<b>Cat 1 and Cat 2 Tier 2</b>						
Main - large dredge	6.2	0.20	0.19	0.004	0.1	3.7
Main - small dredge	5.0	0.08	0.08	0.004	0.1	3.7
Dredge auxiliary	4.0	0.08	0.08	0.004	0.1	3.7
Main - large tug	5.0	0.08	0.08	0.004	0.1	3.7
Main - small tug	4.0	0.08	0.08	0.004	0.1	3.7
Tug auxiliary	4.0	0.08	0.08	0.004	0.1	3.7
Miscellaneous	4.0	0.08	0.08	0.004	0.1	3.7

**Table 2-6: Estimated Tier 3 Emissions from LPP, tons per year**

Year		Estimated emissions, tons per year					
		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Year 1	2023	429	11	11	0.42	47	307
Year 2	2024	747	21	21	0.73	92	511
Year 3	2025	331	10	10	0.31	35	226
Year 4	2026	320	10	9	0.30	36	218
Year 5	2027	139	4	4	0.14	19	98
Year 6	2028	74	2	2	0.08	10	53
Total		2,039	58	58	1.99	241	1,413

The Tier 2 NO<sub>x</sub> results indicate a reduction of approximately 30 percent for the LPP, a substantial reduction. The Tier 3 NO<sub>x</sub> results indicate a further reduction of 18 percent from Tier 2 in the highest emission year. Though these results are substantially reduced, they still exceed the *de minimis* threshold of 50 TPY in 4 of the 5 years. Therefore, a formal determination of conformity would still be required for either plan.

Most of the emissions are from the marine category, of which dredge engines dominate. Due to the increased demand for larger-scale dredging resulting from supplemental Federal funding, and the progression of several deepening and widening projects for major channels to funding and construction, demand for new dredging capacity has resulted in a \$1.5 billion dredging fleet expansion (Navingo Maritime and Offshore Media Group 2019). Several of the major dredging firms have new large cutterhead dredges planned for delivery in the next 2 years to meet industry capacity needs, including Manson, Weeks, Callan and Great Lakes Dredging and Dock (Navingo Maritime and Offshore Media Group 2019, Gerhardt 2018). Therefore, there will be an increase in dredges that meet emissions standards higher than Tier 2, and it is possible that equipment used for the proposed project could be higher tier equipment, which would further reduce the actual emissions. However, the limited population and availability of higher tier equipment may limit cost-feasible bidding for project implementation.

### 3 LONG-TERM EMISSIONS IMPACTS OF THE PROPOSED PROJECT

As discussed in Section 1.2, the LPP addresses multiple navigation problems and opportunities related to transportation delays, inefficiencies, and the related costs. Addressing these directly decreases the time and fuel spent transporting the commodities shipped through the HSC system, and by extension, the associated emissions from Ocean Going Vessels (OGV). The reduction of transportation costs by the measures formulated for both plans is achieved in two primary ways. One way is by reducing transportation delays in the form of slower or delayed navigation, and waiting at docks and anchorages due to navigation restrictions. Another way is to reduce inefficient delivery of cargo imposed by draft restrictions by deepening the channel to alleviate light loading of vessels. In support of the NEPA documentation of project effects, analysis was conducted to estimate the projected air pollutant emissions reductions from OGVs resulting from implementation of the LPP. The analysis and results are summarized in this section, and are described in detail in Section 3.1.8.2 of Appendix G, Environmental Supporting Document of the FIFR-EIS, and Attachment 1 to Appendix G, Houston Ship Channel Expansion Channel Improvement Project Projected Emissions Reductions.

As part of the economic analysis required for the feasibility study, detailed estimates of projected future commodities, vessel fleets, vessel movement, and associated transportation costs are conducted by navigation economists to analyze whether proposed plans are economically justified. Harborsym, the USACE's certified economic analysis computer simulation model developed by the Institute for Water Resources (IWR), is used to aid the analysis. According to the model's user manual, Harborsym is based on the creation of discrete event Monte Carlo simulations that mimic movement of vessels through a harbor (USACE IWR 2012). The model uses these event simulations along with user-defined statistical inputs to generate trips and calculate vessel transit time, loading and unloading time at docks, and docking and undocking time. A model of the harbor network that physically and statistically represents the navigation conditions of the harbor and its channels is developed as part of the analysis, and incorporates the vessel pilot rules that govern how different classes of vessels can move (one-way, two-way, loaded etc.) given the size, channel dimensions, and other navigation conditions. The model provides a detailed estimate of vessel calls (i.e. trips) and transit times by major vessel categories (i.e. tankers, containers, bulkers by different size classes) and can be used to quantify the extra or reduced time involved in transporting cargo by comparing with-project scenarios to without project conditions. An economic model for the HSC system, using Port of Houston-specific vessel fleets, current and future commodities throughput, and vessel pilot rules from the Houston Pilots Association, was developed for this study's economic analysis.

In order to maximize confidence in and utility of the emissions reduction analysis, the Harborsym output was used to support the operational air analysis. Due to the way specific channel improvements work to reduce transportation time, the reduced hours associated with certain groups of measures (e.g. channel widening, deepening) and study segments can be generally categorized as waiting (hours spent waiting at berth or anchorage) or steaming (under way using propulsion). These assumptions were used to employ the appropriate emissions factors and activity. The annual in-port reduction in these hours by vessel category and by study segment were used to estimate emissions reduced by the action alternatives. Besides in-port reductions, which would occur landward of the entrance buoy to the HSC, the proposed action alternatives would also reduce vessel transit hours and emissions seaward of the buoy in the shipping lanes of the Gulf of Mexico

through the elimination of vessel trips. These reductions would take place mostly outside of the HGB NAA, but would still represent substantial emissions reductions in the North American Emissions Control Area (ECA), which encompasses the US Gulf of Mexico. In-port reductions would take place within the HGB NAA. The annual in-port reduction in hours for the Years 2029 and 2044 were used to provide a range of reduction reflecting the increasing reduction occurring as traffic increases in the future due to increased commodity demand.

To provide average vessel engine specifications for the different categories, main engine and auxiliary engine size data was obtained from world fleet vessel data from Information Handling Services (IHS) Fairplay Seaweb, a world vessel registry service. Emissions estimates were developed in accordance with EPA-standard methodologies used for port air emission inventories specified in the *Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories* (ICFI, 2009), including emissions factors for the criteria pollutants, and load factors for propulsion and auxiliary engines. Vessel speed necessary to define various estimate factors were obtained from the economic analysis information used to define vessel transit. One important condition reflected in the operational emissions reduction calculations was the difference in age and engine emissions standards of the OGVs between the larger, newer classes of vessels expected to call at the Port of Houston (POH) and the smaller, older class of vessels replaced. The main vessel category involved are Post-Panamax first (PPX1), second (PPX2) and third generation (PPX3) container vessels (aka New Panamax). The LPP would lift key restrictions that would enable PPX3 vessels that have a capacity in the 10,000 to 12,000 TEU range to call. This would enable a shift of the fleet calling at POH from being dominated by PPX1 (4,000-6,000 TEU) and PPX2 (6,000-10,000 TEU) to one dominated by PPX 2 and PPX3. The average build year of the PPX3 class (taken as PPX of 120 deadweight tons [DWT] or larger) according to the SeaWeb world fleet data is 2012 with most vessels in the 2013-2014 build year, and relatively few ships, comprising a small percentage of the world container vessel fleet. The PPX3 vessel class is relatively new with most of the future fleet of this class expected to have been built in the last few years or in future years to come. SeaWeb fleet data for those with PPX2 dimensions indicated an average build year of 2012, and an average build year of 2003 for PPX1.

Two key changes in marine emissions standards took place in 2010 that would result in reduced emissions for newer Category 3 engines. First, EPA passed regulations requiring new U.S. flagged or manufactured OGVs with Category 3 engines to meet Tier 2 standards by 2011 which would reduce NO<sub>x</sub> from then-current standards by 15 to 25 percent. Thereafter, new engines would have to meet Tier 3 standards by 2016 which would reduce NO<sub>x</sub> 80 percent from pre-2011 standards. Also, since 2015, all fuel produced and sold in a NAA for Category 3 engines must have fuel with sulfur content reduced to 1,000 ppm. Second, the United Nations International Maritime Organization (IMO) required all OGVs calling or traveling through the North American ECA to meet fuel and emissions standards similar to the EPA standards discussed above. Starting in 2012, fuel sulfur content was to be reduced to 10,000 ppm, and then to 1,000 ppm in 2015, and in 2016, new engines must use NO<sub>x</sub> or other ozone precursor exhaust after-treatment systems, to achieve reduced emissions equivalent to the EPA Tier 3 standard. Future year IMO ECA adjustments in the 2009 EPA port inventory guidance were applied to the emissions factors commensurate with the future 2029 project year. Although smaller PPX1 vessels may be built in the future, the fleet age average of 2003 indicates this will be a small, niche market, as the general trend towards the larger classes will predominate, and PPX1 age in the future would likely remain older, with engines meeting lower tier standards. Therefore, the difference in emissions standards between the older



PPX1 and the shift to newer PPX2 and PPX3 vessels, was accounted for by adjusting the PPX3 vessels to reflect Tier 3 emissions standards.

Table 3-1 shows a summary of the projected in-port emissions reductions from OGVs in tons per year (tpy) for the LPP. Emissions are estimated based on vessel hourly reductions projected for the years 2029 and 2044, and pollutants of concern for this analysis include criteria pollutants nitrogen dioxide (NO<sub>x</sub>), particulate matter 10 micrometers or less in diameter (PM<sub>10</sub>), PM 2.5 micrometers or less in diameter (PM<sub>2.5</sub>), hydrocarbon (HC) which is analogous to VOC, carbon monoxide (CO), sulfur oxides (SO<sub>x</sub>) and greenhouse gas pollutant carbon dioxide (CO<sub>2</sub>). Note that since these values represent reductions in emissions, higher values indicate greater reductions. For each year analyzed, calculations demonstrate a significant reduction in emissions associated with the LPP for all pollutants.

Table 3-1: Summary of In-Port Operational Emissions Reductions by the LPP

Emissions Reductions (tpy)							
Year	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	HC	CO	SO <sub>x</sub>	CO <sub>2</sub>
2029	147.2	15.61	14.24	3.35	7.74	17.98	29,274
2044	334.4	31.61	28.84	6.90	16.03	36.53	59,474

The results show that the LPP, which provides full widening through the bay, and reduces the most transit delays, reduces in-port NO<sub>x</sub> emissions by greater than the *de minimis* threshold (50 TPY) throughout the project operational timespan. The annual LPP NO<sub>x</sub> emissions reductions were interpolated between 2029 and 2044, and cumulative reductions calculated, then compared to the total conformity emissions for the LPP as shown in Table 3-2. From 2044 and forward, the underlying economic analysis assumes a steady state of commodity growth and transport, which results in the constant annual reduction from that point forward. The cumulative reduction surpasses the Tier 1 construction total of 3,652 tons presented in Table 2-2 in 2043, which means construction emissions would be offset by operational reductions in fourteen years after the project would be operational. The cumulative reduction surpasses the Tier 2 construction total of 2,517 tons presented in Table 2-4 in 2044, eleven years after the project would be operational. The cumulative reduction surpasses the Tier 3 construction total of 2,145 tons presented in **Table 2-6** in 2037, ten years after the project would be operational. Once the shift to the larger, newer vessel fleet plateaus in 2040, it would take 10 years to reach a cumulative NO<sub>x</sub> reduction that surpasses the Tier 1 emissions, 7 years to surpass the Tier 2 emissions, and 6 years to surpass the Tier 3 emissions. The results of the analysis demonstrate the positive impacts to the long-term operational emissions that can be anticipated. The removal of inefficient vessel traffic patterns and loading, and the increase in efficiency brought on by the economies of scale allowed by the increased channel size contribute to the forecasted emissions decrease.

Table 3-2: Cumulative In-Port Operational NO<sub>x</sub> Reduction of the LPP

Year	NO <sub>x</sub> Reduction (TPY)	Cumulative NO <sub>x</sub> Reduction (tons)
2029	147	

Year	NO <sub>x</sub> Reduction (TPY)	Cumulative NO <sub>x</sub> Reduction (tons)
2030	164	311
2031	181	493
2032	198	691
2033	215	906
2034	232	1,138
2035	249	1,388
2036	266	1,654
2037	283	1,937
2038	300	2,237
2039	317	2,555
2040	334	2,889
2041	334	3,224
2042	334	3,558
2043	334	3,892
2044	334	4,227
2045	334	4,561
2046	334	4,895
2047	334	5,230
2048	334	5,564
2049	334	5,899
2050	334	6,233
2051	334	6,567
2052	334	6,902
2053	334	7,236
2054	334	7,571
2055	334	7,905
2056	334	8,239
2057	334	8,574
2058	334	8,908
2059	334	9,242
2060	334	9,577
2061	334	9,911
2062	334	10,246
2063	334	10,580
2064	334	10,914
2065	334	11,249
2066	334	11,583
2067	334	11,917
2068	334	12,252

Year	NO <sub>x</sub> Reduction (TPY)	Cumulative NO <sub>x</sub> Reduction (tons)
2069	334	12,586
2070	334	12,921
2071	334	13,255
2072	334	13,589
2073	334	13,924
2074	334	14,258
2075	334	14,592
2076	334	14,927
2077	334	15,261
2078	334	15,596

#### 4 GENERAL CONFORMITY EVALUATION AND PRELIMINARY DETERMINATION

As noted in Section 1 (Introduction) and illustrated in **Error! Reference source not found.**, Table 2-2, **Error! Reference source not found.**, and Table 2-4, only emissions of NO<sub>x</sub> exceed the applicable General Conformity threshold. Therefore, this section addresses NO<sub>x</sub> emissions with respect to General Conformity requirements. To demonstrate whether the RP (LPP) construction NO<sub>x</sub> emissions can be accommodated in the HGB SIP emissions budgets, the most recent EPA-approved ozone SIP demonstration documents were reviewed for emissions inventory information. In consideration of the definition and conformity determination requirements for the most recent revisions to the SIP in 40 CFR §93.152 and §93.158(a)(5)(i)(A) respectively, the latest approved revision to the SIP is the *HGB 2008 Eight-Hour Ozone RFP SIP Revision*, approved by EPA on February 13, 2019 (TCEQ 2016).

This SIP RFP demonstration was reviewed to determine the various activity categories of emissions in which the RP’s construction activities will fall. While the SIP evaluates NO<sub>x</sub> emissions from all sources, including biogenic (non-human-caused) emission sources, this evaluation focuses on the categories most relevant to the RP construction emissions, specifically the Commercial Marine and Construction and Mining categories. Employee commuting emissions would be a negligible amount of project emissions, as explained in Section 2.3, and given the size of the mobile source budget, would be an even more negligible percentage of this budget.

The NO<sub>x</sub> emissions budget for commercial marine vessels (CMV), which constitute most of the project emissions at more than 90%, was obtained from Appendix 1, Reasonable Further Progress Demonstration Spreadsheet, to the *HGB 2008 Eight-Hour Ozone RFP SIP Revision* [RFP SIP] (TCEQ 2016). Table 4-1 below provides the uncontrolled and controlled CMV emissions inventory for the HGB NAA excerpted from Appendix 1 of the RFP SIP. The RFP SIP demonstration contained non-road mobile source category emissions, which encompasses various sub-categories of construction, mining, agricultural, and landscaping, but did not further break down emissions into the sub-categories. The RFP SIP demonstration separated oil and gas drilling rigs from this estimate into a separate estimate, and provided non-road mobile source emissions for 2017, but did not contain information for future year projections. The emissions estimated for uncontrolled (i.e. before required emissions standards and controls are applied) emissions, source reductions due to controls, and the resulting controlled emissions, are presented in Table 4-2.

Table 4-1: Statewide and HGB Area CMV Emissions, tpy

Analysis Year	NOX (tpd)		VOC (tpd)	
	Uncontrolled	Controlled	Uncontrolled	Controlled
2011	68.95	61.61	1.59	1.59
2017	38.16	28.77	1.21	1.15

Table 4-2: HGB RFP 2017 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)

<b>Emissions</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>
Uncontrolled emissions	210.26	123.21
RFP non-road source reduction	123.29	89.63
RFP controlled (post-control) emissions	86.97	33.58

The LPP marine vessel Tier 1 emissions are compared with the HGB CMV projections in Table 4-3 below. Project emissions represent no more than 11.9% of CMV emissions in any one year and make up approximately 5% of CMV emissions on average over the project work period. The project non-road equipment consists of the landside dozers, loaders and other equipment used to conduct PA site work described in Section 2.2. As discussed in that section, these emissions are a relatively minor part of the project emissions. The LPP non-road category Tier 1 emissions are compared to the HGB non-road mobile source controlled emissions in Table 4-4 below. Note, for presentation, these are shown as tons per day instead of tons per year. As shown, the project non-road source emissions represent no more than 0.26% of emissions and make up 0.1% to 0.2% of non-road emissions on average over the work period.

Table 4-3: CMV Tier 1 NO<sub>x</sub> Emissions (tpy)

<b>Year</b>	<b>LPP</b>	<b>SIP</b>	<b>% of SIP LPP</b>
2023	782	10,501	7.4%
2024	1,248	10,501	11.9%
2025	525	10,501	5.0%
2026	487	10,501	4.6%
2027	201	10,501	1.9%
2028	112	10,501	1.1%
<b>All years</b>	<b>3,355</b>	<b>63,006</b>	<b>5.3%</b>

Table 4-4: Non-Road Tier 1 Emissions (tons per day)

<b>Year</b>	<b>LPP Landside Non-Road Emissions</b>		<b>SIP Controlled Non-Road Emissions for 2017</b>		<b>Project % of 2017 Non-Road emissions</b>	
	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>
2023	0.19	0.03	86.97	33.58	0.21%	0.08%
2024	0.22	0.03	86.97	33.58	0.26%	0.10%
2025	0.11	0.02	86.97	33.58	0.13%	0.05%
2026	0.13	0.02	86.97	33.58	0.15%	0.06%
2027	0.12	0.02	86.97	33.58	0.13%	0.05%
2028	0.05	0.01	86.97	33.58	0.05%	0.02%
<b>All years</b>	<b>0.81</b>	<b>0.12</b>	<b>521.82</b>	<b>201.48</b>	<b>0.2%</b>	<b>0.1%</b>

To provide comparison with the range of estimated emissions in Section 2, CMV emissions have also been compared between the LPP project based on the use of Tier 2 engines instead of the Tier 1 and the SIP emissions, in tons per year, is presented in Table 4-5 below. Project emissions are reduced to no more than 8% of CMV emissions in any one year and make up 3.7% of CMV emissions on average over the project work period. Similarly, for non-road emissions, the Tier 2 LPP emissions are compared to SIP emissions, in tons per day in Table 4-6. Project NO<sub>x</sub> emissions are slightly reduced percentage-wise to 0.1% of SIP non-road emissions.

Table 4-5: CMV Tier 2 NO<sub>x</sub> Emissions (tpy)

Year	LPP	SIP	% of SIP
			LPP
2023	535	10,501	5.1%
2024	856	10,501	8.2%
2025	364	10,501	3.5%
2026	337	10,501	3.2%
2027	137	10,501	1.3%
2028	76	10,501	0.7%
<b>All years</b>	<b>2,306</b>	<b>63,006</b>	<b>3.7%</b>

Table 4-6: Non-Road Tier 2 Emissions (tons per day)

Year	LPP Landside Non-Road Emissions(tons per day)		SIP Controlled Non-Road Emissions for 2017 (tons per day)		Project % of 2017 Non-Road emissions	
	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC
	2023	0.13	0.03	86.97	33.58	0.15%
2024	0.16	0.03	86.97	33.58	0.18%	0.10%
2025	0.08	0.02	86.97	33.58	0.09%	0.05%
2026	0.09	0.02	86.97	33.58	0.11%	0.06%
2027	0.08	0.02	86.97	33.58	0.09%	0.05%
2028	0.03	0.01	86.97	33.58	0.04%	0.02%
<b>All years</b>	<b>0.57</b>	<b>0.12</b>	<b>521.82</b>	<b>201.48</b>	<b>0.1%</b>	<b>0.1%</b>

The Tier 3 emissions from Table 4-7 were also compared to the CMV SIP budget. As shown, the maximum annual emissions are no more than 7.5% of the CMV budget, and average 3.2% of the CMV budget. Comparatively, the Tier 3 emissions comprise 0.7% less of the CMV SIP budget than the Tier 1 emissions.

Table 4-7 CMV Tier 3 NO<sub>x</sub> Emissions (tpy)

Year	LPP	SIP	% of SIP
			LPP
2023	458	10,501	4.6%

2024	752	10,501	7.5%
2025	320	10,501	3.2%
2026	298	10,501	3.0%
2027	120	10,501	1.3%
2028	66	10,501	0.7%
All years	2,015	63,006	3.2%

The USACE believes that on average, the LPP emissions constitute a small percentage of the applicable SIP budgets, and the reduction in ship channel operational emissions resulting from the project’s navigation improvements would produce greater long-term emissions reduction, then the emissions from this project can clearly be accommodated in the HGB SIP emission budget. The USACE has preliminarily determined that the project construction emissions can conform to the applicable HGB SIP. Therefore, USACE seeks TCEQ’s concurrence with this assertion.

## **5 DRAFT GCD COMMENTS AND RESPONSES**

The USACE will submit this Draft GCD, and issue a public notice announcing the availability of the Draft GCD for the RP for a 30-day comment period. The public notice and Draft GCD will be posted on the USACE website. Availability of the public notice and Draft GCD will be communicated to TCEQ, EPA Region 6, and the Houston-Galveston Area Council (H-GAC), which is the MPO for the HGB NAA. The Notice of Availability will be published in the Houston Chronicle and posted on the USACE website.

### **5.1 TCEQ, EPA, and MPO Comments**

Comments and recommendations received from the TCEQ, EPA Region 6 and MPO, and responses to them, will be summarized in this section, once received.

### **5.2 Individual and Organized Groups Comments**

Comments received from the public and organizations, and responses to them, will be summarized in this section, once received.



## **6 FINAL GENERAL CONFORMITY DETERMINATION**

PENDING COMPLETION

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## **Attachment A**

### **Emission Estimation Details**

## **Appendix A – Emission Estimation Details**

Project construction emissions of NO<sub>x</sub> and VOCs have been estimated because of the Project area's status as an ozone nonattainment area. The emission estimates are based on equipment and activity estimates provided by the project engineers and emission factors and other information from published sources, including the PHA's most recent air emissions inventory, *2013 Goods Movement Air Emissions Inventory* (Eastern Research Group, 2017) and published emission standards. Use of the Goods Movement Emissions Inventory (GMEI) as a source of emission factors and other emissions-related information ensures that the emission estimates presented in this conformity determination are consistent with the PHA's port-wide inventory of air emissions.

AECOM has developed schedule and equipment information for the LPP based on project design parameters for the two plans. Information includes:

- Equipment type (dredge, barge, tug, dozer, etc.)
- Engine type (main, auxiliary, etc.)
- Engine horsepower and load factor (% of full load)
- Hours of operation for each vessel or piece of equipment

The following sections describe the different categories of emitting equipment that would be used to construct the LPP.

### **A.1 Equipment and Supporting Vessel Emissions**

Emission sources on the dredge itself consist of diesel-fueled engines that provide power for the various operations required for dredging. The dredge is expected to be a cutter suction dredge equipped with a main engine to provide power to the cutterhead, an engine to power the ladder pump used to transport the dredged material from the substrate to the surface, an engine to move and position the ladder that guides and positions the cutterhead, and an auxiliary engine to produce electricity for power needs on the dredge. The dredging operation will also require various support vessels such as positioning tugs, crew boats, and survey boats.

The project engineers estimated characteristics of the diesel engines on board the dredge such as total horsepower, operating hours, and average operating loads. They also characterized typical parameters of the support vessels, including total installed horsepower and operating hours. Basic emission factors for the diesel engines were obtained from the "harbor craft" section of the GMEI, which lists emission factors for marine engines of various sizes and emission tier levels. Additionally, advanced-tier emission factors have been based on the emission standards for the appropriately sized marine engines.

### **A.2 Dredged Material Placement Site Work**

Once the dredged material has been placed in the placement area it will be moved and compacted by non-road equipment such as dozers and loaders. The project engineers estimated typical horsepower, operating hours, and load factors for this type of equipment. Emission factors were based on the emission certification levels of Tier 1, Tier 2, and Tier 3 non-road equipment.

Dredged material placement and handling will account for a relatively small percentage (approximately 8%) of overall project construction NO<sub>x</sub> emissions and approximately 18% of VOC emissions.

### **A.3 Employee Vehicle Commuting**

Employee vehicle commuting will make up a very small part of overall project construction emissions and will represent a negligible percentage of SIP emissions. As an example, the latest EPA approved SIP documentation includes on-road emissions based on 169,918,016 miles per weekday (TCEQ 2016).<sup>1</sup> A 100-person work force making an average 50-mile round trip commute would drive 5,000 miles per day, or 0.003% of the on-road basis of the current SIP.

### **A.4 Emissions Calculations and Results**

Emission estimates for each engine have been based on horsepower hours (hp hrs), calculated by multiplying horsepower by load factor by operating hours, multiplied by emission factors in units of grams per horsepower hour (g/hp hr). Emission factors have been chosen for marine and other nonroad engines to be relatively conservative (i.e., to be relatively high so as to calculate reasonably worst-case emission levels). Emission factors for marine engines (propulsion and auxiliary engines on dredges, tugs, work boats, etc.) are from Port Houston's most recent (2013) air emissions inventory and reflect average emissions from these engines in 2013. Emission factors for nonroad engines are based on the Tier 1, 2, and 3 emission standards stratified by horsepower. The Tier 1 standards have been applicable since the late 1990s (year depending on horsepower) and so reflect the oldest equipment likely to be in use when the project elements take place and likely overestimate the age of equipment that will actually be used, consequently overestimating prospective emissions. Emission estimates based on Tier 2 and 3 reflect the lower emissions that would result from newer engines being used for the work.

The Tier 1 emission factors used in calculating these emissions are presented in Table A-1. As noted above, the emission factors are based on Tier 1 standards, which likely overestimate the emissions that would actually occur because of the introduction of Tier 2 and Tier 3 engines into the equipment that may be used on the project. While NO<sub>x</sub> and VOC emissions have been calculated for demonstration of General Conformity related emissions, other criteria pollutants have been included for completeness. The anticipated schedule of work was used to allocate emissions to each of the project years. Table A-2 presents a summary of emissions from Tier 1 vessels and equipment by year for the LPP.

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<sup>1</sup> *HGB 2008 Eight-Hour Ozone RFP SIP Revision* Adopted by TCEQ 15 December 2016 and approved by EPA on 13 February 2019. See: [https://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/HGB\\_2016\\_AD\\_RFP/RFP/Adoption/16017\\_SIP\\_HGBRFP\\_Ado.pdf](https://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/HGB_2016_AD_RFP/RFP/Adoption/16017_SIP_HGBRFP_Ado.pdf) Accessed 11 July 2019

**Table A-1: Emission Factors Used for Nonroad and Marine Engines**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 1 nonroad</b>						
(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	7.1	0.60	0.58	0.005	1.0	4.1
(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.0	8.5
100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.0	8.5
175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.0	8.5
300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.0	8.5
600 ≤ hp < 750	6.9	0.40	0.39	0.005	1.0	8.5
>750	6.9	0.40	0.39	0.005	1.0	8.5
<b>Marine</b>						
<b>Cat 1 and Cat 2 Tier 1</b>						
Main - large dredge	9.3	0.23	0.22	0.004	0.1	1.8
Main - small dredge	9.3	0.23	0.22	0.004	0.1	1.8
Dredge auxiliary	7.3	0.23	0.22	0.004	0.1	1.7
Main - large tug	8.7	0.23	0.22	0.004	0.1	1.7
Main - small tug	8.7	0.23	0.22	0.004	0.1	1.7
Tug auxiliary	7.3	0.23	0.22	0.004	0.1	1.7
Miscellaneous	9.1	0.23	0.22	0.004	0.1	1.8

**Table A-2: Estimated Tier 1 Emissions, tons per year**

Year		Estimated emissions, tons per year					
		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Year 1</b>	<b>2023</b>	850	32	31	0.47	49	470
<b>Year 2</b>	<b>2024</b>	1,330	54	52	0.77	93	870
<b>Year 3</b>	<b>2025</b>	565	22	21	0.32	35	337
<b>Year 4</b>	<b>2026</b>	535	22	21	0.30	36	340
<b>Year 5</b>	<b>2027</b>	243	11	10	0.14	19	177
<b>Year 6</b>	<b>2028</b>	129	6	5	0.08	10	94
<b>Total</b>		<b>3,652</b>	<b>146</b>	<b>141</b>	<b>2.08</b>	<b>243</b>	<b>2,288</b>

Tier 2 emissions standards for the various categories of marine engines became effective in different years dependent on the size category of the engine, with Category 2 becoming effective as late as 2007, and Category 3 in 2011. Dredge main engines displacement and horsepower typically fall into either Category 2 or 3. With more than a decade since initial effective dates, Tier 2 dredges are becoming a more common part of the national large dredge fleet. Also, Tier 2 standards for nonroad equipment, although a minor part of emissions in this project, were effective

in the 2003 to 2006 range. Therefore, to provide a range of emission estimation that might be more reflective of equipment ultimately used, emissions have also been estimated for the use of Tier 2 engines rather than the Tier 1-based estimates presented above. While it is not possible to predict the actual equipment that will be brought to the project by contractors who have yet to be selected, it is more likely that equipment will be Tier 2 or newer based on when the standards were implemented.

The 2013 Goods Movement Air Emissions Inventory does not include Tier 2 emission factors. Therefore, the marine factors were selected from another recent emissions inventory released by a Texas port, the 2013 Air Emissions Inventory for Port Corpus Christi, July 2015 (Port of Corpus Christi Authority 2013) and on relevant emission standards. Nonroad Tier 2 emission factors were based on the Tier 2 emission standards since more precise modeling would require detailed model year and other engine information that is not available. The Tier 2 emission factors used in calculating these emissions are presented in Table A-3 below. Table A-4 presents the results for the LPP using Tier 2 emission factors.

**Table A-3: Tier 2 Emission Factors, g/hp-hr**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 2 nonroad</b>						
(11 ≤ hp < 25)	5.6	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	5.6	0.45	0.44	0.005	1.0	4.1
(50 ≤ hp < 100)	5.6	0.30	0.29	0.005	1.0	3.7
100 ≤ hp < 175	4.9	0.22	0.21	0.005	1.0	3.7
175 ≤ hp < 300	4.9	0.15	0.15	0.005	1.0	2.6
300 ≤ hp < 600	4.8	0.15	0.15	0.005	1.0	2.6
600 ≤ hp < 750	4.8	0.15	0.15	0.005	1.0	2.6
>750	4.8	0.15	0.15	0.005	1.0	2.6
<b>Cat 1 and Cat 2 Tier 2</b>						
Dredge main - large	6.9	0.37	0.36	0.004	0.1	1.8
Dredge main - small	6.2	0.37	0.36	0.004	0.1	1.8
Dredge aux	5.2	0.15	0.14	0.004	0.1	1.8
Tug main - large	6.1	0.37	0.36	0.004	0.1	1.8
Tug main - small	5.2	0.37	0.36	0.004	0.1	1.8
Tug aux	5.2	0.15	0.14	0.004	0.1	1.8
Miscellaneous	5.2	0.15	0.14	0.004	0.1	1.8



**Table A-4: Estimated Tier 2 Emissions, tons per year**

Year		Estimated emissions, tons per year					
		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Year 1	2023	583	28	27	0.47	49	228
Year 2	2024	915	41	40	0.77	93	378
Year 3	2025	393	18	17	0.32	35	155
Year 4	2026	372	16	16	0.30	36	151
Year 5	2027	167	7	7	0.14	19	72
Year 6	2028	88	4	4	0.08	10	39
<b>Total</b>		<b>2,517</b>	<b>113</b>	<b>111</b>	<b>2.08</b>	<b>243</b>	<b>1,023</b>

Further information is provided by evaluating emissions that would be produced by the use of Tier 3 equipment and vessel engines on the project. Emission factors for these engines have been based on the relevant Tier 3 emission standards. Table A-5 presents the Tier 3 emission factors used in calculating these emissions while Table A-6 presents the emission estimates resulting from the use of Tier 3 engines and equipment on the LPP.

**Table A-5: Tier 3 Emission Factors, g/hp-hr**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 3 nonroad</b>						
(11 ≤ hp < 25)	5.6	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	5.6	0.45	0.44	0.005	1.0	4.1
(50 ≤ hp < 100)	5.6	0.30	0.29	0.005	1.0	3.7
100 ≤ hp < 175	4.9	0.22	0.21	0.005	1.0	3.7
175 ≤ hp < 300	4.9	0.15	0.15	0.005	1.0	2.6
300 ≤ hp < 600	4.8	0.15	0.15	0.005	1.0	2.6
600 ≤ hp < 750	4.8	0.15	0.15	0.005	1.0	2.6
>750	4.8	0.15	0.15	0.005	1.0	2.6
<b>Marine</b>						
<b>Cat 1 and Cat 2 Tier 2</b>						
Main - large dredge	6.2	0.20	0.19	0.004	0.1	3.7
Main - small dredge	5.0	0.08	0.08	0.004	0.1	3.7
Dredge auxiliary	4.0	0.08	0.08	0.004	0.1	3.7
Main - large tug	5.0	0.08	0.08	0.004	0.1	3.7
Main - small tug	4.0	0.08	0.08	0.004	0.1	3.7
Tug auxiliary	4.0	0.08	0.08	0.004	0.1	3.7
Miscellaneous	4.0	0.08	0.08	0.004	0.1	3.7

**Table A-6: Estimated Tier 3 Emissions, tons per year**

Year		Estimated emissions, tons per year					
		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Year 1	2023	488	12	12	0.47	49	351
Year 2	2024	788	22	21	0.77	93	541
Year 3	2025	337	10	10	0.32	35	231
Year 4	2026	320	10	9	0.30	36	218
Year 5	2027	139	4	4	0.14	19	98
Year 6	2028	74	2	2	0.08	10	53
<b>Total</b>		<b>2,145</b>	<b>60</b>	<b>59</b>	<b>2.08</b>	<b>243</b>	<b>1,491</b>

The construction schedule on which the annual emissions are based is included below in Figure A-1. An illustration of the detailed calculations of Tier 1 emissions developed for the LPP are included as Figure A-2. The Tier 2 and Tier 3 emissions were estimated in a similar manner using the appropriate emission factors.



**Figure A-2: Illustration of Tier 1 Emission Calculations**

PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	% of work in year						Nonroad / Marine	Category	Emission factors, g/hp hr					
												1	2	3	4	5	6			NOx	PM10	PM2.5	SOx	VOC	CO
<b>CONTRACT YEAR 01 - LPP</b>																									
NED: Segment 1 - Bolivar Roads to Redfish Reef (Station 138+369 to 100+000)																									
Pt. of CW1_Bolivar-Redfish_700 TO: 8-AC Bird Island & Long Bird Island																									
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.53	16	1,994,000	16	1,305	95.5	5,830,731	100%	0%	0%	0%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8
		1	Auxiliaries	1,000	0.80	24					1,833,563	100%	0%	0%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7
		1	Ladder Pump	1,200	0.58	16					1,063,467	100%	0%	0%	0%	0%	0%	Nonroad	≥750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Cutter & Swing	2,500	0.80	16					3,055,939	100%	0%	0%	0%	0%	0%	Nonroad	≥750	6.9	0.40	0.39	0.005	1.00	8.5
	30"-Booster	1	Main Engines	5,000	0.70	16					5,347,893	100%	0%	0%	0%	0%	0%	Nonroad	≥750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.60	24					275,034	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Anchor Barge	2	Auxiliaries	200	0.60	16					366,713	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Derrick Barge	1	Main Engines	2,000	0.50	11					1,050,479	100%	0%	0%	0%	0%	0%	Nonroad	≥750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.60	11					125,057	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Spill Barge	1	Auxiliaries	150	0.60	16					137,517	100%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Tender Tug	4	Propulsion	600	0.50	22					2,521,149	100%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		4	Auxiliaries	50	0.50	24					229,195	100%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Tow Tug	1	Propulsion	4,500	0.80	8					2,750,345	100%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
		1	Auxiliaries	300	0.50	24					343,793	100%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	25ft Shallow Draft Workboat	2	Propulsion	450	0.50	12					515,690	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		2	Auxiliaries	50	0.50	24					114,598	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
	Crewboat	1	Propulsion	400	0.60	14					320,874	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	24					57,299	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	156.3	140,668	100%	0%	0%	0%	0%	0%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5
	Light Towers	2	N/A	8	0.50	18					22,507	100%	0%	0%	0%	0%	0%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9
	D6 Dozer	2	N/A	200	0.75	18					844,010	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Marsh Hoe	4	N/A	200	0.75	18					1,688,019	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	325 LR Excavator	2	N/A	170	0.75	18					717,408	100%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Field Truck	1	N/A	180	0.50	18					253,203	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Survey/Crewboat	1	Propulsion	200	0.60	14					262,581	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	24					93,779	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Rock S.P.install	Barge Mounted Crane	2	Main Power	400	0.65	8	N/A	N/A	N/A	16.0	66,560	100%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
	325 LR Excavator	2	N/A	170	0.75	8					32,640	100%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Work Tug	1	Main Power	1,000	0.65	8					83,200	100%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
	Survey/Crewboat	1	Propulsion	200	0.60	8					15,360	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	8					3,200	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Culch S.P.install	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	12.0	24,960	100%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
	Work Tug	1	Main Power	1,000	0.65	8					62,400	100%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
	Survey/Crewboat	1	Propulsion	200	0.60	8					11,520	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	8					2,400	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Culch Mt.install	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	152.0	316,160	100%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
	Work Tug	1	Main Power	1,000	0.65	8					790,400	100%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
	Survey/Crewboat	1	Propulsion	200	0.60	8					145,920	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	8					30,400	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
NED: Segment 1 - Bolivar Roads to Redfish (Station 100+000 to 073+934)																									
Pt. of CW1_Bolivar-Redfish_700 TO: ODMDS																									
Mechanical Dredging	Clamshell Dredge (21CY)	1	Main Engines	2,000	0.50	15	3,038,000	15	877	230.9	3,464,082	100%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.60	24					665,104	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Tow Tug	2	Propulsion	4,500	0.80	15					24,941,391	100%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
		2	Auxiliaries	300	0.50	24					1,662,759	100%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Tender Tug	4	Propulsion	1,000	0.50	8					3,695,021	100%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		4	Auxiliaries	50	0.50	24					554,253	100%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Survey/Crewboat	1	Propulsion	400	0.60	14					775,954	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.60	24					166,276	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
NED: Segment 4 - Boggy Bayou to Sims Bayou (Station 676+53 to 850+00)																									
CW4_BB-BG_530 + Pt. of CD4_Whole TO: Beltway-8 Tract																									
PAPrep.	D6 Dozer	6	N/A	200	0.75	8	N/A	N/A	N/A	143.0	1,029,600	22%	78%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Dragline	4	N/A	600	0.75	8	N/A	N/A	N/A	124.0	1,785,600	22%	78%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
	Field Truck	2	N/A	180	0.75	8	N/A	N/A	N/A	124.0	267,840	22%	78%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
Dredging	24" Cutter Suction Dredge	1	Main Engines	4,200	0.52	14	2,920,000	14	1,020	204.5	6,252,235	22%	78%	0%	0%	0%	0%	Marine	Dredge main - small	9.3	0.23	0.22	0.004	0.10	1.8
		1	Auxiliaries	800	0.80	24					3,140,840	22%	78%	0%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7
		1	Ladder Pump	1,200	0.92	14					3,160,471	22%	78%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0			



PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	% of work in year					Nonroad /		Emission factors, g/hp hr						
												1	2	3	4	5	6	Marine	Category	NOx	PM10	PM2.5	SOx	VOC	CO
NED: Segment 4 - Boggy Bayou to Sims Bayou (Station 850+00 to 974+08)																									
Pt. of CD4_Whole TO: E2 Clinton																									
PAPrep.	D6 Dozer	6	N/A	200	0.75	8	N/A	N/A	N/A	78.0	561,600	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Dragline	4	N/A	600	0.75	8	N/A	N/A	N/A	68.0	979,200	100%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
Dredging	Field Truck	2	N/A	130	0.75	8	N/A	N/A	N/A	68.0	106,080	100%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	24" Cutter Suction Dredge	1 Main Engines	4,200	0.71	14	562,000	14	997	40.3	1,680,927	100%	0%	0%	0%	0%	0%	0%	Marine	Dredge main - small	9.3	0.23	0.22	0.004	0.10	1.8
		1 Auxiliaries	800	0.80	24					618,450	100%	0%	0%	0%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7
		1 Ladder Pump	1,200	1.00	14					676,429	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
	24"-Booster	1 Cutter & Swing	2,500	0.80	14					1,127,382	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		3 Main Engines	4,000	0.70	14					4,735,005	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		3 Auxiliaries	200	0.60	24					347,878	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Anchor Barge	2 Auxiliaries	200	0.60	14					135,286	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
		Derrick Barge	1 Main Engines	2,000	0.50	11				442,900	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
	Tender Tug	1 Auxiliaries	200	0.60	11					53,148	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
		4 Propulsion	600	0.50	22					1,062,960	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
	Tow Tug	4 Auxiliaries	50	0.50	24					96,633	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
		1 Propulsion	4,500	0.80	8					1,159,593	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
	25ft Shallow Draft Workboat	1 Auxiliaries	300	0.50	24					144,949	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
		2 Propulsion	450	0.50	12					217,424	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Crewboat	2 Auxiliaries	50	0.50	24					48,316	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	1 Propulsion	400	0.60	14					135,286	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Shaping & Grading	1 Auxiliaries	50	0.50	24					24,158	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	70.7	63,597	100%	0%	0%	0%	0%	0%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5
Light Towers	2 N/A	8	0.50	18					10,176	100%	0%	0%	0%	0%	0%	0%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9	
	D6 Dozer	2	N/A	200	0.75	18				381,584	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
Marsh Hoe	4 N/A	200	0.75	18					763,167	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	325 LR Excavator	2	N/A	170	0.75	18				324,346	100%	0%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
Field Truck	1 N/A	180	0.50	18					114,475	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Survey/Crewboat	1 Propulsion	200	0.60	14				118,715	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Survey/Crewboat	1 Auxiliaries	50	0.50	24					42,398	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	CONTRACT YEAR 02 - NED																								
LPP: Segment 1 - HSC (Station 073+934 to 042+000 +/-)																									
Pt. of CW1_Redfish-BSC_700 TO: San Leon/Dollar Reef Mitigation Sites																									
Dredging	30" Cutter Suction Dredge	1 Main Engines	7,200	0.61	16	2,030,000	16	1,713	74.1	5,204,764	0%	100%	0%	0%	0%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8
		1 Auxiliaries	1,000	0.80	24					1,422,067	0%	100%	0%	0%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7
		1 Ladder Pump	1,200	0.67	16					952,785	0%	100%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
30"-Booster	1 Cutter & Swing	2,370,111	0%	100%	0%	0%	0%	0%	2,370,111	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		2 Main Engines	5,000	0.70	16					8,295,388	0%	100%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		2 Auxiliaries	200	0.60	24					426,620	0%	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
Anchor Barge	2 Auxiliaries	200	0.60	16					284,413	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
		1 Main Engines	2,000	0.50	11					814,726	0%	100%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
Spill Barge	1 Auxiliaries	200	0.60	11					97,767	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
		1 Auxiliaries	150	0.60	16					106,655	0%	100%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
Tender Tug	4 Propulsion	600	0.50	22					1,955,342	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		4 Auxiliaries	50	0.50	24					177,758	0%	100%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
Tow Tug	1 Propulsion	4,500	0.80	8					2,133,100	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
		1 Auxiliaries	300	0.50	24					266,637	0%	100%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
25ft Shallow Draft Workboat	2 Propulsion	450	0.50	12					399,956	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		2 Auxiliaries	50	0.50	24					88,879	0%	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Crewboat	1 Propulsion	400	0.60	14					248,862	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1 Auxiliaries	50	0.50	24					44,440	0%	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Survey/Crewboat	1 Propulsion	200	0.60	14					124,431	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1 Auxiliaries	50	0.50	24					44,440	0%	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Cutlch Mit.Install	Barge Mounted Crane	1 Main Power	400	0.65	8	N/A	N/A	N/A	186.0	386,880	0%	100%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
		1 Main Power	1,000	0.65	8					967,200	0%	100%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
Survey/Crewboat	1 Propulsion	200	0.60	8					178,560	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1 Auxiliaries	50	0.50	8					37,200	0%	100%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
LPP: Segment 1 - HSC (Station 042+000 +/- to 028+605)																									
Pt. of CW1_Redfish-BSC_700 TO: Bird Island Marsh																									
Dredging	30" Cutter Suction Dredge	1 Main Engines	7,200	0.49	16	3,181,000	16	1,718	115.7	6,532,345	0%	86%	14%	0%	0%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8
		1 Auxiliaries	1,000	0.80	24					2,221,886	0%	86%	14%	0%	0%	0%	0%</								





PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	% of work in year					Nonroad / Marine	Category	Emission factors, g/hp hr							
												1	2	3	4	5			6	NOx	PM10	PM2.5	SOx	VOC	CO	
Rock S.Pinstall	Barge Mounted Crane	2	Main Power	400	0.65	8	N/A	N/A	N/A	30.0	124,800	0%	86%	14%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5	
	325 LR Excavator	2	N/A	170	0.75	8					61,200	0%	86%	14%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
	Work Tug	1	Main Power	1,000	0.65	8					156,000	0%	86%	14%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
	Survey/Crewboat	1	Propulsion	200	0.60	8					28,800	0%	86%	14%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
			1	Auxiliaries	50	0.50	8				6,000	0%	86%	14%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Culch S.Pinstall	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	25.0	52,000	0%	86%	14%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5	
	Work Tug	1	Main Power	1,000	0.65	8					130,000	0%	86%	14%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
	Survey/Crewboat	1	Propulsion	200	0.60	8					24,000	0%	86%	14%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.50	8					5,000	0%	86%	14%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
LPP: Segment 2 - BSC (Station 25+58 to 221+00)																										
Pt. of CW1_Redfish-BSC_700												TO: Bird Island Marsh														
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.54	16	2,108,000	16	1,258	104.7	6,515,027	0%	50%	50%	0%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8	
		1	Auxiliaries	1,000	0.80	24					2,010,811	0%	50%	50%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7	
		1	Ladder Pump	1,200	0.58	16					1,166,270	0%	50%	50%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Cutter & Swing	2,500	0.80	16					3,351,351	0%	50%	50%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
	30"-Booster	3	Main Engines	5,000	0.66	16					16,589,189	0%	50%	50%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		3	Auxiliaries	200	0.60	24					904,865	0%	50%	50%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
		2	Auxiliaries	200	0.60	16					402,162	0%	50%	50%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Derrick Barge	1	Main Engines	2,000	0.50	11					1,152,027	0%	50%	50%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Auxiliaries	200	0.60	11					138,243	0%	50%	50%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Spill Barge	1	Auxiliaries	150	0.60	16					150,811	0%	50%	50%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
	Tender Tug	4	Propulsion	600	0.50	22					2,764,865	0%	50%	50%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
		4	Auxiliaries	50	0.50	24					251,351	0%	50%	50%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	Tow Tug	1	Propulsion	4,500	0.80	8					3,016,216	0%	50%	50%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7	
		1	Auxiliaries	300	0.50	24					377,027	0%	50%	50%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	25ft Shallow Draft Workboat	2	Propulsion	450	0.50	12					565,541	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	2	Auxiliaries	50	0.50	24					125,676	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
Crewboat	1	Propulsion	400	0.60	14					351,892	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
	1	Auxiliaries	50	0.50	24					62,838	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	120.0	108,000	0%	50%	50%	0%	0%	0%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5	
	Light Towers	2	N/A	8	0.50	18					17,280	0%	50%	50%	0%	0%	0%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9	
	D6 Dozer	2	N/A	200	0.75	18					648,000	0%	50%	50%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Marsh Hoe	4	N/A	200	0.75	18					1,296,000	0%	50%	50%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	325 LR Excavator	2	N/A	170	0.75	18					550,800	0%	50%	50%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
	Field Truck	1	N/A	180	0.50	18					194,400	0%	50%	50%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Survey/Crewboat	1	Propulsion	200	0.60	14					201,600	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.50	24					72,000	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	Rock S.Pinstall	Barge Mounted Crane	2	Main Power	400	0.65	8	N/A	N/A	N/A	20.0	83,200	0%	50%	50%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
		325 LR Excavator	2	N/A	170	0.75	8					40,800	0%	50%	50%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
		Work Tug	1	Main Power	1,000	0.65	3					39,000	0%	50%	50%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		Survey/Crewboat	1	Propulsion	200	0.60	14					33,600	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
			1	Auxiliaries	50	0.50	24					12,000	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
	Culch S.Pinstall	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	17.0	35,360	0%	50%	50%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
		Work Tug	1	Main Power	1,000	0.65	3					33,150	0%	50%	50%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
Survey/Crewboat		1	Propulsion	200	0.60	14					28,560	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.50	24					10,200	0%	50%	50%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
LPP: Segment 1 - Bolivar Roads to Redfish (Station 100+000 to 073+934)																										
Pt. of CW1_Bolivar-Redfish_700												TO: ODMDS														
MechanicalDredging	Clamshell Dredge (21CY)	1	Main Engines	2,000	0.50	15	2,474,000	15	877	188.1	2,820,981	0%	86%	14%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Auxiliaries	200	0.60	24					541,628	0%	86%	14%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Tow Tug	2	Propulsion	4,500	0.80	15					20,311,060	0%	86%	14%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7	
		2	Auxiliaries	300	0.50	24					1,354,071	0%	86%	14%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	Tender Tug	4	Propulsion	1,000	0.50	8					3,009,046	0%	86%	14%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
		4	Auxiliaries	50	0.50	24					451,357	0%	86%	14%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	Survey/Crewboat	1	Propulsion	400	0.60	14					631,900	0%	86%	14%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.60	24					135,407	0%	86%	14%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	CONTRACT YEAR 03 - NED																									
	NED: Segment 3 - BCC Channel & Flare (Station 8+78 to 67+11)																									
CW3_BCC_455 + BETB3_BCCFlare												TO: Atkinson Marsh Cell M12														
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.63	16	2,825,000	16	1,247	141.6	10,276,022	0%	0%	86%	14%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8	
		1	Auxiliaries	1,000	0.80	24					2,718,524	0%	0%	86%	14%	0%	0%	Marine								



PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	% of work in year					Nonroad /		Emission factors, g/hp hr						
												1	2	3	4	5	6	Marine	Category	NOx	PM10	PM2.5	SOx	VOC	CO
Culch Mt.Install	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	9.0	18,720	0%	0%	100%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
	Work Tug	1	Main Power	1,000	0.65	8					46,800	0%	0%	100%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
	Survey/Crewboat	1	Propulsion	200	0.60	8					8,640	0%	0%	100%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
			Auxiliaries	50	0.50	8					1,800	0%	0%	100%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
MechanicalDredging	Clamshell Dredge (12CY)	1	Main Engines	1,750	0.50	15	N/A	N/A	N/A	22.2	291,270	0%	0%	86%	14%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.60	24					63,913	0%	0%	86%	14%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Tow Tug	1	Propulsion	4,500	0.80	15					1,198,368	0%	0%	86%	14%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
			Auxiliaries	300	0.50	24					79,891	0%	0%	86%	14%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Tender Tug	2	Propulsion	1,000	0.50	8					177,536	0%	0%	86%	14%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		2	Auxiliaries	50	0.50	24					26,630	0%	0%	86%	14%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Survey/Crewboat	1	Propulsion	400	0.60	14					74,565	0%	0%	86%	14%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.60	24					15,978	0%	0%	86%	14%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
LPP: Segment 1 - HSC (Station 028+605 to -3.94)																									
Pt. of CW1_BSC-BCC_700												TO: M11 & M789													
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.56	16	3,800,000	16	1,463	162.3	10,472,727	0%	0%	0%	100%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8
		1	Auxiliaries	1,000	0.80	24					3,116,883	0%	0%	0%	100%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7
		1	Ladder Pump	1,200	0.67	16					2,088,312	0%	0%	0%	100%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Cutter & Swing	2,500	0.80	16					5,194,805	0%	0%	0%	100%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
	30"-Booster	1	Main Engines	5000	0.72	16					9,350,649	0%	0%	0%	100%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.6	24					467,532	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Anchor Barge	2	Auxiliaries	200	0.6	16					623,377	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Derrick Barge	1	Main Engines	2000	0.5	11					1,785,714	0%	0%	0%	100%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.6	11					214,286	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Spill Barge	1	Auxiliaries	150	0.6	16					233,766	0%	0%	0%	100%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Tender Tug	4	Propulsion	600	0.5	22					4,285,714	0%	0%	0%	100%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		4	Auxiliaries	50	0.5	24					389,610	0%	0%	0%	100%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Tow Tug	1	Propulsion	4,500	0.80	8					4,675,325	0%	0%	0%	100%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
		1	Auxiliaries	300	0.5	24					584,416	0%	0%	0%	100%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	25ft Shallow Draft Workboat	2	Propulsion	450	0.5	12					876,623	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		2	Auxiliaries	50	0.5	24					194,805	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
	Crewboat	1	Propulsion	400	0.6	14					545,455	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.5	24					97,403	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	223.1	200,824	0%	0%	0%	100%	0%	0%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5
	Light Towers	2	N/A	8	0.50	18					32,132	0%	0%	0%	100%	0%	0%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9
	D6 Dozer	2	N/A	200	0.75	18					1,204,943	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
Marsh Hoe	4	N/A	200	0.75	18					2,409,887	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
325 LR Excavator	2	N/A	170	0.75	18					1,024,202	0%	0%	0%	100%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
Field Truck	N/A	180	0.50	18						361,483	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
Survey/Crewboat	1	Propulsion	200	0.60	14					374,871	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.50	24					133,883	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
LPP: Segment 1 - HSC (Station 028+605 to -3.94)																									
Pt. of CW1_BSC-BCC_700												TO: BSC Sed. Attn. Feature													
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.60	16	1,541,000	16	1,588	60.7	4,192,141	0%	0%	0%	25%	75%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8
		1	Auxiliaries	1,000	0.80	24					1,164,484	0%	0%	0%	25%	75%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7
		1	Ladder Pump	1,200	0.67	16					780,204	0%	0%	0%	25%	75%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Cutter & Swing	2,500	0.80	16					1,940,806	0%	0%	0%	25%	75%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
	30"-Booster	1	Main Engines	5000	0.7	16					3,396,411	0%	0%	0%	25%	75%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.6	24					174,673	0%	0%	0%	25%	75%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Anchor Barge	2	Auxiliaries	200	0.6	16					232,897	0%	0%	0%	25%	75%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Derrick Barge	1	Main Engines	2000	0.5	11					667,152	0%	0%	0%	25%	75%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.6	11					80,058	0%	0%	0%	25%	75%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Spill Barge	1	Auxiliaries	150	0.6	16					87,336	0%	0%	0%	25%	75%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Tender Tug	4	Propulsion	600	0.5	22					1,601,165	0%	0%	0%	25%	75%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		4	Auxiliaries	50	0.5	24					145,560	0%	0%	0%	25%	75%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Tow Tug	1	Propulsion	4,500	0.80	8					1,746,725	0%	0%	0%	25%	75%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
		1	Auxiliaries	300	0.5	24					218,341	0%	0%	0%	25%	75%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	25ft Shallow Draft Workboat	2	Propulsion	450	0.5	12					327,511	0%	0%	0%	25%	75%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		2	Auxiliaries	50	0.5	24					72,780	0%	0%	0%	25%	75%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8



PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	% of work in year					Nonroad /		Emission factors, g/hp hr															
												1	2	3	4	5	6	Marine	Category	NOx	PM10	PM2.5	SOx	VOC	CO									
	24"-Booster	2	Main Engines	4,000	0.68	14					960,588	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		2	Auxiliaries	200	0.60	24					72,650	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Anchor Barge	2	Auxiliaries	200	0.60	14					42,379	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Derrick Barge	1	Main Engines	2,000	0.50	11					138,740	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		1	Auxiliaries	200	0.60	11					16,649	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Tender Tug	4	Propulsion	600	0.50	22					332,977	0%	0%	0%	0%	50%	50%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7									
		4	Auxiliaries	50	0.50	24					30,271	0%	0%	0%	0%	50%	50%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7									
	Tow Tug	1	Propulsion	4,500	0.80	8					363,248	0%	0%	0%	0%	50%	50%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7									
		1	Auxiliaries	300	0.50	24					45,406	0%	0%	0%	0%	50%	50%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7									
	25ft Shallow Draft Workboat	2	Propulsion	450	0.50	12					68,109	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		2	Auxiliaries	50	0.50	24					15,135	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
	Crewboat	1	Propulsion	400	0.60	14					42,379	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		1	Auxiliaries	50	0.50	24					7,568	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
	Survey/Crewboat	1	Propulsion	200	0.60	14					21,189	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		1	Auxiliaries	50	0.50	24					7,568	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	12.6	11,351	0%	0%	0%	0%	50%	50%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5									
	Light Towers	2	N/A	8	0.50	18					1,816	0%	0%	0%	0%	50%	50%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9									
	D6 Dozer	2	N/A	200	0.75	18					68,109	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Marsh Hoe	4	N/A	200	0.75	18					136,218	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	325 LR Excavator	2	N/A	170	0.75	18					57,893	0%	0%	0%	0%	50%	50%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5									
	Field Truck	1	N/A	180	0.50	18					20,433	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
NED: Segment 6 - 610 Bridge to Main Turning Basin (Station 1160+62 to 1266+49)																																		
Pt. of CD6_Whole + TB6_1 Pt. of CD6_Whole + TB6_Brad TO: Glendale PA																																		
PAPrep.	D6 Dozer	6	N/A	200	0.75	8	N/A	N/A	N/A	76.0	547,200	0%	0%	0%	0%	100%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Dragline	4	N/A	600	0.75	8	N/A	N/A	N/A	62.0	892,800	0%	0%	0%	0%	100%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5									
	Field Truck	2	N/A	130	0.75	8	N/A	N/A	N/A	62.0	96,720	0%	0%	0%	0%	100%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5									
Dredging	24" Cutter Suction Dredge	1	Main Engines	4,200	0.71	14	733,529	14	997	52.6	2,193,965	0%	0%	0%	0%	50%	50%	Marine	Dredge main - small	9.3	0.23	0.22	0.004	0.10	1.8									
		1	Auxiliaries	800	0.80	24					807,208	0%	0%	0%	0%	50%	50%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7									
		1	Ladder Pump	1,200	1.00	14					882,883	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		1	Cutter & Swing	2,500	0.80	14					1,471,472	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
	24"-Booster	2	Main Engines	4,000	0.68	14					4,002,405	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		2	Auxiliaries	200	0.60	24					302,703	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Anchor Barge	2	Auxiliaries	200	0.60	14					176,577	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Derrick Barge	1	Main Engines	2,000	0.50	11					578,078	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		1	Auxiliaries	200	0.60	11					69,369	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Tender Tug	4	Propulsion	600	0.50	22					1,387,388	0%	0%	0%	0%	50%	50%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7									
		4	Auxiliaries	50	0.50	24					126,126	0%	0%	0%	0%	50%	50%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7									
	Tow Tug	1	Propulsion	4,500	0.80	8					5,113,514	0%	0%	0%	0%	50%	50%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7									
		1	Auxiliaries	300	0.50	24					189,189	0%	0%	0%	0%	50%	50%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7									
	25ft Shallow Draft Workboat	2	Propulsion	450	0.50	12					283,784	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		2	Auxiliaries	50	0.50	24					63,063	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
	Crewboat	1	Propulsion	400	0.60	14					176,577	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		1	Auxiliaries	50	0.50	24					31,532	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
	Survey/Crewboat	1	Propulsion	200	0.60	14					88,288	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		1	Auxiliaries	50	0.50	24					31,532	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	83.0	74,657	0%	0%	0%	0%	50%	50%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5									
	Light Towers	2	N/A	8	0.50	18					11,945	0%	0%	0%	0%	50%	50%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9									
	D6 Dozer	2	N/A	200	0.75	18					447,944	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Marsh Hoe	4	N/A	200	0.75	18					895,888	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	325 LR Excavator	2	N/A	170	0.75	18					380,752	0%	0%	0%	0%	50%	50%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5									
	Field Truck	1	N/A	180	0.50	18					134,383	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
NED: Segment 6 - 610 Bridge to Main Turning Basin (Station 00+00 to 30+95)																																		
Pt. of CD6_Whole TO: Filterbed PA																																		
PAPrep.	D6 Dozer	6	N/A	200	0.75	8	N/A	N/A	N/A	47.0	338,400	0%	0%	0%	0%	100%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Dragline	4	N/A	600	0.75	8	N/A	N/A	N/A	36.0	518,400	0%	0%	0%	0%	100%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5									
	Field Truck	2	N/A	130	0.75	8	N/A	N/A	N/A	36.0	56,160	0%	0%	0%	0%	100%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60													



NOTICE OF AVAILABILITY OF THE HOUSTON SHIP CHANNEL EXPANSION CHANNEL IMPROVEMENT PROJECT DRAFT GENERAL CONFORMITY DETERMINATION Interested parties are hereby notified of and provided an opportunity to comment on the Draft General Conformity Determination (DGCD), provided as Appendix J to the Integrated Feasibility Report-Environmental Impact Statement. In accordance with Title 40 of the Code of Federal Regulations, Chapter I, Subchapter C, Part 93, Section 93.156(b), notice is hereby provided that the DGCD contains a description of the proposed Federal action and the Federal agency's draft conformity determination. The DGCD is available at <https://www.swg.usace.army.mil/Business-With-Us/Planning-Environmental-Branch/Documents-for-Public-Review/> Written comments on the DGCD must be postmarked by December 23, 2019. Comments may be mailed or emailed to: GALVESTON DISTRICT, CORPS OF ENGINEERS, ATTN: DR. HARMON BROWN, P.O. BOX 1229 GALVESTON, TEXAS 77553 or [harmon.brown@usace.army.mil](mailto:harmon.brown@usace.army.mil) **Publish Dates:** 11/22/2019-12/6/2019



**US Army Corps  
of Engineers** ®  
Galveston District

**Final General Conformity Determination  
for  
Houston Ship Channel Expansion Channel  
Improvement Project**

**Harris, Chambers, and Galveston Counties, Texas**

Prepared for:

U.S. Army Corps of Engineers, Galveston District

Provided by:

The Port of Houston Authority

Prepared by:

Starcrest Consulting Group, LLC and the Joint Venture of Turner Collie & Braden Inc. and  
Gahagan & Bryant Associates, Inc.

**December 2019**

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Attachment A – Emission Estimation Details

Attachment B – TCEQ Letter of Agreement

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# 1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Galveston District and the Non-Federal Sponsor (NFS), Port Houston, are proposing to implement the Recommended Plan (RP) to address reducing transportation costs while providing for safe, reliable navigation on the Houston Ship Channel (HSC) system. The RP resulted from the HSC Expansion Channel Improvement Project (HSC ECIP), a 4-year federal navigation megastudy conducted to address navigation problems and opportunities. The RP is a Federally-proposed action to dredge portions of the HSC to wider and deeper dimensions to address limitations in the existing channel that result in navigation restrictions and delays with the current and future forecasted vessel traffic and commodity movement. In accordance with the General Conformity (GC) regulations promulgated under the Clean Air Act in 40 CFR Part 93 Subpart B, Determining Conformity of Federal Actions to State or Federal Implementation Plans (EPA 2010a), this Final General Conformity Determination (GCD) has been prepared to analyze and document the GC-related air emissions that will result from the RP and document that project emissions will conform to the latest U.S. Environmental Protection Agency (EPA) approved State Implementation Plan (SIP) applicable to the Houston/Galveston/Brazoria (HGB) ozone non-attainment area (NAA).

## 1.1 Project Background

The HSC consists of a 50-mile, 45-foot deep, 530-foot wide channel through Galveston Bay, and upstream of Galveston Bay narrowing down and becoming shallower through segments that are 400 feet and 300 feet wide and from 45 feet down to 36 feet deep. The HSC system includes the side channels, Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC). Additionally, 250-foot wide barge lanes are currently maintained on the both sides of the HSC to separate the faster, deep-draft ship traffic from the slower, shallow-draft barge traffic. At each of these major components of the system, there are a variety of navigation features such as bend easings and turning basins to allow vessels to turn into channels and turn around. The last system-wide study of the HSC was completed in 1995, with the resulting project, the Houston and Galveston Navigation Channels (HGNC) Project being constructed primarily from 2000 to 2005. The study was completed almost 25 years ago, and initiated years prior to that at a time when major container terminals and vessel traffic had just started in the system (at Barbours Cut) and before the largest planned terminal (Bayport) was planned or built. The study was also complete before the continued and most recent exponential growth in crude and refined product shipping from Houston. Since then, industry trends in both containerized and bulk liquid or gas cargo have seen a shift to substantially larger vessels. This includes trends towards larger container vessels that have essentially doubled and tripled in capacity, growing from mean a new-build size of 3,000 Twenty-Foot Equivalent Units (TEU) to between a mean of 6,000 and 9,000 TEU, and largest sizes of upwards of 18,000 TEU. Locally, the HSC is beginning to experience vessel calls in the 10,000 TEU and higher class. Also, shifts in crude and refined product tanker size in the HSC is increasingly shifting from Panamax to larger Aframax and Suezmax vessel classes. These vessels come with a variety of transit restrictions related to vessel size and channel dimension due to vessel pilot rules designed to safely guide vessels. Additionally, the upper reaches of the HSC have -37.5 feet Mean Low Lower Water (MLLW) and -41.5 feet MLLW depths that are less than the maximum depth the main HSC provides, limiting vessel draft in these reaches. The HSC ECIP study addresses the delays, draft restrictions and other problems and opportunities related to navigation identified during the study, with an RP planned to address them.

## 1.2 Project Description, Purpose, and Need

The RP consists of dredging to widen the HSC through the Bay and through a limited segment above Morgans Point in the upper channel, deepen the draft-restricted upper channel, widen the BSC and BCC, and improve or construct new turning features throughout the system. The project also includes dredged material placement areas (PA) and beneficial use (BU) sites to manage material dredged for the project. During the feasibility study process, the various project alternatives formulated were evaluated and two were selected for advancement to detailed evaluation. One was the National Economic Development (NED) Plan, the plan that the USACE has identified as the plan that reasonably maximizes NED benefits consistent with protecting the Nation's environment. The other was the one that the NFS prefers, termed the Locally Preferred Plan (LPP). The LPP was selected as the plan recommended for implementation, and is therefore the RP. The NED Plan is a variant of the RP that omits widening of the HSC in the Bay from Redfish Reef northward to Morgans Point, and requires bend easing and further easing of the Bayport Flare at the confluence of the HSC with the BSC. Because the NED Plan is a smaller variant that omits two major widening segments, it requires fewer cubic yards of dredging, and fewer emissions, to construct. Therefore, the LPP represents the largest that emissions could be from the HSC ECIP project. Both plans are presented to the Assistant Secretary of the Army for Civil Works [ASA(CW)] for review and approval of the LPP as the RP. The LPP and NED Plan are illustrated in **Figure 1-1**. The following summarizes the channel improvement features of the LPP (which again, is the RP):

- Widen the HSC to 700 feet through Galveston Bay from Bolivar Roads near the Entrance Channel to the BCC, and provide bend easings at four bends along the channel. The NED Plan limits the widening to the lower section of the Bay from Bolivar Roads to Redfish Reef. The widening would include shifting the current shallow draft barge lanes outward of the widened channel.
- Widen the HSC from Boggy Bayou to Greens Bayou from its current 300 to 400-foot width to 530 feet.
- Widen the BSC and BCC to 455 ft wide, and construct a combination turning basin and bend easing at the BCC. The NED Plan requires further widening of the Bayport Flare.
- Deepen the HSC from Boggy Bayou to Hunting Bayou to -46.5 ft MLLW, and from Sims Bayou to the Main Turning Basin to -41.5 ft MLLW
- Expand and shift the Brady Island Turning Basin in the upper HSC to a larger diameter.
- Construct a shoaling attenuation feature, which is a groin or jetty-like structure to be modeled and designed during preconstruction engineering and design (PED) to address excessive shoaling occurring in the Bayport Flare.

The RP would be constructed using hydraulic and mechanical dredges supported by various tender, boat, barges and scows. As discussed, the RP includes dredged material PAs and BU sites that would be constructed using the material or used to place the material. At the time of channel construction, material would be pumped by pipeline or transported by scow to upland or aquatic PA and BU sites to raise or build containment dikes, and fill the interior of sites. A variety of onshore equipment such as graders, excavators and dozers would be used to grade, shape and ditch the sites and dikes to build the features or dewater the material. Integral to the Dredged Material Placement Plan (DMMP)

planned for the RP, are a variety of BU sites that will use the dredge material to construct ecological restoration features such as tidal marsh and bird islands that have been coordinated with Federal and State resource agencies. To manage the new work dredged material generated from constructing the RP, the following existing and new PAs and BU sites are proposed to be used to accept the material. These are illustrated in **Figure 1-2** through **Figure 1-6** described from the Gulf of Mexico to landward:

- Use of the existing Offshore Dredged Material Disposal Site (ODMDS) No. 1.
- Use new work material to construct the base of oyster reef mitigation pads in lower and mid Galveston Bay.
- Construct the following BU sites: two new 6 and 8-acre bird islands in the lower Bay and a new 3-bird island/tidal marsh in the middle part of the Bay. Construct a new marsh cell M12 and an unconstructed, previously authorized marsh cell M11 in the upper part of the Bay.
- Use material to repair and rehabilitate dikes at existing marsh cell M7/8/9.
- In the upper HSC, raise dikes and fill in the existing Filterbed and Glendale PAs, construct and fill a new, one-time upland PA E2 Clinton on PHA property, and beneficially use material to raise the grade of PHA property for future terminal development at BW8.

Once the RP and the above placement features are constructed, the channel would be maintained periodically through maintenance dredging over the next 50 years using the existing PAs and some of the sites created with the project material. The purpose of HSC ECIP study is to evaluate Federal interest in alternative plans (including the No-Action Plan) for reducing transportation costs while providing for safe, reliable navigation on the HSC system. Economic conditions have changed significantly since the last HSC study for both the container and bulk industry. An increase in throughput tonnage and a significant shift in average fleet size render current channel dimensions incapable of accommodating the forecasted commodity and fleet growth without significant and system-wide inefficiencies. The study evaluates and recommends measures that address current and expected inefficiencies. The needs for this project are to address problems and opportunities identified during the study including the following problems:

- Inefficient deep and shallow-draft vessel utilization of the HSC system resulting from existing channel depth, width, and configuration;
- Navigation safety concerns for deep and shallow-draft vessel traffic; and
- A lack of environmentally acceptable dredged material placement (PA/BU) with capacity to service the system

The following opportunities were identified:

- Reduce transportation cost of forecasted commodity volume at HSC;
- Eliminate or reduce navigation inefficiencies at HSC for existing and forecasted fleet (i.e., reduce delay times, interport movements, and transit times);
- Eliminate or reduce beam, length, and draft restrictions at HSC for forecasted fleet;

- Optimize channel configuration/design in a cost effective and environmentally acceptable manner that improves safety;
- Establish environmentally suitable PAs/BU sites for new work dredged material, as well as maintenance-dredged material;
- Reduce the environmental impacts from a new project, or protect or improve environmentally sensitive areas in the vicinity of the Federal project through BU of dredge materials; and
- Study the configuration of barge lanes and further optimize them.

The study evaluated a wide variety of widening, deepening, turning, and anchoring measures to address the problems and opportunities. Economic analysis was performed using vessel traffic and transit cost modeling. Engineering analysis was performed to establish proper channel design through ship simulation, hydrodynamic modeling, calculation of dredging and placement quantities, and estimation of construction costs. Environmental evaluation was performed including National Environmental Policy Act (NEPA) analysis and documentation, oyster reef and wetland surveys, and other impact analysis. The cost and benefit analysis identified the plans that produced the most net benefits while meeting the other objectives of the study that addressed the aforementioned problems and opportunities. The plans were evaluated following the planning procedures in USACE planning regulations for Civil Works projects. A Final Integrated Feasibility Report and Environmental Impact Statement (FIFR-EIS) has been developed as the decision document to coordinate the RP for approval and provide NEPA documentation. The RP is the project resulting from the study proposed for implementation to address those problems and opportunities.

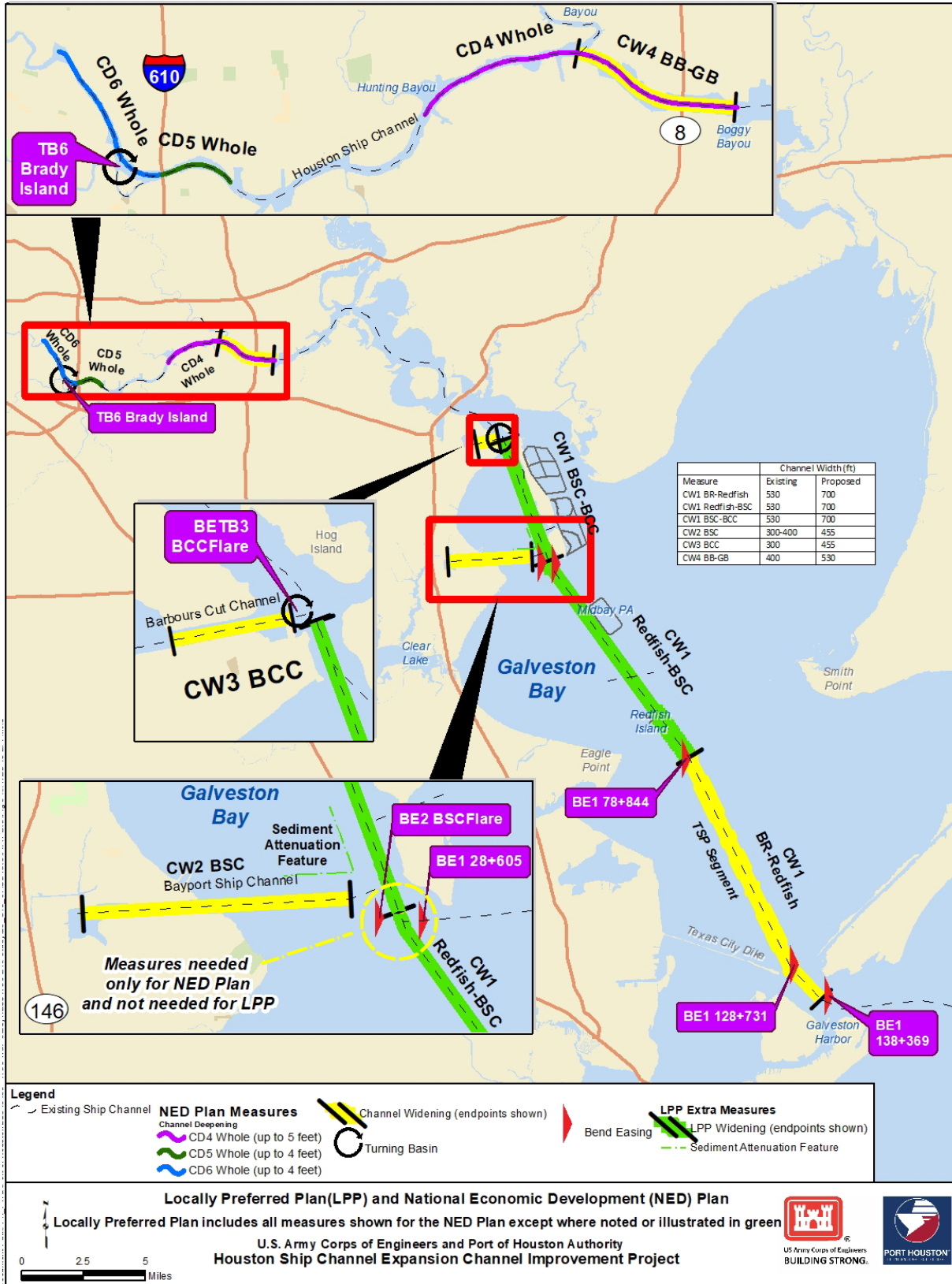


Figure 1-1: The Proposed LPP and NED Plan

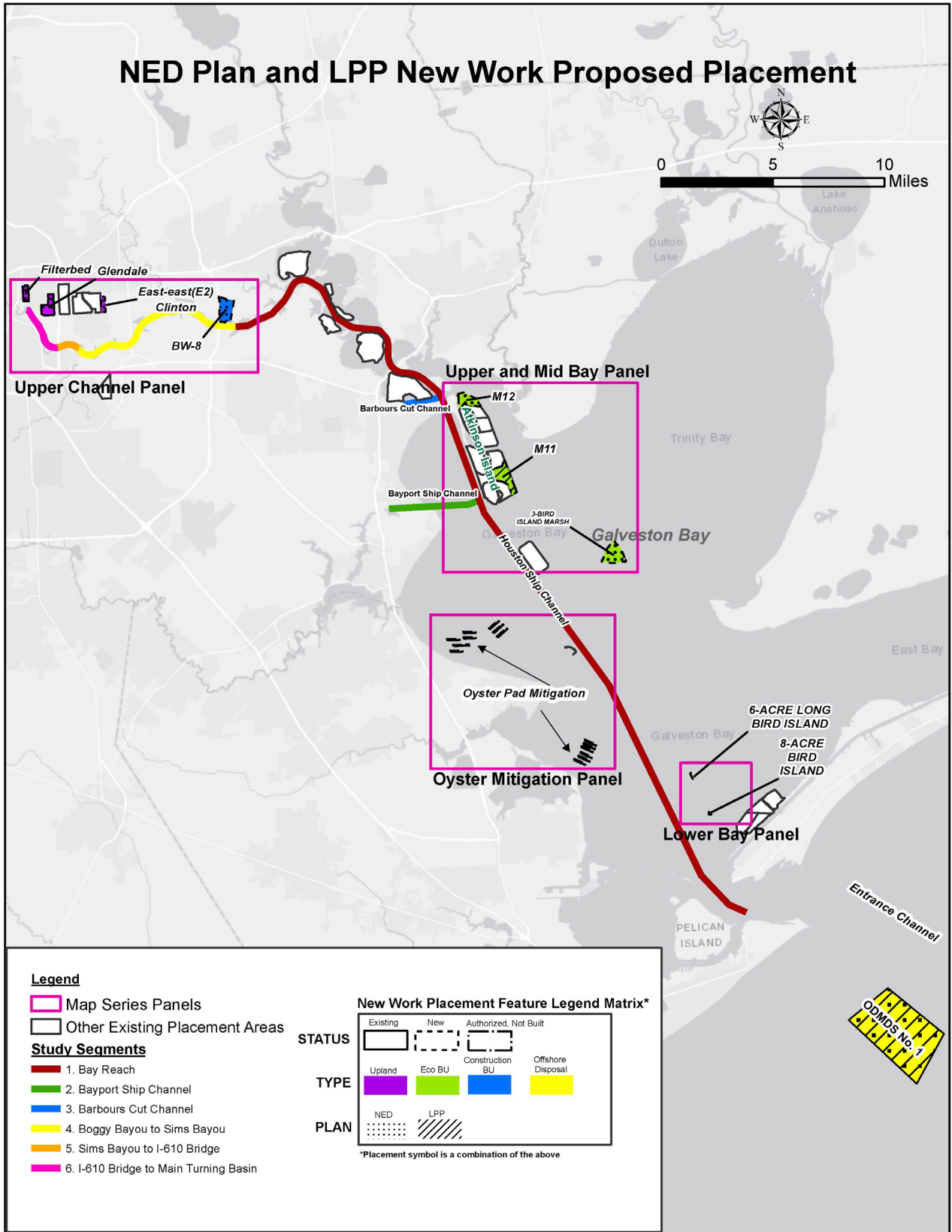
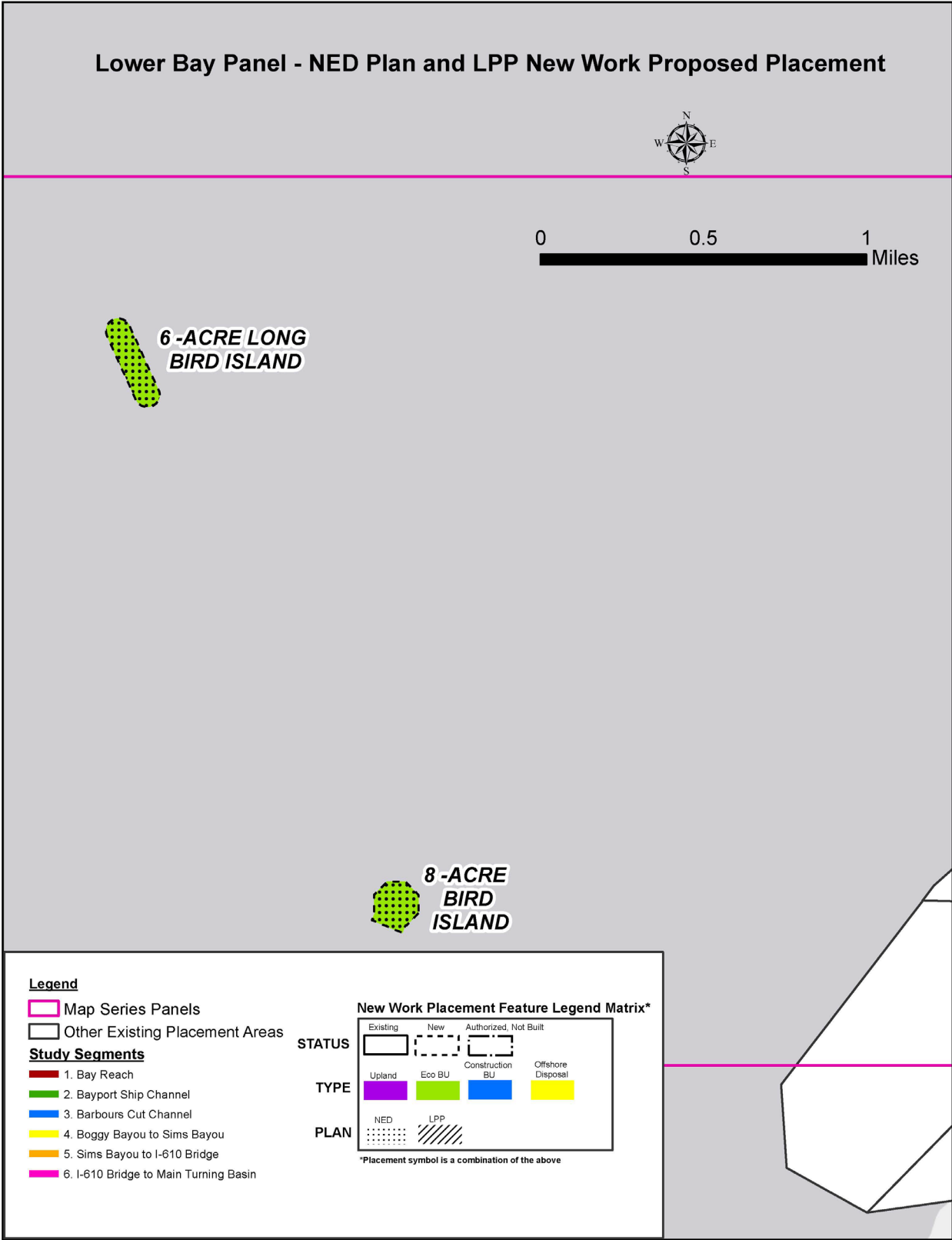
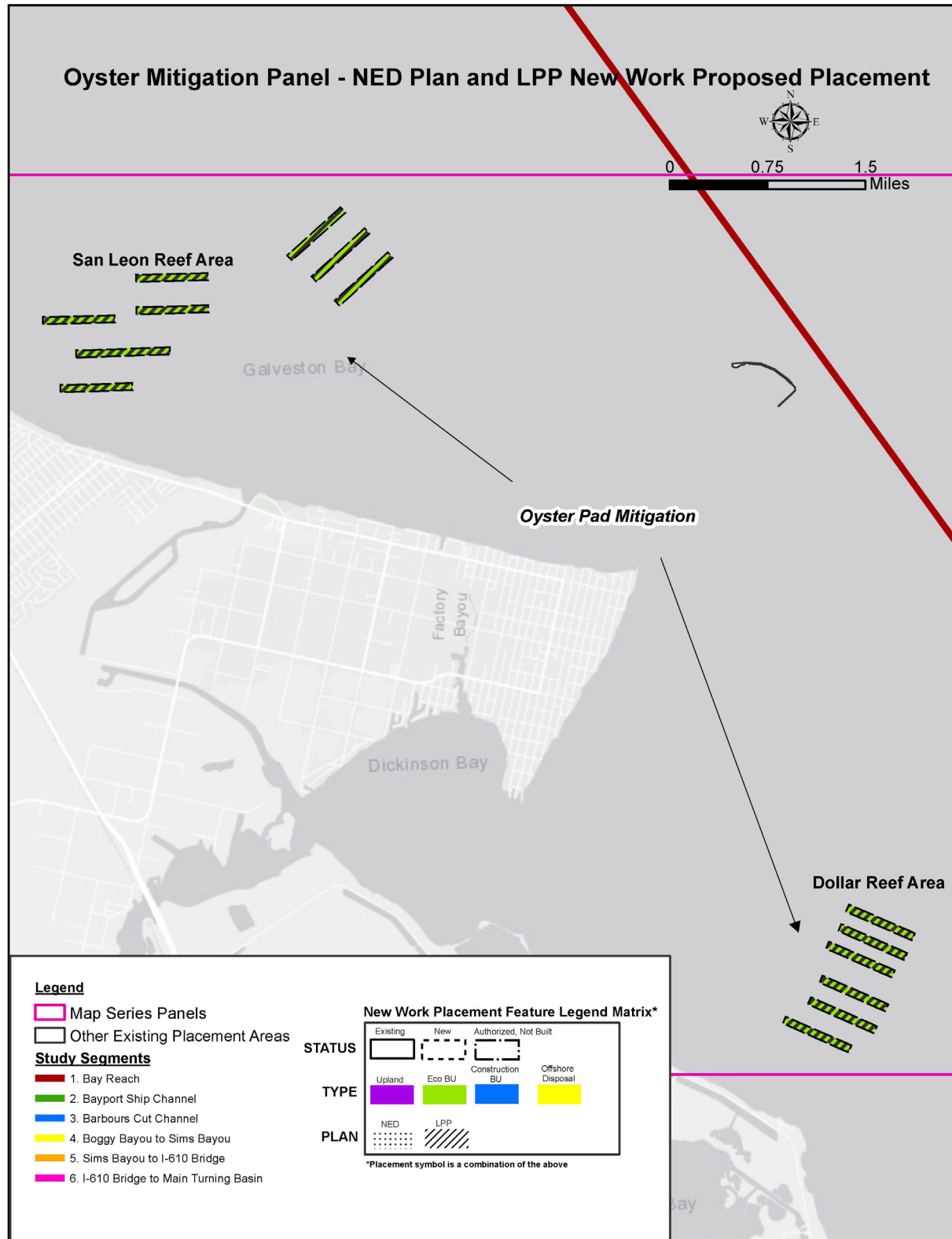


Figure 1-2: Proposed New Work Placement of the LPP and NED Plan

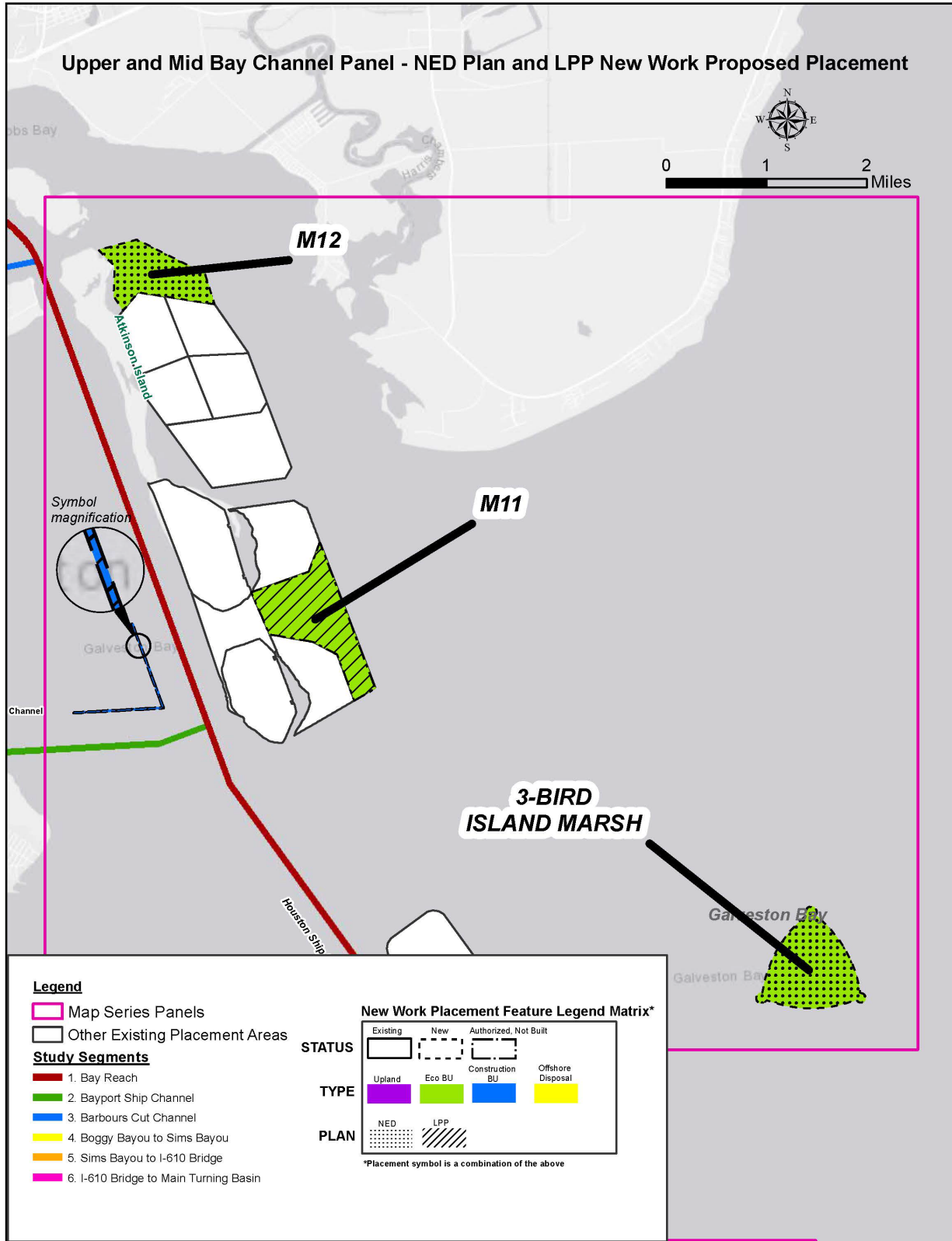


**Figure 1-3: Lower Bay – Proposed New Work Placement of the LPP and NED Plan**

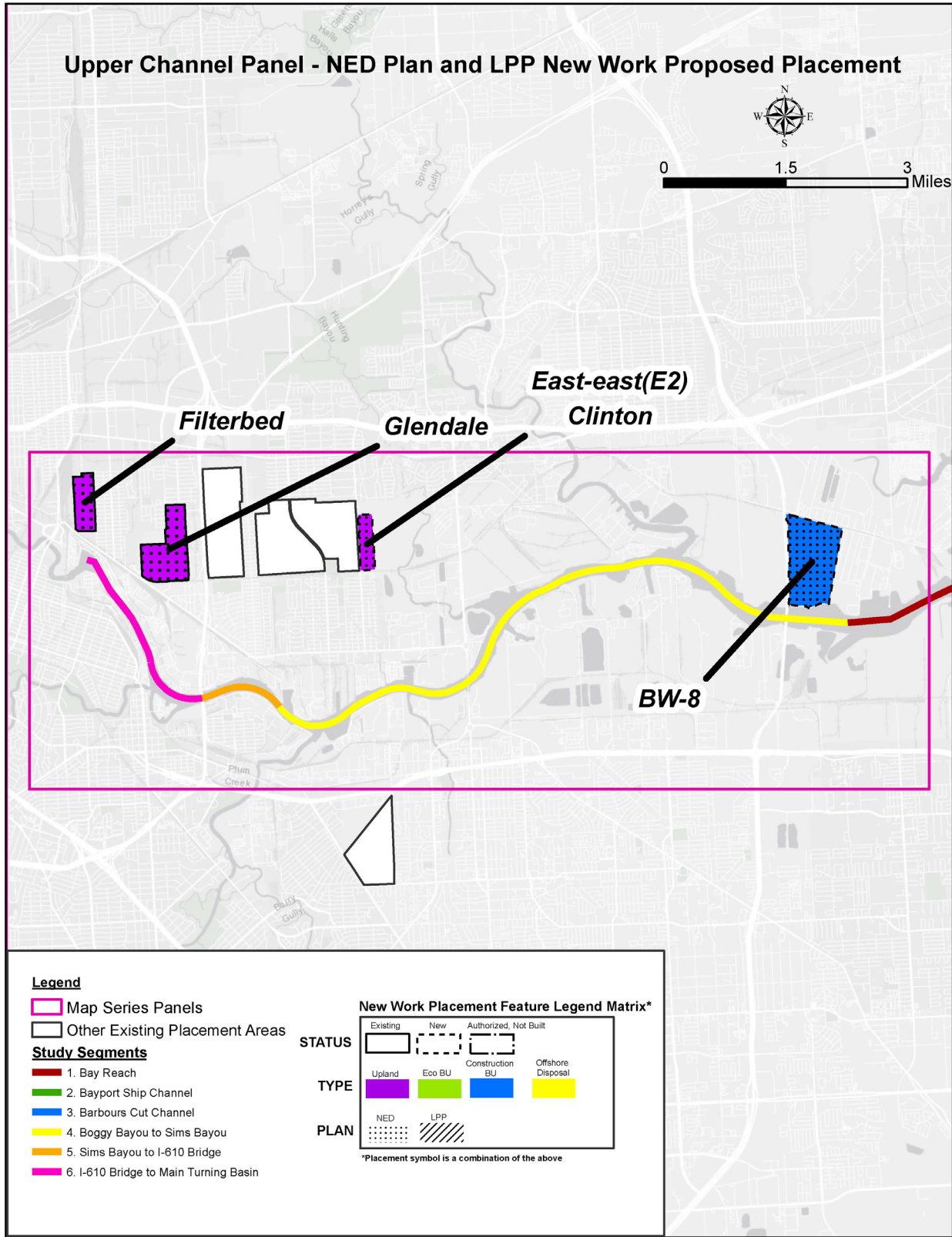




**Figure 1-4: Oyster Mitigation – Proposed New Work Placement of the LPP and NED Plan**



**Figure 1-5: Upper and Mid Bay – Proposed New Work Placement of the LPP and NED Plan**



**Figure 1-6: Upper HSC – Proposed New Work Placement of the LPP and NED Plan**

### 1.3 Regulatory Background

General Conformity is a Federal regulatory program designed to ensure that actions taken by Federal entities, such as projects proposed by the USACE, do not hinder states' efforts to meet the national ambient air quality standards (NAAQS). The definition of a Federal action as specified in 40 CFR 93.152 includes "...any activity engaged in by a department, agency, or instrumentality of the Federal government, or any activity that a department, agency or instrumentality of the Federal government supports in any way, provides financial assistance for, licenses, permits, or approves, other than activities related to transportation plans, programs, and projects developed, funded, or approved under title 23 U.S.C. or the Federal Transit Act (49 U.S.C. 1601et seq.)"

With regard to a dredging project such as the Proposed Project, the Federal Action consists of a Federal project being funded and implemented by the USACE, which is subject to General Conformity review. Placement of dredged material is part of the proposed Federal Action, and is subject to General Conformity. Maintenance dredging is not subject to General Conformity review.

The EPA has established a series of steps to determine whether a given Federal Action is subject to General Conformity review as follows (EPA 2010b).

1. Whether the action will occur in a nonattainment or maintenance area (see **Table 1-1** below for the attainment status of the project area);
2. Whether one or more of the specific exemptions apply to the action;
3. Whether the federal agency has included the action on its list of "presumed to conform" actions;
4. Whether the total direct and indirect emissions are below or above the *de minimis* levels (see **Table 1-2** below for the *de minimis* levels); and/or
5. Where the facility has an emission budget approved by the state as part of the SIP, the federal agency determines if the emissions from the proposed action are within the budget.

#### 1.3.1 Federal Action Applicability

Regarding the proposed Federal action to implement the RP,

1. The action will be occurring in the Houston-Galveston-Brazoria (HGB) ozone nonattainment area, which is designated as serious nonattainment for the 2008 ozone standard and marginal nonattainment of the 2015 ozone standard;
2. None of the specific exemptions apply to the action, except to the extent that any of the dredging to be carried out is maintenance dredging, which is specifically exempt;
3. The USACE has not included dredging projects on a list of "presumed to conform" actions;
4. Total direct and indirect emissions, as currently estimated, will exceed the *de minimis* level of 100 tons of oxides of nitrogen (NO<sub>x</sub>) in a marginal nonattainment area (NAA)

and 50 tons of NO<sub>x</sub> in a serious NAA. (see Table 2-2, Table 2-4, and Table 2-6 in Section 2 for estimated project related emissions); and

5. The USACE does not possess an emissions budget approved as part of the HGB area SIP.

### 1.3.2 Consistency Determination Options

Based on the discussion presented above and the emissions presented below in Section 2, a General Conformity determination is required for NO<sub>x</sub> emissions from the RP. Since the action is required to demonstrate conformity, one or more of the following conditions must be met (EPA 2010b).

1. Demonstrating that the total direct and indirect emissions are specifically identified and accounted for in the applicable SIP;
2. Obtaining a written statement from the state documenting that the total direct and indirect emissions from the action, along with all other emissions in the area, will not exceed the SIP emission budget;
3. Obtaining a written commitment from the state to revise the SIP to include the emissions from the action;
4. Obtaining a statement from the metropolitan planning organization (MPO) for the area documenting that any on-road motor vehicle emissions are included in the current regional emission analysis for the area's transportation plan or transportation improvement program;
5. Fully offsetting the total direct and indirect emissions by reducing emissions of the same pollutant or precursor in the same nonattainment or maintenance area.

A sixth potential demonstration method, conducting air quality modeling that demonstrates that the emissions will not cause or contribute to new violations of the standards, or increase the frequency or severity of any existing violations of the standards, is not available for the RP, because modeling is not acceptable for ozone nonattainment areas due to the complexity of ozone formation from precursor pollutants and the limitations of current air quality models. Of the options detailed above, the USACE elected to utilize the fifth option, obtaining concurrence from the Texas Commission on Environmental Quality (TCEQ) through fully offsetting the total direct and indirect emissions by reducing emissions of the same pollutant or precursor in the same nonattainment or maintenance area.

**Table 1-1: Attainment Status of Houston-Galveston-Brazoria Area**

<b>Pollutant</b>	<b>Primary NAAQS</b>	<b>Averaging Period</b>	<b>Designation</b>	<b>Counties</b>	<b>Attainment Deadline</b>
Ozone (O <sub>3</sub> )*	0.070 ppm (2015 standard)	8-hour	Marginal Nonattainment	Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery	August 3, 2021
	0.075 ppm (2008 standard)	8-hour	Serious Nonattainment	Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller	July 20, 2021
Lead (Pb)	0.15 µg/m <sup>3</sup> (2008 standard)	Rolling 3-Month Average	Unclassifiable/Attainment		
Carbon Monoxide (CO)	9 ppm	8-hour	Unclassifiable/Attainment		
	35 ppm	1-hour	Unclassifiable/Attainment		
Nitrogen Dioxide (NO <sub>2</sub> )	0.053 ppm	Annual	Unclassifiable/Attainment		
	100 ppb	1-hour	Unclassifiable/Attainment		
Particulate Matter (PM <sub>10</sub> )	150 µg/m <sup>3</sup>	24-hour	Unclassifiable/Attainment		
Particulate Matter (PM <sub>2.5</sub> )	12.0 µg/m <sup>3</sup> (2012 standard)	Annual (Arithmetic Mean)	Unclassifiable/Attainment		
	15.0 µg/m <sup>3</sup> (1997 standard)	Annual (Arithmetic Mean)	Unclassifiable/Attainment		
	35 µg/m <sup>3</sup>	24-hour	Unclassifiable/Attainment		
Sulfur Dioxide (SO <sub>2</sub> )	0.03 ppm**	Annual (Arithmetic Mean)	Unclassifiable/Attainment		
	0.14 ppm**	24-hour	Unclassifiable/Attainment		
	75 ppb	1-hour	Attainment/		
			Unclassifiable		

**Table 1-2: Significant Action Thresholds in Nonattainment Areas**

Ambient Pollutant	Nonattainment Status	Tons/yr
<b>Ozone (VOCs or NO<sub>x</sub>):</b>	<b>Serious NAA's</b>	<b>50</b>
	Severe NAA's	25
	Extreme NAA's	10
	Other ozone NAA's outside an ozone transport region	100
	Other ozone NAA's inside an ozone transport region	
	VOC	50
	NO <sub>x</sub>	100
Carbon monoxide:	All NAA's	100
SO <sub>2</sub> or NO <sub>2</sub>	All NAA's	100
PM-10:		
	Moderate NAA's	100
	Serious NAA's	70
PM-2.5:		
	Direct emissions	100
	SO <sub>2</sub>	100
	NO <sub>x</sub> (unless determined not to be a significant precursor)	100
	VOC or ammonia (if determined to be significant precursors)	100
Pb:	All NAA's	25

Source of table: 40 CFR §93.153 Applicability. (Amended to include PM2.5)

The HGB nonattainment status is now classified as serious as a result of the 2008 Eight-Hour Ozone Standard Designations. This designation brings the tons-per-year down to 50 for all Ozone emissions. This change which took effect September 23, 2019 has been reflected in this report. The attainment date for serious nonattainment areas is July 20, 2021 with a 2020 attainment year.

## 2 PROJECT CONSTRUCTION EMISSIONS

Project construction emissions of NO<sub>x</sub> and VOCs have been estimated because of the Project area's status as an ozone nonattainment area. The emission estimates are based on equipment and activity estimates provided by the project engineers and emission factors and other information from published sources, including the PHA's most recent air emissions inventory, *2013 Goods Movement Air Emissions Inventory* (Eastern Research Group, 2017). Use of the Goods Movement Emissions Inventory (GMEI) as a source of emission factors and other emissions-related information ensures that the emission estimates presented in this conformity determination are consistent with the PHA's port-wide inventory of air emissions.

Schedule and equipment information for the LPP has been provided by the Joint Venture of Turner Collie and Braden, Inc. and Gahagan and Bryant Associates, Inc. based on project design parameters for the plan. Information includes:

- Equipment type (dredge, barge, tug, dozer, etc.)
- Engine type (main, auxiliary, etc.)
- Engine horsepower and load factor (% of full load)
- Hours of operation for each vessel or piece of equipment

The following sections describe the different categories of emitting equipment that would be used to construct the LPP.

### 2.1 Dredging Equipment and Supporting Vessel Emissions

Emission sources on the dredge itself consist of diesel-fueled engines that provide power for the various operations required for dredging. The dredge is expected to be a cutter suction dredge equipped with a main engine to provide power to the cutterhead, an engine to power the ladder pump used to transport the dredged material from the substrate to the surface, an engine to move and position the ladder that guides and positions the cutterhead, and an auxiliary engine to produce electricity for power needs on the dredge. The dredging operation will also require various support vessels such as positioning tugs, crew boats, and survey boats.

The project engineers provided estimated characteristics of the diesel engines on board the dredge such as total horsepower, operating hours, and average operating loads. They also provided typical characteristics of the support vessels, including total installed horsepower and operating hours. Emission factors for all of these diesel engines were obtained from the "harbor craft" section of the GMEI, which lists emission factors for marine engines of various sizes and emission tier levels.

### 2.2 Dredged Material Placement Site Work

Once the dredged material has been placed in the placement area it will be moved and compacted by non-road equipment such as dozers and loaders. The project engineers provided typical horsepower, operating hours, and load factors for this type of equipment. Emission factors were based on the emission certification levels of Tier 1 non-road equipment. Dredged material placement and handling will account for a relatively small percentage (approximately 8%) of overall project construction NO<sub>x</sub> emissions and approximately 18% of VOC emissions.



## 2.3 Employee Vehicle Commuting

Employee vehicle commuting will make up a very small part of overall project construction emissions, and will represent a negligible percentage of SIP emissions. As an example, the latest EPA approved SIP documentation includes on-road emissions based on 169,918,016 miles per weekday (TCEQ 2016).<sup>1</sup> A 100-person work force making an average 50-mile round trip commute would drive 5,000 miles per day, or 0.003% of the on-road basis of the current SIP.

## 2.4 Emissions Calculations and Results

Emission estimates for each engine have been based on horsepower hours (hp hrs), calculated by multiplying horsepower by load factor by operating hours, multiplied by emission factors in units of grams per horsepower hour (g/hp hr). Emission factors have been chosen for marine and other nonroad engines to be relatively conservative (i.e., to be relatively high so as to calculate reasonably worst-case emission levels). Emission factors for marine engines (propulsion and auxiliary engines on dredges, tugs, work boats, etc.) are from Port Houston's most recent (2013) air emissions inventory and reflect average emissions from these engines in 2013. Emission factors for nonroad engines are based on the Tier 1 emission standards stratified by horsepower. The Tier 1 standards have been applicable since the late 1990s (year depending on horsepower) and so reflect the oldest equipment likely to be in use when the project elements take place and likely overestimate the age of equipment that will actually be used, consequently overestimating prospective emissions.

The emission factors used in calculating these emissions are presented in **Table 2-1**. As noted above, the emission factors are based on Tier 1 standards, which likely overestimate the emissions that would actually occur because of the introduction of Tier 2 and Tier 3 engines into the equipment that may be used on the project. While NO<sub>x</sub> and VOC emissions have been calculated for demonstration of General Conformity related emissions, other criteria pollutants have been included for completeness. The anticipated schedule of work was used to allocate emissions to each of the project years. **Table 2-2** presents a summary of emissions by year for the LPP.

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<sup>1</sup> *HGB 2008 Eight-Hour Ozone RFP SIP Revision* Adopted by TCEQ 15 December 2016 and approved by EPA on 13 February 2019. See: [https://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/HGB\\_2016\\_AD\\_RFP/RFP/Adoption/16017\\_SIP\\_HGBRFP\\_Ado.pdf](https://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/HGB_2016_AD_RFP/RFP/Adoption/16017_SIP_HGBRFP_Ado.pdf) Accessed 11 July 2019

**Table 2-1: Emission Factors Used for Nonroad and Marine Engines**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 1 nonroad</b>						
(11 ≤ hp < 25)	7.1	0.60	0.58	0.004	1.0	4.9
(25 ≤ hp < 50)	7.1	0.60	0.58	0.004	1.0	4.1
(50 ≤ hp < 100)	6.9	0.60	0.58	0.004	1.0	8.5
100 ≤ hp < 175	6.9	0.60	0.58	0.004	1.0	8.5
175 ≤ hp < 300	6.9	0.40	0.39	0.004	1.0	8.5
300 ≤ hp < 600	6.9	0.40	0.39	0.004	1.0	8.5
600 ≤ hp < 750	6.9	0.40	0.39	0.004	1.0	8.5
>750	6.9	0.40	0.39	0.004	1.0	8.5
<b>Marine Cat 1 &amp; Cat 3</b>						
Dredging	9.3	0.23	0.22	0.004	0.1	1.80
Miscellaneous	9.1	0.23	0.22	0.004	0.1	1.78
Tug	8.7	0.23	0.22	0.004	0.1	1.74

**Table 2-2: Estimated Tier 1 Emissions from LPP, tons per year**

		Estimated emissions, tons per year					
Year		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Year 1</b>	<b>2023</b>	850	32	31	0.47	49	470
<b>Year 2</b>	<b>2024</b>	1,330	54	52	0.77	93	870
<b>Year 3</b>	<b>2025</b>	565	22	21	0.32	35	337
<b>Year 4</b>	<b>2026</b>	535	22	21	0.30	36	340
<b>Year 5</b>	<b>2027</b>	243	11	10	0.14	19	177
<b>Year 6</b>	<b>2028</b>	129	6	5	0.08	10	94
<b>Total</b>		<b>3,652</b>	<b>146</b>	<b>141</b>	<b>2.08</b>	<b>243</b>	<b>2,288</b>

The results indicate that NO<sub>x</sub> emissions will be above the lowest *de minimis* threshold of 50 TPY in all 6 years for the LPP. In addition the results indicate that VOC emissions will be above the lowest *de minimis* threshold of 50 TPY in 2024. Therefore, a formal determination of conformity would be required.

Tier 2 emissions standards for the various categories of marine engines became effective in different years dependent on the size category of the engine, with Category 2 becoming effective as late as 2007, and Category 3 in 2011. Dredge main engines displacement and horsepower typically fall into either Category 2 or 3. With more than a decade since initial effective dates, Tier 2 dredges are becoming a more common part of the national large dredge fleet. Also, Tier 2 standards for nonroad equipment, although a minor part of emissions in this project, were effective in the 2003 to 2006 range. Therefore, to provide a range of emission estimation that might be more reflective of equipment ultimately used, emissions have also been estimated for the use of Tier 2 engines rather than the Tier 1-based estimates presented above. While it is not possible to

predict the actual equipment that will be brought to the project by contractors who have yet to be selected, it is more likely that equipment will be Tier 2 or newer based on when the standards were implemented. Tier 3 dredges are newer and fewer in number than Tier 2 in the domestic fleet with only a few spread amongst approximately 3 companies (some are under construction). Tier 3 push or tow boats, although expected to be a smaller percentage of the available fleet, are present in the regional fleet. To analyze the benefit to further reducing construction emissions, Tier 3-associated emissions were also estimated.

The 2013 Goods Movement Air Emissions Inventory does not include Tier 2 or 3 emission factors. Therefore, the marine factors were selected from another recent emissions inventory released by a Texas port, the 2013 Air Emissions Inventory for Port Corpus Christi, July 2015 (Port of Corpus Christi Authority 2013). Nonroad Tier 2 emission factors were based on the Tier 2 emission standards since more precise modeling would require detailed model year and other engine information that is not available. The Tier 2 emission factors used in calculating these emissions are presented in **Table 2-3** below. **Table 2-4** presents the results for the LPP using Tier 2 emission factors. The Tier 3 emission factors used in calculating these emissions are presented in **Table 2-5** below. **Table 2-6** presents the results for the LPP using Tier 3 emission factors.

**Table 2-3: Tier 2 Emission Factors, g/hp-hr**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 2 nonroad</b>						
(11 ≤ hp < 25)	5.6	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	5.6	0.45	0.44	0.005	1.0	4.1
(50 ≤ hp < 100)	5.6	0.30	0.29	0.005	1.0	3.7
>750	4.9	0.22	0.21	0.005	1.0	3.7
100 ≤ hp < 175	4.9	0.15	0.15	0.005	1.0	2.6
175 ≤ hp < 300	4.8	0.15	0.15	0.005	1.0	2.6
300 ≤ hp < 600	4.8	0.15	0.15	0.005	1.0	2.6
600 ≤ hp < 750	4.8	0.15	0.15	0.005	1.0	2.6
<b>Cat 1 and Cat 2 Tier 2</b>						
Dredge main	6.9	0.37	0.36	0.004	0.1	1.8
Dredge aux	5.2	0.15	0.14	0.004	0.1	1.8
Tug main	6.1	0.37	0.36	0.004	0.1	1.8
Tug aux	5.2	0.15	0.14	0.004	0.1	1.8
Miscellaneous	5.2	0.15	0.14	0.004	0.1	1.8

**Table 2-4: Estimated Tier 2 Emissions from LPP, tons per year**

		Estimated emissions, tons per year					
Year		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Year 1</b>	<b>2023</b>	583	28	27	0.47	49	228
<b>Year 2</b>	<b>2024</b>	915	41	40	0.77	93	378
<b>Year 3</b>	<b>2025</b>	393	18	17	0.32	35	155

<b>Year 4</b>	<b>2026</b>	372	16	16	0.30	36	151
<b>Year 5</b>	<b>2027</b>	167	7	7	0.14	19	72
<b>Year 6</b>	<b>2028</b>	88	4	4	0.08	10	39
<b>Total</b>		<b>2,517</b>	<b>113</b>	<b>111</b>	<b>2.08</b>	<b>243</b>	<b>1,023</b>

**Table 2-5: Tier 3 Emission Factors, g/hp-hr**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 3 nonroad</b>						
(11 ≤ hp < 25)	5.6	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	5.6	0.45	0.44	0.005	1.0	4.1
(50 ≤ hp < 100)	5.6	0.30	0.29	0.005	1.0	3.7
100 ≤ hp < 175	4.9	0.22	0.21	0.005	1.0	3.7
175 ≤ hp < 300	4.9	0.15	0.15	0.005	1.0	2.6
300 ≤ hp < 600	4.8	0.15	0.15	0.005	1.0	2.6
600 ≤ hp < 750	4.8	0.15	0.15	0.005	1.0	2.6
>750	4.8	0.15	0.15	0.005	1.0	2.6
<b>Marine</b>						
<b>Cat 1 and Cat 2 Tier 2</b>						
Main - large dredge	6.2	0.20	0.19	0.004	0.1	3.7
Main - small dredge	5.0	0.08	0.08	0.004	0.1	3.7
Dredge auxiliary	4.0	0.08	0.08	0.004	0.1	3.7
Main - large tug	5.0	0.08	0.08	0.004	0.1	3.7
Main - small tug	4.0	0.08	0.08	0.004	0.1	3.7
Tug auxiliary	4.0	0.08	0.08	0.004	0.1	3.7
Miscellaneous	4.0	0.08	0.08	0.004	0.1	3.7

**Table 2-6: Estimated Tier 3 Emissions from LPP, tons per year**

Year		Estimated emissions, tons per year					
		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Year 1</b>	<b>2023</b>	429	11	11	0.42	47	307
<b>Year 2</b>	<b>2024</b>	747	21	21	0.73	92	511
<b>Year 3</b>	<b>2025</b>	331	10	10	0.31	35	226
<b>Year 4</b>	<b>2026</b>	320	10	9	0.30	36	218
<b>Year 5</b>	<b>2027</b>	139	4	4	0.14	19	98
<b>Year 6</b>	<b>2028</b>	74	2	2	0.08	10	53
<b>Total</b>		<b>2,039</b>	<b>58</b>	<b>58</b>	<b>1.99</b>	<b>241</b>	<b>1,413</b>

The Tier 2 NO<sub>x</sub> results indicate a reduction of approximately 30 percent for the LPP, a substantial reduction. The Tier 3 NO<sub>x</sub> results indicate a further reduction of 18 percent from Tier 2 in the highest emission year. Though these results are substantially reduced, they still exceed the *de minimis* threshold of 50 TPY in 4 of the 5 years. Therefore, a formal determination of conformity would still be required for either plan. This conformity determination is based on Tier 1 equipment and is a conservative analysis based on the unknown availability of Tier 2 and Tier 3 equipment at the time of construction. If Tier 2 or 3 equipment is available, and used for construction, then emissions may be lower and the requirements for offsets could be reduced accordingly.

Most of the emissions are from the marine category, of which dredge engines dominate. Due to the increased demand for larger-scale dredging resulting from supplemental Federal funding, and the progression of several deepening and widening projects for major channels to funding and construction, demand for new dredging capacity has resulted in a \$1.5 billion dredging fleet expansion (Navingo Maritime and Offshore Media Group 2019). Several of the major dredging firms have new large cutterhead dredges planned for delivery in the next 2 years to meet industry capacity needs, including Manson, Weeks, Callan and Great Lakes Dredging and Dock (Navingo Maritime and Offshore Media Group 2019, Gerhardt 2018). Therefore, there will be an increase in dredges that meet emissions standards higher than Tier 2, and it is possible that equipment used for the proposed project could be higher tier equipment, which would further reduce the actual emissions. However, the limited population and availability of higher tier equipment may limit cost-feasible bidding for project implementation.

### 3 LONG-TERM EMISSIONS IMPACTS OF THE PROPOSED PROJECT

As discussed in Section 1.2, the LPP addresses multiple navigation problems and opportunities related to transportation delays, inefficiencies, and the related costs. Addressing these directly decreases the time and fuel spent transporting the commodities shipped through the HSC system, and by extension, the associated emissions from Ocean Going Vessels (OGV). The reduction of transportation costs by the measures formulated for both plans is achieved in two primary ways. One way is by reducing transportation delays in the form of slower or delayed navigation, and waiting at docks and anchorages due to navigation restrictions. Another way is to reduce inefficient delivery of cargo imposed by draft restrictions by deepening the channel to alleviate light loading of vessels. In support of the NEPA documentation of project effects, analysis was conducted to estimate the projected air pollutant emissions reductions from OGVs resulting from implementation of the LPP. The analysis and results are summarized in this section, and are described in detail in Section 3.1.8.2 of Appendix G, Environmental Supporting Document of the FIFR-EIS, and Attachment 1 to Appendix G, Houston Ship Channel Expansion Channel Improvement Project Projected Emissions Reductions.

As part of the economic analysis required for the feasibility study, detailed estimates of projected future commodities, vessel fleets, vessel movement, and associated transportation costs are conducted by navigation economists to analyze whether proposed plans are economically justified. Harborsym, the USACE's certified economic analysis computer simulation model developed by the Institute for Water Resources (IWR), is used to aid the analysis. According to the model's user manual, Harborsym is based on the creation of discrete event Monte Carlo simulations that mimic movement of vessels through a harbor (USACE IWR 2012). The model uses these event simulations along with user-defined statistical inputs to generate trips and calculate vessel transit time, loading and unloading time at docks, and docking and undocking time. A model of the harbor network that physically and statistically represents the navigation conditions of the harbor and its channels is developed as part of the analysis, and incorporates the vessel pilot rules that govern how different classes of vessels can move (one-way, two-way, loaded etc.) given the size, channel dimensions, and other navigation conditions. The model provides a detailed estimate of vessel calls (i.e. trips) and transit times by major vessel categories (i.e. tankers, containers, bulkers by different size classes) and can be used to quantify the extra or reduced time involved in transporting cargo by comparing with-project scenarios to without project conditions. An economic model for the HSC system, using Port of Houston-specific vessel fleets, current and future commodities throughput, and vessel pilot rules from the Houston Pilots Association, was developed for this study's economic analysis.

In order to maximize confidence in and utility of the emissions reduction analysis, the Harborsym output was used to support the operational air analysis. Due to the way specific channel improvements work to reduce transportation time, the reduced hours associated with certain groups of measures (e.g. channel widening, deepening) and study segments can be generally categorized as waiting (hours spent waiting at berth or anchorage) or steaming (under way using propulsion). These assumptions were used to employ the appropriate emissions factors and activity. The annual in-port reduction in these hours by vessel category and by study segment were used to estimate emissions reduced by the action alternatives. Besides in-port reductions, which would occur landward of the entrance buoy to the HSC, the proposed action alternatives would also reduce vessel transit hours and emissions seaward of the buoy in the shipping lanes of the Gulf of Mexico

through the elimination of vessel trips. These reductions would take place mostly outside of the HGB NAA, but would still represent substantial emissions reductions in the North American Emissions Control Area (ECA), which encompasses the US Gulf of Mexico. In-port reductions would take place within the HGB NAA. The annual in-port reduction in hours for the Years 2029 and 2044 were used to provide a range of reduction reflecting the increasing reduction occurring as traffic increases in the future due to increased commodity demand.

To provide average vessel engine specifications for the different categories, main engine and auxiliary engine size data was obtained from world fleet vessel data from Information Handling Services (IHS) Fairplay Seaweb, a world vessel registry service. Emissions estimates were developed in accordance with EPA-standard methodologies used for port air emission inventories specified in the *Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories* (ICFI, 2009), including emissions factors for the criteria pollutants, and load factors for propulsion and auxiliary engines. Vessel speed necessary to define various estimate factors were obtained from the economic analysis information used to define vessel transit. One important condition reflected in the operational emissions reduction calculations was the difference in age and engine emissions standards of the OGVs between the larger, newer classes of vessels expected to call at the Port of Houston (POH) and the smaller, older class of vessels replaced. The main vessel category involved are Post-Panamax first (PPX1), second (PPX2) and third generation (PPX3) container vessels (aka New Panamax). The LPP would lift key restrictions that would enable PPX3 vessels that have a capacity in the 10,000 to 12,000 TEU range to call. This would enable a shift of the fleet calling at POH from being dominated by PPX1 (4,000-6,000 TEU) and PPX2 (6,000-10,000 TEU) to one dominated by PPX 2 and PPX3. The average build year of the PPX3 class (taken as PPX of 120 deadweight tons [DWT] or larger) according to the SeaWeb world fleet data is 2012 with most vessels in the 2013-2014 build year, and relatively few ships, comprising a small percentage of the world container vessel fleet. The PPX3 vessel class is relatively new with most of the future fleet of this class expected to have been built in the last few years or in future years to come. SeaWeb fleet data for those with PPX2 dimensions indicated an average build year of 2012, and an average build year of 2003 for PPX1.

Two key changes in marine emissions standards took place in 2010 that would result in reduced emissions for newer Category 3 engines. First, EPA passed regulations requiring new U.S. flagged or manufactured OGVs with Category 3 engines to meet Tier 2 standards by 2011 which would reduce NO<sub>x</sub> from then-current standards by 15 to 25 percent. Thereafter, new engines would have to meet Tier 3 standards by 2016 which would reduce NO<sub>x</sub> 80 percent from pre-2011 standards. Also, since 2015, all fuel produced and sold in a NAA for Category 3 engines must have fuel with sulfur content reduced to 1,000 ppm. Second, the United Nations International Maritime Organization (IMO) required all OGVs calling or traveling through the North American ECA to meet fuel and emissions standards similar to the EPA standards discussed above. Starting in 2012, fuel sulfur content was to be reduced to 10,000 ppm, and then to 1,000 ppm in 2015, and in 2016, new engines must use NO<sub>x</sub> or other ozone precursor exhaust after-treatment systems, to achieve reduced emissions equivalent to the EPA Tier 3 standard. Future year IMO ECA adjustments in the 2009 EPA port inventory guidance were applied to the emissions factors commensurate with the future 2029 project year. Although smaller PPX1 vessels may be built in the future, the fleet age average of 2003 indicates this will be a small, niche market, as the general trend towards the larger classes will predominate, and PPX1 age in the future would likely remain older, with engines meeting lower tier standards. Therefore, the difference in emissions standards between the older

PPX1 and the shift to newer PPX2 and PPX3 vessels, was accounted for by adjusting the PPX3 vessels to reflect Tier 3 emissions standards.

Table 3-1 shows a summary of the projected in-port emissions reductions from OGVs in tons per year (tpy) for the LPP. Emissions are estimated based on vessel hourly reductions projected for the years 2029 and 2044, and pollutants of concern for this analysis include criteria pollutants nitrogen dioxide (NO<sub>x</sub>), particulate matter 10 micrometers or less in diameter (PM<sub>10</sub>), PM 2.5 micrometers or less in diameter (PM<sub>2.5</sub>), hydrocarbon (HC) which is analogous to VOC, carbon monoxide (CO), sulfur oxides (SO<sub>x</sub>) and greenhouse gas pollutant carbon dioxide (CO<sub>2</sub>). Note that since these values represent reductions in emissions, higher values indicate greater reductions. For each year analyzed, calculations demonstrate a significant reduction in emissions associated with the LPP for all pollutants.

**Table 3-1: Summary of In-Port Operational Emissions Reductions by the LPP**

Emissions Reductions (tpy)							
Year	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	HC	CO	SO <sub>x</sub>	CO <sub>2</sub>
2029	147.2	15.61	14.24	3.35	7.74	17.98	29,274
2044	334.4	31.61	28.84	6.90	16.03	36.53	59,474

The results show that the LPP, which provides full widening through the bay, and reduces the most transit delays, reduces in-port NO<sub>x</sub> emissions by greater than the *de minimis* threshold (50 TPY) throughout the project operational timespan. The annual LPP NO<sub>x</sub> emissions reductions were interpolated between 2029 and 2044, and cumulative reductions calculated, then compared to the total conformity emissions for the LPP as shown in Table 3-2. From 2044 and forward, the underlying economic analysis assumes a steady state of commodity growth and transport, which results in the constant annual reduction from that point forward. The cumulative reduction surpasses the Tier 1 construction total of 3,652 tons presented in Table 2-2 in 2043, which means construction emissions would be offset by operational reductions in fourteen years after the project would be operational. The cumulative reduction surpasses the Tier 2 construction total of 2,517 tons presented in Table 2-4 in 2044, eleven years after the project would be operational. The cumulative reduction surpasses the Tier 3 construction total of 2,145 tons presented in Table 2-6 in 2037, ten years after the project would be operational. Once the shift to the larger, newer vessel fleet plateaus in 2040, it would take 10 years to reach a cumulative NO<sub>x</sub> reduction that surpasses the Tier 1 emissions, 7 years to surpass the Tier 2 emissions, and 6 years to surpass the Tier 3 emissions. The results of the analysis demonstrate the positive impacts to the long-term operational emissions that can be anticipated. The removal of inefficient vessel traffic patterns and loading, and the increase in efficiency brought on by the economies of scale allowed by the increased channel size contribute to the forecasted emissions decrease.

**Table 3-2: Cumulative In-Port Operational NO<sub>x</sub> Reduction of the LPP**

Year	NO <sub>x</sub> Reduction (TPY)	Cumulative NO <sub>x</sub> Reduction (tons)
2029	147	



<b>Year</b>	<b>NO<sub>x</sub> Reduction (TPY)</b>	<b>Cumulative NO<sub>x</sub> Reduction (tons)</b>
2030	164	311
2031	181	493
2032	198	691
2033	215	906
2034	232	1,138
2035	249	1,388
2036	266	1,654
2037	283	1,937
2038	300	2,237
2039	317	2,555
2040	334	2,889
2041	334	3,224
2042	334	3,558
2043	334	3,892
2044	334	4,227
2045	334	4,561
2046	334	4,895
2047	334	5,230
2048	334	5,564
2049	334	5,899
2050	334	6,233
2051	334	6,567
2052	334	6,902
2053	334	7,236
2054	334	7,571
2055	334	7,905
2056	334	8,239
2057	334	8,574
2058	334	8,908
2059	334	9,242
2060	334	9,577
2061	334	9,911
2062	334	10,246
2063	334	10,580
2064	334	10,914
2065	334	11,249
2066	334	11,583
2067	334	11,917
2068	334	12,252

<b>Year</b>	<b>NO<sub>x</sub> Reduction (TPY)</b>	<b>Cumulative NO<sub>x</sub> Reduction (tons)</b>
2069	334	12,586
2070	334	12,921
2071	334	13,255
2072	334	13,589
2073	334	13,924
2074	334	14,258
2075	334	14,592
2076	334	14,927
2077	334	15,261
2078	334	15,596

#### 4 GENERAL CONFORMITY EVALUATION AND PRELIMINARY DETERMINATION

As noted in Section 1 (Introduction) and illustrated in Table 2-2, Table 2-4, and Table 2-6, emissions of NO<sub>x</sub> and VOC exceed the applicable General Conformity threshold. However, VOC is only exceeded in Year 2. To demonstrate whether the RP (LPP) construction VOC and NO<sub>x</sub> emissions can be accommodated in the HGB SIP emissions budgets, the most recent EPA-approved ozone SIP demonstration documents were reviewed for emissions inventory information. In consideration of the definition and conformity determination requirements for the most recent revisions to the SIP in 40 CFR §93.152 and §93.158(a)(5)(i)(A) respectively, the latest approved revision to the SIP is the *HGB 2008 Eight-Hour Ozone RFP SIP Revision*, approved by EPA on February 13, 2019 (TCEQ 2016). The conformity evaluation and preliminary determination presented below were coordinated with TCEQ.

This SIP RFP demonstration was reviewed to determine the various activity categories of emissions in which the RP’s construction activities will fall. While the SIP evaluates NO<sub>x</sub> emissions from all sources, including biogenic (non-human-caused) emission sources, this evaluation focuses on the categories most relevant to the RP construction emissions, specifically the Commercial Marine and Construction and Mining categories. Employee commuting emissions would be a negligible amount of project emissions, as explained in Section 2.3, and given the size of the mobile source budget, would be an even more negligible percentage of this budget.

The NO<sub>x</sub> emissions budget for commercial marine vessels (CMV), which constitute most of the project emissions at more than 90%, was obtained from Appendix 1, Reasonable Further Progress Demonstration Spreadsheet, to the *HGB 2008 Eight-Hour Ozone RFP SIP Revision* [RFP SIP] (TCEQ 2016). Table 4-1 below provides the uncontrolled and controlled CMV emissions inventory for the HGB NAA excerpted from Appendix 1 of the RFP SIP. The RFP SIP demonstration contained non-road mobile source category emissions, which encompasses various sub-categories of construction, mining, agricultural, and landscaping, but did not further break down emissions into the sub-categories. The RFP SIP demonstration separated oil and gas drilling rigs from this estimate into a separate estimate, and provided non-road mobile source emissions for 2017, but did not contain information for future year projections. The emissions estimated for uncontrolled (i.e. before required emissions standards and controls are applied) emissions, source reductions due to controls, and the resulting controlled emissions, are presented in Table 4-2.

Table 4-1: Statewide and HGB Area CMV Emissions, tpy

Analysis Year	NOX (tpd)		VOC (tpd)	
	Uncontrolled	Controlled	Uncontrolled	Controlled
2011	68.95	61.61	1.59	1.59
2017	38.16	28.77	1.21	1.15

**Table 4-2: HGB RFP 2017 Non-Road Mobile Source Emissions and Reductions Summary for NO<sub>x</sub> and VOC (tons per day)**

<b>Emissions</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>
Uncontrolled emissions	210.26	123.21
RFP non-road source reduction	123.29	89.63
RFP controlled (post-control) emissions	86.97	33.58

The LPP marine vessel Tier 1 emissions are compared with the HGB CMV projections in Table 4-3 below. Project emissions represent no more than 11.9% of CMV emissions in any one year and make up approximately 5% of CMV emissions on average over the project work period. The project non-road equipment consists of the landside dozers, loaders and other equipment used to conduct PA site work described in Section 2.2. As discussed in that section, these emissions are a relatively minor part of the project emissions. The LPP non-road category Tier 1 emissions are compared to the HGB non-road mobile source controlled emissions in Table 4-4 below. Note, for presentation, these are shown as tons per day instead of tons per year. As shown, the project non-road source emissions represent no more than 0.26% of emissions and make up 0.1% to 0.2% of non-road emissions on average over the work period. These emissions, nevertheless, do not conform to the budgets in the SIP and alternative means of conformance would be needed.

**Table 4-3: CMV Tier 1 NO<sub>x</sub> Emissions (tpy)**

<b>Year</b>	<b>LPP</b>	<b>SIP</b>	<b>% of SIP LPP</b>
2023	782	10,501	7.4%
2024	1,248	10,501	11.9%
2025	525	10,501	5.0%
2026	487	10,501	4.6%
2027	201	10,501	1.9%
2028	112	10,501	1.1%
<b>All years</b>	<b>3,355</b>	<b>63,006</b>	<b>5.3%</b>

**Table 4-4: Non-Road Tier 1 Emissions (tons per day)**

<b>Year</b>	<b>LPP Landside Non-Road Emissions</b>		<b>SIP Controlled Non-Road Emissions for 2017</b>		<b>Project % of 2017 Non-Road emissions</b>	
	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>	<b>NO<sub>x</sub></b>	<b>VOC</b>
2023	0.19	0.03	86.97	33.58	0.21%	0.08%
2024	0.22	0.03	86.97	33.58	0.26%	0.10%
2025	0.11	0.02	86.97	33.58	0.13%	0.05%
2026	0.13	0.02	86.97	33.58	0.15%	0.06%
2027	0.12	0.02	86.97	33.58	0.13%	0.05%
2028	0.05	0.01	86.97	33.58	0.05%	0.02%
<b>All years</b>	<b>0.81</b>	<b>0.12</b>	<b>521.82</b>	<b>201.48</b>	<b>0.2%</b>	<b>0.1%</b>

To provide comparison with the range of estimated emissions in Section 2, CMV emissions have also been compared between the LPP project based on the use of Tier 2 engines instead of the Tier 1 and the SIP emissions, in tons per year, is presented in Table 4-5 below. Project emissions are reduced to no more than 8% of CMV emissions in any one year and make up 3.7% of CMV emissions on average over the project work period. Similarly, for non-road emissions, the Tier 2 LPP emissions are compared to SIP emissions, in tons per day in Table 4-6. Project NO<sub>x</sub> emissions are slightly reduced percentage-wise to 0.1% of SIP non-road emissions. The use of Tier 2 equipment does not reduce emissions enough to conform to the budgets in the SIP and alternative means of conformance would be needed.

**Table 4-5: CMV Tier 2 NO<sub>x</sub> Emissions (tpy)**

Year	LPP	SIP	% of SIP
			LPP
2023	535	10,501	5.1%
2024	856	10,501	8.2%
2025	364	10,501	3.5%
2026	337	10,501	3.2%
2027	137	10,501	1.3%
2028	76	10,501	0.7%
<b>All years</b>	<b>2,306</b>	<b>63,006</b>	<b>3.7%</b>

**Table 4-6: Non-Road Tier 2 Emissions (tons per day)**

Year	LPP Landside Non-Road Emissions(tons per day)		SIP Controlled Non-Road Emissions for 2017 (tons per day)		Project % of 2017 Non-Road emissions	
	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC	NO <sub>x</sub>	VOC
	2023	0.13	0.03	86.97	33.58	0.15%
2024	0.16	0.03	86.97	33.58	0.18%	0.10%
2025	0.08	0.02	86.97	33.58	0.09%	0.05%
2026	0.09	0.02	86.97	33.58	0.11%	0.06%
2027	0.08	0.02	86.97	33.58	0.09%	0.05%
2028	0.03	0.01	86.97	33.58	0.04%	0.02%
<b>All years</b>	<b>0.57</b>	<b>0.12</b>	<b>521.82</b>	<b>201.48</b>	<b>0.1%</b>	<b>0.1%</b>

The Tier 3 emissions from Table 4-7 were also compared to the CMV SIP budget. As shown, the maximum annual emissions are no more than 7.5% of the CMV budget, and average 3.2% of the CMV budget. Comparatively, the Tier 3 emissions comprise 0.7% less of the CMV SIP budget than the Tier 1 emissions. The use of Tier 3 equipment does not reduce emissions enough to conform to the budgets in the SIP and alternative means of conformance would be needed.

**Table 4-7 CMV Tier 3 NO<sub>x</sub> Emissions (tpy)**

<b>Year</b>	<b>LPP</b>	<b>SIP</b>	<b>% of SIP LPP</b>
2023	458	10,501	4.6%
2024	752	10,501	7.5%
2025	320	10,501	3.2%
2026	298	10,501	3.0%
2027	120	10,501	1.3%
2028	66	10,501	0.7%
<b>All years</b>	<b>2,015</b>	<b>63,006</b>	<b>3.2%</b>

The initial conclusion that because LPP emissions constitute a small percentage of the applicable SIP budgets, and the reduction in ship channel operational emissions resulting from the project's navigation improvements would produce greater long-term emissions reduction than the emissions from this project could be accommodated in the HGB SIP emission budget were shown to be not valid. The option to purchase DERCs to fully offset VOC and NO<sub>x</sub> exceedances has been elected to achieve conformity.

## 5 DRAFT GCD COMMENTS AND RESPONSES

The USACE submitted the Draft GCD, and issued a public notice announcing the availability of the Draft GCD for the RP for a 30-day comment period on Nov 22, 2019. The public notice and Draft GCD was posted on the USACE website and published in the Houston Chronicle the same day. Availability of the public notice and Draft GCD was communicated to TCEQ, and EPA Region 6. The Notice of Availability for the Final GCD will be published in the Houston Chronicle and posted on the USACE website.

### 5.1 TCEQ, EPA, and MPO Comments

Comments and recommendations received from the TCEQ, EPA Region 6 and MPO, and responses to them, will be summarized in this section, once received.

#### 5.1.1 TCEQ Comments

Teleconferences with the TCEQ discussing the project construction emissions and consistency determination options were held initially on 18 October 2019, and subsequent calls through 4 December 2019. Based on initial coordination and discussion of the Draft GCD with the TCEQ, it was determined that Options 2, 3 and 5 listed in **Section 1.3.2** would be considered further to support a determination of consistency with the SIP. At the time of the issuance of the DGCD, Option 2 was being pursued, which is obtaining a written statement from the state documenting that the total direct and indirect emissions from the action, along with all other emissions in the area, will not exceed the SIP emission budget. However this would not result in concurrence because project emissions are too great to be accommodated within the applicable SIP budget.

Once it became apparent that pursuing Option 2 was not a viable path to concurrence the project team selected to pursue offsetting construction emissions, which is consistent with Option 5, fully offsetting the total direct and indirect emissions by reducing emissions of the same pollutant or precursor in the same nonattainment area. It could involve implementing emissions reductions from other USACE or NFS projects that are quantifiable, consistent with the applicable SIP demonstrations, and are surplus to reductions required by, and credited to, other applicable SIP provisions. Alternately, it could involve purchasing offset credits generated by other projects. Offset credits for NO<sub>x</sub> and VOC have been generated by a variety of industry sources in the HGB NAA, such as power plants and refineries, for sale on a brokered market, including those meant to address temporary emissions sources such as the RP construction emissions. These credits have resulted from quantified and approved emissions reduction measures such as plant retirement, fuel switching, or pollution controls that produce net reductions in criteria pollutant emissions. These credits are known as Discreet Emissions Reduction Credits (DERC). The USACE and the NFS have elected to include this commitment, which is explained in further detail in **Section 6**.

Following receipt of the commitment to acquire DERCs, if it becomes necessary, the TCEQ issued a letter agreement (provided in Attachment B), that the purchase of DERCs as an offsetting strategy would meet general conformity requirements and conform to the SIP.

## **5.2 Individual and Organized Groups Comments**

Comments received from the public and organizations, and responses to them, will be summarized in this section, once received.



## 6 FINAL GENERAL CONFORMITY DETERMINATION

The potential project construction emissions have been presented in Section 2 and in **Table 2-2**, **Table 2-4**, and **Table 2-6** for assumption of equipment meeting Tiers 1, 2 and 3 emissions standards respectively. Tier 1 is the oldest equipment expected to be practically used in project implementation. The feasibility of using construction equipment higher than Tier 1 would be further determined during PED. The total project emissions of NO<sub>x</sub> and VOC associated with Tier 1, represent the maximum amount of emissions expected from project construction. These would occur over the 6-year construction period currently conceived by the USACE. The NFS is exploring options for implementing the project with a faster construction schedule under existing authorities allowing NFS construction. This may involve compression of several years of construction into fewer years, to be determined during the PED phase. Regardless of the schedule compression, the Tier 1 total would constitute the maximum amount of offset credits that would be required to be purchased if no other options to reduce emissions or consistency determination were exercised. Current DERC market information indicates that more than 30,000 tons of temporary NO<sub>x</sub> credits and 980 tons of VOC credits are available, well in excess what is needed for this project. To determine the maximum credits that would be required, the total tons for years that exceed de minimis were summed. For NO<sub>x</sub>, every year exceeds de minimis, and the total of 3,652 tons would be required. Therefore, under a compressed schedule, all years associated with this total would continue to be subject to the offset and would not be affected by schedule compression. For VOC, under the USACE schedule, the Year 2 total of 93 tons would be required. Under schedule compression by the NFS, the first four years of the schedule are more likely to be compressed into fewer years to cause those years to exceed de minimis, which would involve the Years 1 through 4 total of 213 tons. As a conservative estimate, all 243 tons of the VOC emissions would be at maximum subject to offset, although less likely.

**Table 6-1: Tier 1 NO<sub>x</sub> and VOC Emissions for Offset Credit Estimation**

		Estimated emissions (tons per year)*	
Year		NO <sub>x</sub>	VOC
Year 1	2023	<i>850</i>	49
Year 2	2024	<i>1,330</i>	<i>93</i>
Year 3	2025	<i>565</i>	35
Year 4	2026	<i>535</i>	36
Year 5	2027	<i>243</i>	19
Year 6	2028	<i>129</i>	10
<b>Total</b>		<b><i>3,652</i></b>	<b><i>243</i></b>

\*Bolded, italicized values indicate tons that would be subject to offsets.

It is also possible that if higher tier equipment is feasible in procurement, that the necessary credits could be reduced if the other options to achieve a determination of consistency with the SIP do not become feasible. To provide a commitment to acquire offsetting DERCs presently available in the marketplace, the NFS, Port Houston, has committed in a letter to the TCEQ

provided in Attachment C to ensure that adequate DERC emission credits would be acquired before the HSC ECIP-related construction emissions occur to ensure compliance with General Conformity if other consistency determination options are not realized, and offset credits are required. With the receipt of the TCEQ letter of agreement and the commitments to acquire the necessary credits the USACE has determined that the HSC ECIP project will conform to the SIP for purposes of a Federal determination of General Conformity.

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## **Attachment A**

### **Emission Estimation Details**

## **Appendix A – Emission Estimation Details**

Project construction emissions of NO<sub>x</sub> and VOCs have been estimated because of the Project area's status as an ozone nonattainment area. The emission estimates are based on equipment and activity estimates provided by the project engineers and emission factors and other information from published sources, including the PHA's most recent air emissions inventory, *2013 Goods Movement Air Emissions Inventory* (Eastern Research Group, 2017) and published emission standards. Use of the Goods Movement Emissions Inventory (GMEI) as a source of emission factors and other emissions-related information ensures that the emission estimates presented in this conformity determination are consistent with the PHA's port-wide inventory of air emissions.

AECOM has developed schedule and equipment information for the LPP based on project design parameters for the two plans. Information includes:

- Equipment type (dredge, barge, tug, dozer, etc.)
- Engine type (main, auxiliary, etc.)
- Engine horsepower and load factor (% of full load)
- Hours of operation for each vessel or piece of equipment

The following sections describe the different categories of emitting equipment that would be used to construct the LPP.

### **A.1 Equipment and Supporting Vessel Emissions**

Emission sources on the dredge itself consist of diesel-fueled engines that provide power for the various operations required for dredging. The dredge is expected to be a cutter suction dredge equipped with a main engine to provide power to the cutterhead, an engine to power the ladder pump used to transport the dredged material from the substrate to the surface, an engine to move and position the ladder that guides and positions the cutterhead, and an auxiliary engine to produce electricity for power needs on the dredge. The dredging operation will also require various support vessels such as positioning tugs, crew boats, and survey boats.

The project engineers estimated characteristics of the diesel engines on board the dredge such as total horsepower, operating hours, and average operating loads. They also characterized typical parameters of the support vessels, including total installed horsepower and operating hours. Basic emission factors for the diesel engines were obtained from the "harbor craft" section of the GMEI, which lists emission factors for marine engines of various sizes and emission tier levels. Additional, advanced-tier emission factors have been based on the emission standards for the appropriately sized marine engines.

### **A.2 Dredged Material Placement Site Work**

Once the dredged material has been placed in the placement area it will be moved and compacted by non-road equipment such as dozers and loaders. The project engineers estimated typical horsepower, operating hours, and load factors for this type of equipment. Emission factors were based on the emission certification levels of Tier 1, Tier 2, and Tier 3 non-road equipment.

Dredged material placement and handling will account for a relatively small percentage (approximately 8%) of overall project construction NO<sub>x</sub> emissions and approximately 18% of VOC emissions.

### **A.3 Employee Vehicle Commuting**

Employee vehicle commuting will make up a very small part of overall project construction emissions and will represent a negligible percentage of SIP emissions. As an example, the latest EPA approved SIP documentation includes on-road emissions based on 169,918,016 miles per weekday (TCEQ 2016).<sup>1</sup> A 100-person work force making an average 50-mile round trip commute would drive 5,000 miles per day, or 0.003% of the on-road basis of the current SIP.

### **A.4 Emissions Calculations and Results**

Emission estimates for each engine have been based on horsepower hours (hp hrs), calculated by multiplying horsepower by load factor by operating hours, multiplied by emission factors in units of grams per horsepower hour (g/hp hr). Emission factors have been chosen for marine and other nonroad engines to be relatively conservative (i.e., to be relatively high so as to calculate reasonably worst-case emission levels). Emission factors for marine engines (propulsion and auxiliary engines on dredges, tugs, work boats, etc.) are from Port Houston's most recent (2013) air emissions inventory and reflect average emissions from these engines in 2013. Emission factors for nonroad engines are based on the Tier 1, 2, and 3 emission standards stratified by horsepower. The Tier 1 standards have been applicable since the late 1990s (year depending on horsepower) and so reflect the oldest equipment likely to be in use when the project elements take place and likely overestimate the age of equipment that will actually be used, consequently overestimating prospective emissions. Emission estimates based on Tier 2 and 3 reflect the lower emissions that would result from newer engines being used for the work.

The Tier 1 emission factors used in calculating these emissions are presented in Table A-1. As noted above, the emission factors are based on Tier 1 standards, which likely overestimate the emissions that would actually occur because of the introduction of Tier 2 and Tier 3 engines into the equipment that may be used on the project. While NO<sub>x</sub> and VOC emissions have been calculated for demonstration of General Conformity related emissions, other criteria pollutants have been included for completeness. The anticipated schedule of work was used to allocate emissions to each of the project years. Table A-2 presents a summary of emissions from Tier 1 vessels and equipment by year for the LPP.

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<sup>1</sup> *HGB 2008 Eight-Hour Ozone RFP SIP Revision* Adopted by TCEQ 15 December 2016 and approved by EPA on 13 February 2019. See: [https://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/HGB\\_2016\\_AD\\_RFP/RFP/Adoption/16017\\_SIP\\_HGBRFP\\_Ado.pdf](https://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/HGB_2016_AD_RFP/RFP/Adoption/16017_SIP_HGBRFP_Ado.pdf) Accessed 11 July 2019

**Table A-1: Emission Factors Used for Nonroad and Marine Engines**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 1 nonroad</b>						
(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	7.1	0.60	0.58	0.005	1.0	4.1
(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.0	8.5
100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.0	8.5
175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.0	8.5
300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.0	8.5
600 ≤ hp < 750	6.9	0.40	0.39	0.005	1.0	8.5
>750	6.9	0.40	0.39	0.005	1.0	8.5
<b>Marine</b>						
<b>Cat 1 and Cat 2 Tier 1</b>						
Main - large dredge	9.3	0.23	0.22	0.004	0.1	1.8
Main - small dredge	9.3	0.23	0.22	0.004	0.1	1.8
Dredge auxiliary	7.3	0.23	0.22	0.004	0.1	1.7
Main - large tug	8.7	0.23	0.22	0.004	0.1	1.7
Main - small tug	8.7	0.23	0.22	0.004	0.1	1.7
Tug auxiliary	7.3	0.23	0.22	0.004	0.1	1.7
Miscellaneous	9.1	0.23	0.22	0.004	0.1	1.8

**Table A-2: Estimated Tier 1 Emissions, tons per year**

Year		Estimated emissions, tons per year					
		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Year 1</b>	<b>2023</b>	850	32	31	0.47	49	470
<b>Year 2</b>	<b>2024</b>	1,330	54	52	0.77	93	870
<b>Year 3</b>	<b>2025</b>	565	22	21	0.32	35	337
<b>Year 4</b>	<b>2026</b>	535	22	21	0.30	36	340
<b>Year 5</b>	<b>2027</b>	243	11	10	0.14	19	177
<b>Year 6</b>	<b>2028</b>	129	6	5	0.08	10	94
<b>Total</b>		<b>3,652</b>	<b>146</b>	<b>141</b>	<b>2.08</b>	<b>243</b>	<b>2,288</b>

Tier 2 emissions standards for the various categories of marine engines became effective in different years dependent on the size category of the engine, with Category 2 becoming effective as late as 2007, and Category 3 in 2011. Dredge main engines displacement and horsepower typically fall into either Category 2 or 3. With more than a decade since initial effective dates, Tier 2 dredges are becoming a more common part of the national large dredge fleet. Also, Tier 2 standards for nonroad equipment, although a minor part of emissions in this project, were effective



in the 2003 to 2006 range. Therefore, to provide a range of emission estimation that might be more reflective of equipment ultimately used, emissions have also been estimated for the use of Tier 2 engines rather than the Tier 1-based estimates presented above. While it is not possible to predict the actual equipment that will be brought to the project by contractors who have yet to be selected, it is more likely that equipment will be Tier 2 or newer based on when the standards were implemented.

The 2013 Goods Movement Air Emissions Inventory does not include Tier 2 emission factors. Therefore, the marine factors were selected from another recent emissions inventory released by a Texas port, the 2013 Air Emissions Inventory for Port Corpus Christi, July 2015 (Port of Corpus Christi Authority 2013) and on relevant emission standards. Nonroad Tier 2 emission factors were based on the Tier 2 emission standards since more precise modeling would require detailed model year and other engine information that is not available. The Tier 2 emission factors used in calculating these emissions are presented in Table A-3 below. Table A-4 presents the results for the LPP using Tier 2 emission factors.

**Table A-3: Tier 2 Emission Factors, g/hp-hr**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 2 nonroad</b>						
(11 ≤ hp < 25)	5.6	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	5.6	0.45	0.44	0.005	1.0	4.1
(50 ≤ hp < 100)	5.6	0.30	0.29	0.005	1.0	3.7
100 ≤ hp < 175	4.9	0.22	0.21	0.005	1.0	3.7
175 ≤ hp < 300	4.9	0.15	0.15	0.005	1.0	2.6
300 ≤ hp < 600	4.8	0.15	0.15	0.005	1.0	2.6
600 ≤ hp < 750	4.8	0.15	0.15	0.005	1.0	2.6
>750	4.8	0.15	0.15	0.005	1.0	2.6
<b>Cat 1 and Cat 2 Tier 2</b>						
Dredge main - large	6.9	0.37	0.36	0.004	0.1	1.8
Dredge main - small	6.2	0.37	0.36	0.004	0.1	1.8
Dredge aux	5.2	0.15	0.14	0.004	0.1	1.8
Tug main - large	6.1	0.37	0.36	0.004	0.1	1.8
Tug main - small	5.2	0.37	0.36	0.004	0.1	1.8
Tug aux	5.2	0.15	0.14	0.004	0.1	1.8
Miscellaneous	5.2	0.15	0.14	0.004	0.1	1.8

**Table A-4: Estimated Tier 2 Emissions, tons per year**

Year		Estimated emissions, tons per year					
		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Year 1	2023	583	28	27	0.47	49	228
Year 2	2024	915	41	40	0.77	93	378
Year 3	2025	393	18	17	0.32	35	155
Year 4	2026	372	16	16	0.30	36	151
Year 5	2027	167	7	7	0.14	19	72
Year 6	2028	88	4	4	0.08	10	39
<b>Total</b>		<b>2,517</b>	<b>113</b>	<b>111</b>	<b>2.08</b>	<b>243</b>	<b>1,023</b>

Further information is provided by evaluating emissions that would be produced by the use of Tier 3 equipment and vessel engines on the project. Emission factors for these engines have been based on the relevant Tier 3 emission standards. Table A-5 presents the Tier 3 emission factors used in calculating these emissions while Table A-6 presents the emission estimates resulting from the use of Tier 3 engines and equipment on the LPP.

**Table A-5: Tier 3 Emission Factors, g/hp-hr**

	grams per hp-hr					
	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
<b>Tier 3 nonroad</b>						
(11 ≤ hp < 25)	5.6	0.60	0.58	0.005	1.0	4.9
(25 ≤ hp < 50)	5.6	0.45	0.44	0.005	1.0	4.1
(50 ≤ hp < 100)	5.6	0.30	0.29	0.005	1.0	3.7
100 ≤ hp < 175	4.9	0.22	0.21	0.005	1.0	3.7
175 ≤ hp < 300	4.9	0.15	0.15	0.005	1.0	2.6
300 ≤ hp < 600	4.8	0.15	0.15	0.005	1.0	2.6
600 ≤ hp < 750	4.8	0.15	0.15	0.005	1.0	2.6
>750	4.8	0.15	0.15	0.005	1.0	2.6
<b>Marine</b>						
<b>Cat 1 and Cat 2 Tier 2</b>						
Main - large dredge	6.2	0.20	0.19	0.004	0.1	3.7
Main - small dredge	5.0	0.08	0.08	0.004	0.1	3.7
Dredge auxiliary	4.0	0.08	0.08	0.004	0.1	3.7
Main - large tug	5.0	0.08	0.08	0.004	0.1	3.7
Main - small tug	4.0	0.08	0.08	0.004	0.1	3.7
Tug auxiliary	4.0	0.08	0.08	0.004	0.1	3.7
Miscellaneous	4.0	0.08	0.08	0.004	0.1	3.7

**Table A-6: Estimated Tier 3 Emissions, tons per year**

Year		Estimated emissions, tons per year					
		NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>x</sub>	VOC	CO
Year 1	2023	488	12	12	0.47	49	351
Year 2	2024	788	22	21	0.77	93	541
Year 3	2025	337	10	10	0.32	35	231
Year 4	2026	320	10	9	0.30	36	218
Year 5	2027	139	4	4	0.14	19	98
Year 6	2028	74	2	2	0.08	10	53
<b>Total</b>		<b>2,145</b>	<b>60</b>	<b>59</b>	<b>2.08</b>	<b>243</b>	<b>1,491</b>

The construction schedule on which the annual emissions are based is included below in Figure A-1. An illustration of the detailed calculations of Tier 1 emissions developed for the LPP are included as Figure A-2. The Tier 2 and Tier 3 emissions were estimated in a similar manner using the appropriate emission factors.



**Figure A-2: Illustration of Tier 1 Emission Calculations**

PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	1	2	% of work in year					6	Nonroad /	Category	Emission factors, g/hp hr				
														3	4	5		Marine		NOx	PM10	PM2.5	SOx	VOC	CO	
<b>CONTRACT YEAR 01 - LPP</b>																										
NED: Segment 1 - Bolivar Roads to Redfish Reef (Station 138+369 to 100+000)																										
Pt. of CW1 Bolivar-Redfish_700 TO: 8-AC Bird Island & Long Bird Island																										
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.53	16	1,994,000	16	1,305	95.5	5,830,731	100%	0%	0%	0%	0%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8
		1	Auxiliaries	1,000	0.80	24					1,833,563	100%	0%	0%	0%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7
		1	Ladder Pump	1,200	0.58	16					1,063,467	100%	0%	0%	0%	0%	0%	0%	Nonroad	≥750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Cutter & Swing	2,500	0.80	16					3,055,939	100%	0%	0%	0%	0%	0%	0%	Nonroad	≥750	6.9	0.40	0.39	0.005	1.00	8.5
	30"-Booster	1	Main Engines	5,000	0.70	16					5,347,893	100%	0%	0%	0%	0%	0%	0%	Nonroad	≥750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.60	24					275,034	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Anchor Barge	2	Auxiliaries	200	0.60	16					366,713	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Derrick Barge	1	Main Engines	2,000	0.50	11					1,050,479	100%	0%	0%	0%	0%	0%	0%	Nonroad	≥750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.60	11					125,057	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Spill Barge	2	Auxiliaries	150	0.60	16					137,517	100%	0%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Tender Tug	4	Propulsion	600	0.50	22					2,521,149	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		4	Auxiliaries	50	0.50	24					229,195	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Tow Tug	1	Propulsion	4,500	0.80	8					2,750,345	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
		1	Auxiliaries	300	0.50	24					343,793	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	25ft Shallow Draft Workboat	2	Propulsion	450	0.50	12					515,690	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		2	Auxiliaries	50	0.50	24					114,598	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
	Crewboat	1	Propulsion	400	0.60	14					320,874	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	24					57,299	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	156.3	140,668	100%	0%	0%	0%	0%	0%	0%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5
	Light Towers	2	N/A	8	0.50	18					22,507	100%	0%	0%	0%	0%	0%	0%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9
	D6 Dozer	2	N/A	200	0.75	18					844,010	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Marsh Hoe	4	N/A	200	0.75	18					1,688,019	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	325 LR Excavator	2	N/A	170	0.75	18					717,408	100%	0%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Field Truck	1	N/A	180	0.50	18					253,203	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Survey/Crewboat	1	Propulsion	200	0.60	14					262,581	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	24					93,779	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Rock S.Plinstall	Barge Mounted Crane	2	Main Power	400	0.65	8	N/A	N/A	N/A	16.0	66,560	100%	0%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
		2	N/A	170	0.75	8					32,640	100%	0%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Work Tug	1	Main Power	1,000	0.65	8					83,200	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		1	Propulsion	200	0.60	8					15,360	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	8					3,200	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Culch S.Plinstall	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	12.0	24,960	100%	0%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
		1	Main Power	1,000	0.65	8					62,400	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
	Work Tug	1	Propulsion	200	0.60	8					11,520	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
	Survey/Crewboat	1	Auxiliaries	50	0.50	8					2,400	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
Culch Mt.Install	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	152.0	316,160	100%	0%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
		1	Main Power	1,000	0.65	8					790,400	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
	Work Tug	1	Propulsion	200	0.60	8					145,920	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
	Survey/Crewboat	1	Auxiliaries	50	0.50	8					30,400	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
NED: Segment 1 - Bolivar Roads to Redfish (Station 100+000 to 073+934)																										
Pt. of CW1 Bolivar-Redfish_700 TO: ODMDS																										
MechanicalDredging	Clamshell Dredge (21CY)	1	Main Engines	2,000	0.50	15	3,038,000	15	877	230.9	3,464,082	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		1	Auxiliaries	200	0.60	24					665,104	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Tow Tug	2	Propulsion	4,500	0.80	15					24,941,391	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
		2	Auxiliaries	300	0.50	24					1,662,759	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Tender Tug	4	Propulsion	1,000	0.50	8					3,695,021	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		4	Auxiliaries	50	0.50	24					554,253	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Survey/Crewboat	1	Propulsion	400	0.60	14					775,954	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.60	24					166,276	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
NED: Segment 4 - Boggy Bayou to Sims Bayou (Station 676+53 to 850+00)																										
CW4_BB-GB_530 + Pt. of CD4_Whole TO: Beltway-8 Tract																										
PAPrep.	D6 Dozer	6	N/A	200	0.75	8	N/A	N/A	N/A	143.0	1,029,600	22%	78%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Dragline	4	N/A	600	0.75	8	N/A	N/A	N/A	124.0	1,785,600	22%	78%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
	Field Truck	2	N/A	180	0.75	8	N/A	N/A	N/A	124.0	267,840	22%	78%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
Dredging	24" Cutter Suction Dredge	1	Main Engines	4,200	0.52	14	2,920,000	14	1,020	204.5	6,252,235	22%	78%	0%	0%	0%	0%	0%	Marine	Dredge main - small	9.3	0.23	0.22	0.004	0.10	1.8
</																										



PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	% of work in year					Nonroad /		Emission factors, g/hp hr								
												1	2	3	4	5	6	Marine	Category	NOx	PM10	PM2.5	SOx	VOC	CO		
NED: Segment 4 - Bogy Bayou to Sims Bayou (Station 850+00 to 974+08)																											
Pt. of CD4_Whole TO: E2 Clinton																											
PAPrep.	D6 Dozer	6	N/A	200	0.75	8	N/A	N/A	N/A	78.0	561,600	100%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5		
	Dragline	4	N/A	600	0.75	8	N/A	N/A	N/A	68.0	979,200	100%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5		
Dredging	Field Truck	2	N/A	130	0.75	8	N/A	N/A	N/A	68.0	106,080	100%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5		
	24" Cutter Suction Dredge	1	Main Engines	4,200	0.71	14	562,000	14	997	40.3	1,680,927	100%	0%	0%	0%	0%	0%	Marine	Dredge main - small	9.3	0.23	0.22	0.004	0.10	1.8		
	1 Auxiliaries	800	0.80	24						618,450	100%	0%	0%	0%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7		
	1 Ladder Pump	1,200	1.00	14						676,429	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5		
	1 Cutter & Swing	2,500	0.80	14						1,127,382	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5		
	3 Main Engines	4,000	0.70	14						4,735,005	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5		
24"-Booster	2 Auxiliaries	200	0.60	24						347,878	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5		
	2 Auxiliaries	200	0.60	24						135,286	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5		
Anchor Barge	1 Main Engines	2,000	0.50	11						442,900	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5		
	1 Auxiliaries	200	0.60	11						53,148	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5		
Tender Tug	4 Propulsion	600	0.50	22						1,062,960	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7		
	4 Auxiliaries	50	0.50	24						96,633	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7		
Tow Tug	1 Propulsion	4,500	0.80	8						1,159,593	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7		
	1 Auxiliaries	300	0.50	24						144,949	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7		
25ft Shallow Draft Workboat	2 Propulsion	450	0.50	12						217,424	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
	2 Auxiliaries	50	0.50	24						48,316	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
Crewboat	1 Propulsion	400	0.60	14						135,286	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
	1 Auxiliaries	50	0.50	24						24,158	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	70.7	63,597	100%	0%	0%	0%	0%	0%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5		
	Light Towers	2	N/A	8	0.50	18					10,176	100%	0%	0%	0%	0%	0%	0%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9	
	D6 Dozer	2	N/A	200	0.75	18					381,584	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Marsh Hoe	4	N/A	200	0.75	18					763,167	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	325 LR Excavator	2	N/A	170	0.75	18					324,346	100%	0%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
	Field Truck	1	N/A	180	0.50	18					114,475	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
Survey/Crewboat	1 Propulsion	200	0.60	14						118,715	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
	1 Auxiliaries	50	0.50	24						42,398	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
CONTRACT YEAR 02 - NED																											
LPP: Segment 1 - HSC (Station 073+934 to 042+000 +/-)																											
Pt. of CW1_Redfish-BSC_700 TO: San Leon/Dollar Reef Mitigation Sites																											
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.61	16	2,030,000	16	1,713	74.1	5,204,764	0%	100%	0%	0%	0%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8	
	1 Auxiliaries	1,000	0.80	24						1,422,067	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7	
	1 Ladder Pump	1,200	0.67	16						952,785	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
	1 Cutter & Swing	2,500	0.80	16						2,370,111	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
30"-Booster	2 Main Engines	5,000	0.70	16						8,295,388	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
	2 Auxiliaries	200	0.60	24						426,620	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
Anchor Barge	2 Auxiliaries	200	0.60	16						284,413	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	1 Main Engines	2,000	0.50	11						814,726	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
Spill Barge	1 Auxiliaries	200	0.60	11						97,767	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	1 Auxiliaries	150	0.60	16						106,655	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
Tender Tug	4 Propulsion	600	0.50	22						1,955,342	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
	4 Auxiliaries	50	0.50	24						177,758	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
Tow Tug	1 Propulsion	4,500	0.80	8						2,133,100	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7	
	1 Auxiliaries	300	0.50	24						266,637	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
25ft Shallow Draft Workboat	2 Propulsion	450	0.50	12						399,956	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	2 Auxiliaries	50	0.50	24						88,879	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Crewboat	1 Propulsion	400	0.60	14						248,862	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	1 Auxiliaries	50	0.50	24						44,440	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Survey/Crewboat	1 Propulsion	200	0.60	14						124,431	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	1 Auxiliaries	50	0.50	24						44,440	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Cutlch Mt.Install	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	186.0	386,880	0%	100%	0%	0%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
	Work Tug	1	Main Power	1,000	0.65	8					967,200	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
Survey/Crewboat	1 Propulsion	200	0.60	8						178,560	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	1 Auxiliaries	50	0.50	8						37,200	0%	100%	0%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
LPP: Segment 1 - HSC (Station 042+000 +/- to 028+605)																											
Pt. of CW1_Redfish-BSC_700 TO: Bird Island Marsh																											
Dredging</																											





PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	1	2	% of work in year					Nonroad /		Emission factors, g/hp hr						
														3	4	5	6	Marine	Category	NOx	PM10	PM2.5	SOx	VOC	CO		
Rock S.Pinstall	Barge Mounted Crane	2	Main Power	400	0.65	8	N/A	N/A	N/A	30.0	124,800	0%	86%	14%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5	
	325 LR Excavator	2	N/A	170	0.75	8					61,200	0%	86%	14%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
	Work Tug	1	Main Power	1,000	0.65	8					156,000	0%	86%	14%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
	Survey/Crewboat	1	Propulsion	200	0.60	8					28,800	0%	86%	14%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.50	8					6,000	0%	86%	14%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Culch S.Pinstall	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	25.0	52,000	0%	86%	14%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5	
	Work Tug	1	Main Power	1,000	0.65	8					130,000	0%	86%	14%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
	Survey/Crewboat	1	Propulsion	200	0.60	8					24,000	0%	86%	14%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	1	Auxiliaries	50	0.50	8					5,000	0%	86%	14%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8		
LPP: Segment 2 - BSC (Station 25+58 to 221+00)																											
Pt. of CW1_Redfish-BSC_700											TO: Bird Island Marsh																
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.54	16	2,108,000	16	1,258	104.7	6,515,027	0%	50%	50%	0%	0%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8	
		1	Auxiliaries	1,000	0.80	24					2,010,811	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7
		1	Ladder Pump	1,200	0.58	16					1,166,270	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
	30"-Booster	1	Cutter & Swing	2,500	0.80	16					3,351,351	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		3	Main Engines	5,000	0.66	16					16,589,189	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
		3	Auxiliaries	200	0.60	24					904,865	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Anchor Barge	2	Auxiliaries	200	0.60	16					402,162	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
		1	Main Engines	2,000	0.50	11					1,152,027	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
	Derrick Barge	1	Auxiliaries	200	0.60	11					138,243	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
		1	Main Engines	2,000	0.50	11					1,152,027	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5
	Spill Barge	1	Auxiliaries	150	0.60	16					150,811	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
		4	Propulsion	600	0.50	22					2,764,865	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
	Tender Tug	4	Auxiliaries	50	0.50	24					251,351	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
		1	Propulsion	4,500	0.80	8					3,016,216	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
25ft Shallow Draft Workboat	1	Auxiliaries	300	0.50	24					377,027	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	2	Propulsion	450	0.50	12					565,541	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Crewboat	2	Auxiliaries	50	0.50	24					125,676	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	1	Propulsion	400	0.60	14					351,892	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	1	Auxiliaries	50	0.50	24					62,838	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	120.0	108,000	0%	50%	50%	0%	0%	0%	0%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5	
		2	N/A	8	0.50	18					17,280	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9
	D6 Dozer	2	N/A	200	0.75	18					648,000	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Marsh Hoe	4	N/A	200	0.75	18					1,296,000	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	325 LR Excavator	2	N/A	170	0.75	18					550,800	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
	Field Truck	1	N/A	180	0.50	18					194,400	0%	50%	50%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Survey/Crewboat	1	Propulsion	200	0.60	14					201,600	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	24					72,000	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
	Rock S.Pinstall	Barge Mounted Crane	2	Main Power	400	0.65	8	N/A	N/A	N/A	20.0	83,200	0%	50%	50%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
		325 LR Excavator	2	N/A	170	0.75	8					40,800	0%	50%	50%	0%	0%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5
		Work Tug	1	Main Power	1,000	0.65	3					39,000	0%	50%	50%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		Survey/Crewboat	1	Propulsion	200	0.60	14					33,600	0%	50%	50%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
		1	Auxiliaries	50	0.50	24					12,000	0%	50%	50%	0%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8
	Culch S.Pinstall	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	17.0	35,360	0%	50%	50%	0%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5
		Work Tug	1	Main Power	1,000	0.65	3					33,150	0%	50%	50%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
Survey/Crewboat		1	Propulsion	200	0.60	14					28,560	0%	50%	50%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.50	24					10,200	0%	50%	50%	0%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
LPP: Segment 1 - Bolivar Roads to Redfish (Station 100+000 to 073+934)																											
Pt. of CW1_Bolivar-Redfish_700											TO: ODMDS																
Mechanical Dredging	Clamshell Dredge (21CY)	1	Main Engines	2,000	0.50	15	2,474,000	15	877	188.1	2,820,981	0%	86%	14%	0%	0%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Auxiliaries	200	0.60	24					541,628	0%	86%	14%	0%	0%	0%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5
	Tow Tug	2	Propulsion	4,500	0.80	15					20,311,060	0%	86%	14%	0%	0%	0%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7
		2	Auxiliaries	300	0.50	24					1,354,071	0%	86%	14%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Tender Tug	4	Propulsion	1,000	0.50	8					3,009,046	0%	86%	14%	0%	0%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7
		4	Auxiliaries	50	0.50	24					451,357	0%	86%	14%	0%	0%	0%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7
	Survey/Crewboat	1	Propulsion	400	0.60	14					631,90																



PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	1	2	% of work in year					Nonroad / Marine	Category	Emission factors, g/hp hr					
														3	4	5	6	NOx			PM10	PM2.5	SOx	VOC	CO	
Culch Mt.Install	Barge Mounted Crane	1	Main Power	400	0.65	8	N/A	N/A	N/A	9.0	18,720	0%	0%	100%	0%	0%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5	
	Work Tug	1	Main Power	1,000	0.65	8					46,800	0%	0%	100%	0%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
	Survey/Crewboat	1	Propulsion	200	0.60	8					8,640	0%	0%	100%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
			1	Auxiliaries	50	0.50	8				1,800	0%	0%	100%	0%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
Mechanical/Dredging	Clamshell Dredge (12CY)	1	Main Engines	1,750	0.50	15	N/A	N/A	N/A	22.2	291,270	0%	0%	86%	14%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Auxiliaries	200	0.60	24					63,913	0%	0%	86%	14%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Tow Tug	1	Propulsion	4,500	0.80	15					1,198,368	0%	0%	86%	14%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7	
		1	Auxiliaries	300	0.50	24					79,891	0%	0%	86%	14%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	Tender Tug	2	Propulsion	1,000	0.50	8					177,536	0%	0%	86%	14%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
		2	Auxiliaries	50	0.50	24					26,630	0%	0%	86%	14%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	Survey/Crewboat	1	Propulsion	400	0.60	14					74,565	0%	0%	86%	14%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.60	24					15,978	0%	0%	86%	14%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
LPP: Segment 1 - HSC (Station 028+605 to -3.94)		TO: M11 & M789																								
Pt. of CW1_BSC-BCC_700																										
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.56	16	3,800,000	16	1,463	162.3	10,472,727	0%	0%	0%	100%	0%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8	
		1	Auxiliaries	1,000	0.80	24					3,116,883	0%	0%	0%	100%	0%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7	
		1	Ladder Pump	1,200	0.67	16					2,088,312	0%	0%	0%	100%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Cutter & Swing	2,500	0.80	16					5,194,805	0%	0%	0%	100%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
	30"-Booster	1	Main Engines	5000	0.72	16					9,350,649	0%	0%	0%	100%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Auxiliaries	200	0.6	24					467,532	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Anchor Barge	2	Auxiliaries	200	0.6	16					623,377	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Derrick Barge	1	Main Engines	2000	0.5	11					1,785,714	0%	0%	0%	100%	0%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Auxiliaries	200	0.6	11					214,286	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Spill Barge	1	Auxiliaries	150	0.6	16					233,766	0%	0%	0%	100%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
	Tender Tug	4	Propulsion	600	0.5	22					4,285,714	0%	0%	0%	100%	0%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
		4	Auxiliaries	50	0.5	24					389,610	0%	0%	0%	100%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	Tow Tug	1	Propulsion	4,500	0.80	8					4,675,325	0%	0%	0%	100%	0%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7	
		1	Auxiliaries	300	0.5	24					584,416	0%	0%	0%	100%	0%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	25ft Shallow Draft Workboat	2	Propulsion	450	0.5	12					876,623	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		2	Auxiliaries	50	0.5	24					194,805	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	Crewboat	1	Propulsion	400	0.6	14					545,455	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.5	24					97,403	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	223.1	200,824	0%	0%	0%	100%	0%	0%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5
	Light Towers	2	N/A	8	0.50	18					32,132	0%	0%	0%	100%	0%	0%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9	
	D6 Dozer	2	N/A	200	0.75	18					1,204,943	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Marsh Hoe	4	N/A	200	0.75	18					2,409,887	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	325 LR Excavator	2	N/A	170	0.75	18					1,024,202	0%	0%	0%	100%	0%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
	Field Truck	1	N/A	180	0.50	18					361,483	0%	0%	0%	100%	0%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Survey/Crewboat	1	Propulsion	200	0.60	14					374,871	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		1	Auxiliaries	50	0.50	24					133,883	0%	0%	0%	100%	0%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
LPP: Segment 1 - HSC (Station 028+605 to -3.94)		TO: BSC Sed. Attn. Feature																								
Pt. of CW1_BSC-BCC_700																										
Dredging	30" Cutter Suction Dredge	1	Main Engines	7,200	0.60	16	1,541,000	16	1,588	60.7	4,192,141	0%	0%	0%	25%	75%	0%	Marine	Dredge main - large	9.3	0.23	0.22	0.004	0.10	1.8	
		1	Auxiliaries	1,000	0.80	24					1,164,484	0%	0%	0%	25%	75%	0%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7	
		1	Ladder Pump	1,200	0.67	16					780,204	0%	0%	0%	25%	75%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Cutter & Swing	2,500	0.80	16					1,940,806	0%	0%	0%	25%	75%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
	30"-Booster	1	Main Engines	5000	0.7	16					3,396,411	0%	0%	0%	25%	75%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Auxiliaries	200	0.6	24					174,673	0%	0%	0%	25%	75%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Anchor Barge	2	Auxiliaries	200	0.6	16					232,897	0%	0%	0%	25%	75%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Derrick Barge	1	Main Engines	2000	0.5	11					667,152	0%	0%	0%	25%	75%	0%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5	
		1	Auxiliaries	200	0.6	11					80,058	0%	0%	0%	25%	75%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5	
	Spill Barge	1	Auxiliaries	150	0.6	16					87,336	0%	0%	0%	25%	75%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5	
	Tender Tug	4	Propulsion	600	0.5	22					1,601,165	0%	0%	0%	25%	75%	0%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7	
		4	Auxiliaries	50	0.5	24					145,560	0%	0%	0%	25%	75%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	Tow Tug	1	Propulsion	4,500	0.80	8					1,746,725	0%	0%	0%	25%	75%	0%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7	
		1	Auxiliaries	300	0.5	24					218,341	0%	0%	0%	25%	75%	0%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7	
	25ft Shallow Draft Workboat	2	Propulsion	450	0.5	12					327,511	0%	0%	0%	25%	75%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
		2	Auxiliaries	50	0.5	24					72,780	0%	0%	0%	25%	75%	0%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8	
	Crewboat	1	Propulsion	400	0.6	14					203,785	0%	0%													



PART	EQUIPMENT	QTY.	SUB-PART	HP	%USED	HR/DAY	CY	PROD. HRS.	CY/HR	OPER.DAYS	hp hrs	% of work in year					Nonroad /		Emission factors, g/hp hr															
												1	2	3	4	5	6	Marine	Category	NOx	PM10	PM2.5	SOx	VOC	CO									
	24"-Booster	2	Main Engines	4,000	0.68	14					960,588	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		2	Auxillaries	200	0.60	24					72,650	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Anchor Barge	2	Auxillaries	200	0.60	14					42,379	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Derrick Barge	1	Main Engines	2,000	0.50	11					138,740	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		1	Auxillaries	200	0.60	11					16,649	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Tender Tug	4	Propulsion	600	0.50	22					332,977	0%	0%	0%	0%	50%	50%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7									
		4	Auxillaries	50	0.50	24					30,271	0%	0%	0%	0%	50%	50%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7									
	Tow Tug	1	Propulsion	4,500	0.80	8					363,248	0%	0%	0%	0%	50%	50%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7									
		1	Auxillaries	300	0.50	24					45,406	0%	0%	0%	0%	50%	50%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7									
	25ft Shallow Draft Workboat	2	Propulsion	450	0.50	12					68,109	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		2	Auxillaries	50	0.50	24					15,135	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
	Crewboat	1	Propulsion	400	0.60	14					42,379	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		1	Auxillaries	50	0.50	24					7,568	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
	Survey/Crewboat	1	Propulsion	200	0.60	14					21,189	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		1	Auxillaries	50	0.50	24					7,568	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	12.6	11,351	0%	0%	0%	0%	50%	50%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5									
	Light Towers	2	N/A	8	0.50	18					1,816	0%	0%	0%	0%	50%	50%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9									
	D6 Dozer	2	N/A	200	0.75	18					68,109	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Marsh Hoe	4	N/A	200	0.75	18					136,218	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	325 LR Excavator	2	N/A	170	0.75	18					57,893	0%	0%	0%	0%	50%	50%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5									
	Field Truck	1	N/A	180	0.50	18					20,433	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
NED: Segment 6 - 610 Bridge to Main Turning Basin (Station 1160+62 to 1266+49)																																		
Pt. of CD6_Whole + TB6_1 Pt. of CD6_Whole + TB6_Brad TO: Glendale PA																																		
PAPrep.	D6 Dozer	6	N/A	200	0.75	8	N/A	N/A	N/A	N/A	76.0	547,200	0%	0%	0%	0%	100%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5								
	Dragline	4	N/A	600	0.75	8	N/A	N/A	N/A	N/A	62.0	892,800	0%	0%	0%	0%	100%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5								
	Field Truck	2	N/A	130	0.75	8	N/A	N/A	N/A	N/A	62.0	96,720	0%	0%	0%	0%	100%	0%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5								
Dredging	24" Cutter Suction Dredge	1	Main Engines	4,200	0.71	14	733,529	14	997	52.6	2,193,965	0%	0%	0%	0%	50%	50%	Marine	Dredge main - small	9.3	0.23	0.22	0.004	0.10	1.8									
		1	Auxillaries	800	0.80	24					807,208	0%	0%	0%	0%	50%	50%	Marine	Dredge aux	7.3	0.23	0.22	0.004	0.10	1.7									
		1	Ladder Pump	1,200	1.00	14					882,883	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		1	Cutter & Swing	2,500	0.80	14					1,471,472	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
	24"-Booster	2	Main Engines	4,000	0.68	14					4,002,405	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		2	Auxillaries	200	0.60	24					302,703	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Anchor Barge	2	Auxillaries	200	0.60	14					176,577	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Derrick Barge	1	Main Engines	2,000	0.50	11					578,078	0%	0%	0%	0%	50%	50%	Nonroad	>750	6.9	0.40	0.39	0.005	1.00	8.5									
		1	Auxillaries	200	0.60	11					69,369	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Tender Tug	4	Propulsion	600	0.50	22					1,387,388	0%	0%	0%	0%	50%	50%	Marine	Tug main - small	8.7	0.23	0.22	0.004	0.10	1.7									
		4	Auxillaries	50	0.50	24					126,126	0%	0%	0%	0%	50%	50%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7									
	Tow Tug	1	Propulsion	4,500	0.80	8					5,113,514	0%	0%	0%	0%	50%	50%	Marine	Tug main - large	8.7	0.23	0.22	0.004	0.10	1.7									
		1	Auxillaries	300	0.50	24					189,189	0%	0%	0%	0%	50%	50%	Marine	Tug aux	7.3	0.23	0.22	0.004	0.10	1.7									
	25ft Shallow Draft Workboat	2	Propulsion	450	0.50	12					283,784	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		2	Auxillaries	50	0.50	24					63,063	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
	Crewboat	1	Propulsion	400	0.60	14					176,577	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		1	Auxillaries	50	0.50	24					31,532	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
	Survey/Crewboat	1	Propulsion	200	0.60	14					88,288	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
		1	Auxillaries	50	0.50	24					31,532	0%	0%	0%	0%	50%	50%	Marine	Miscellaneous	9.1	0.23	0.22	0.004	0.11	1.8									
Shaping & Grading	400A Welder	2	N/A	50	0.50	18	N/A	N/A	N/A	N/A	83.0	74,657	0%	0%	0%	0%	50%	50%	Nonroad	(50 ≤ hp < 100)	6.9	0.60	0.58	0.005	1.00	8.5								
	Light Towers	2	N/A	8	0.50	18					11,945	0%	0%	0%	0%	50%	50%	Nonroad	(11 ≤ hp < 25)	7.1	0.60	0.58	0.005	1.00	4.9									
	D6 Dozer	2	N/A	200	0.75	18					447,944	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	Marsh Hoe	4	N/A	200	0.75	18					895,888	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
	325 LR Excavator	2	N/A	170	0.75	18					380,752	0%	0%	0%	0%	50%	50%	Nonroad	100 ≤ hp < 175	6.9	0.60	0.58	0.005	1.00	8.5									
	Field Truck	1	N/A	180	0.50	18					134,383	0%	0%	0%	0%	50%	50%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5									
NED: Segment 6 - 610 Bridge to Main Turning Basin (Station 00+00 to 30+95)																																		
Pt. of CD6_Whole TO: Filterbed PA																																		
PAPrep.	D6 Dozer	6	N/A	200	0.75	8	N/A	N/A	N/A	N/A	47.0	338,400	0%	0%	0%	0%	100%	0%	Nonroad	175 ≤ hp < 300	6.9	0.40	0.39	0.005	1.00	8.5								
	Dragline	4	N/A	600	0.75	8	N/A	N/A	N/A	N/A	36.0	518,400	0%	0%	0%	0%	100%	0%	Nonroad	300 ≤ hp < 600	6.9	0.40	0.39	0.005	1.00	8.5								
	Field Truck	2	N/A	130	0.75	8	N/A	N/A	N/A	N/A	36.0	56,160	0%	0%	0%	0%	100																	



**Attachment B**

**TCEQ Letter of Agreement**



Jon Niermann, *Chairman*  
Emily Lindley, *Commissioner*  
Bobby Janecka, *Commissioner*  
Toby Baker, *Executive Director*



## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

December 6, 2019

Colonel Timothy Vail  
Commander and District Engineer  
USACE Galveston District  
P.O. Box 1229  
Galveston, TX 77553-1229

Subject: Agreement on General Conformity Determination Plan

Dear Colonel Vail:

A *Draft General Conformity Determination for Houston Ship Channel Expansion Channel Improvement Project* (draft determination) was received by the Texas Commission on Environmental Quality (TCEQ) from the United States Army Corps of Engineers (USACE) for review and concurrence. The draft determination concerns a proposed project to deepen and widen the Houston Ship Channel to allow greater access for large ocean-going vessels and would take place in Chambers, Galveston, and Harris Counties. As discussed in more detail below, the TCEQ agrees with the USACE's revised path forward to budget and plan for the use of emissions offsets with discrete emissions reduction credits (DERC) in combination with other available compliance tools and strategies to assure CAA compliance.

TCEQ staff reviewed the draft determination and found that projected nitrogen oxides (NO<sub>x</sub>) emissions for each year of the project and the projected volatile organic compounds (VOC) emissions for the second year of the project would result in a level of emissions which, together with all other emissions in the nonattainment area, would exceed the emissions budgets in the applicable state implementation plan (SIP) revision,<sup>1</sup> the *Houston-Galveston-Brazoria Reasonable Further Progress State Implementation Plan Revision for the 2008 Eight-Hour Ozone Standard Nonattainment Area*. Comparison of project emissions to emissions budgets in the applicable SIP revision is only one of the means of determining general conformity under 40 CFR §93.158, and the TCEQ discussed with the USACE, the Port of Houston Authority (the non-federal project sponsor), and the United States Environmental Protection Agency other available means of determining general conformity provided for in the federal general conformity regulations. Other methods for demonstrating conformity that were considered included a commitment from the TCEQ to include the project in an upcoming SIP revision, the USACE implementing mitigation measures, the USACE implementing an emission offset strategy in the nonattainment area, or using a combination of these methods.

On December 3, 2019, the USACE confirmed its intent to implement an emissions offset strategy that relies on the purchase of DERCs in an amount equal to the latest and most conservative project emissions estimates.<sup>2</sup> The USACE determined that purchasing DERCs to offset the proposed Houston Ship Channel expansion project is the most cost-effective means

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<sup>1</sup> As required by 40 CFR §93.158(a)(5)(i)(A)

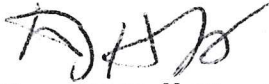
<sup>2</sup> Table 2-2: *Estimated Tier 1 Emissions from LPP, tons per year* of the November 2019 draft of the USACE general conformity determination bases projected project emissions on the use of Tier 1 equipment; however, the TCEQ acknowledges that the use of cleaner equipment may reduce project emissions and the associated necessary offsets. The TCEQ understands that the USACE will apprise the TCEQ of changes in project emissions as the proposed project is finalized.

Colonel Vail  
December 6, 2019  
Page 2

of determining general conformity, and the TCEQ agrees that this path is one by which this proposed project may successfully meet federal general conformity requirements. On December 5, 2019, the TCEQ received and is currently reviewing a second revised draft determination from the USACE that includes a description of its emissions offset strategy that relies on the purchase of DERs. The TCEQ understands that offsetting project emissions is the most likely path for a general conformity determination. However, further discussions with USACE and the Port of Houston Authority may determine that other methods could be used to comply with general conformity regulations and that a revision to the conformity determination would be sought, if needed. The TCEQ expects to be able to provide a letter of concurrence on the revised draft determination by December 20, 2019.

The TCEQ acknowledges that completion of the proposed project has potential emissions reduction benefits associated with reducing transportation delays in the Houston Ship Channel. The TCEQ understands that the USACE is the approving federal agency for this proposed project and will ensure compliance with the National Environmental Policy Act and the Federal Clean Air Act general conformity requirements, and the TCEQ looks forward to further assisting the USACE as it pursues its current path to general conformity approval. Please contact Ms. Jamie Zech of Air Quality Division staff at 512-239-3935 or [jamie.zech@tceq.texas.gov](mailto:jamie.zech@tceq.texas.gov).

Sincerely,



Donna F. Huff, Director  
Air Quality Division

cc: Roger Guenther, Port of Houston Authority  
David Garcia, Air and Radiation Division Director, EPA Region 6

**Attachment C**

**NFS Letter of Commitment for  
DERC Acquisition**



**PORT HOUSTON**  
THE INTERNATIONAL PORT OF TEXAS™

December 4, 2019

Mr. Toby Baker  
Executive Director  
Texas Commission on Environmental Quality  
P.O. Box 13087  
Austin, TX 78711-3087

Dear Mr. Baker:

On Tuesday, November 26, 2019, the Port of Houston Authority (Port Houston) and the U.S. Army Corps of Engineers (USACE) learned that the Texas Commission on Environmental Quality (TCEQ) is unable to provide a positive General Conformity Determination — without additional actions being taken — for the Houston Ship Channel Expansion Channel Improvement Project (HSC-ECIP). To meet Port Houston's top priority of bringing this nationally significant project to reality, we are committed to working with the TCEQ to address any remaining General Conformity actions.

Since 2010, Port Houston has partnered with members of Congress, the USACE, private industry stakeholders, and state and federal resource agencies to develop a feasibility report for necessary and critical improvements to the 52-mile Houston Ship Channel. The improvements first being considered nearly a decade ago have become more urgent with new economic realities and rapid growth in Texas and the United States. The Houston region is the epicenter of midstream energy production and massive petrochemical manufacturing investments, resulting in more jobs and increased exports. Imports are also growing due to distribution center investments and the growing Texas population. Finally, the global maritime industry is experiencing growth in vessel size, providing greater efficiency, environmental benefits, and more cost-effective supply chains. As a result, critical improvements are necessary to the Houston Ship Channel to accommodate this growth, ensure safe and efficient two-way vessel traffic, and maintain its value for Texas and the nation.

The USACE feasibility study evaluating the proposed channel improvements is in its final stages and is expected to result in a Chief's Report to Congress, with recommendations on authorizing the project. It is critical that the Chief's Report be completed in time to be included in the Water Resources Development Act, or WRDA legislation, being developed by Congress for consideration in 2020.

To address the current General Conformity matters, several possible solutions have been identified, including the option of acquiring offsetting Discrete Emission Reduction Credits (DERCs) that are presently available in the marketplace. By this letter, and to maintain project schedule, **Port Houston is committed to ensure that adequate DERCs will be acquired before the ECIP related construction emissions occur to ensure compliance with the General Conformity regulations. Port Houston also understands that if the USACE, the TCEQ and Port Houston identify an equally acceptable alternative in the future then that measure may be substituted for the purchasing of DERCs. With this commitment, Port Houston requests that the TCEQ issue a concurrence letter so that this much needed project can proceed in a timely manner.**

Thank you for your continued partnership. Please do not hesitate to contact me or my team if you have questions or need additional information.

Sincerely,



Roger Guenther

Cc: Donna Huff, Director of Air Quality Division - TCEQ  
Tonya Baer, Deputy Director of the Office of Air - TCEQ  
Colonel Timothy Vail, Commander and District Engineer Galveston District – USACE  
Richard Byrnes, Chief Infrastructure Officer – Port Houston

Jon Niermann, *Chairman*  
Emily Lindley, *Commissioner*  
Bobby Janecka, *Commissioner*  
Toby Baker, *Executive Director*



## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

December 10, 2019

Colonel Timothy Vail  
Commander and District Engineer  
USACE Galveston District  
P.O. Box 1229  
Galveston, TX 77553-1229

Subject: General Conformity Determination Concurrence

Dear Colonel Vail:

This letter concerns the Final General Conformity Determination for the Houston Ship Channel Expansion Channel Improvement Project in Harris, Chambers, and Galveston Counties, which was submitted by the United States Army Corps of Engineers (USACE) and received by the Texas Commission on Environmental Quality (TCEQ) on December 5, 2019. The TCEQ reviewed the determination in accordance with the general conformity requirements provided in Title 40 Code of Federal Regulations Part 93, Subpart B, and the TCEQ concurs that the proposed project meets general conformity requirements based on an emissions offsetting strategy.

The proposed project is located in the Houston-Galveston-Brazoria (HGB) ozone nonattainment area, which is currently classified by the United States Environmental Protection Agency (EPA) as serious for the 2008 eight-hour ozone National Ambient Air Quality Standard (NAAQS) and marginal for the 2015 eight-hour ozone NAAQS. A federal general conformity emissions threshold of 50 tons per year of ozone precursors (nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC)) applies according to the higher, serious, classification. The USACE presented an emissions analysis<sup>1</sup> showing that project construction would occur over six years. In accordance with 40 CFR §93.153(b), for all project construction years, 2023 through 2028, general conformity analysis is required for NO<sub>x</sub> emissions, and general conformity analysis is required for VOC emissions for the second project construction year, 2024.

In consultation with the TCEQ and its non-federal project sponsor, the Port of Houston Authority, the USACE determined that general conformity requirements would be met for this project through implementation of an emissions offset strategy that relies on the purchase of discrete emissions reduction credits (DERC) in an amount equal to the current, most conservative project emissions estimates. The Port of Houston Authority, in a letter to the TCEQ dated December 4, 2019 (enclosed), committed to ensure the acquisition of adequate DERCS for this project to comply with general conformity requirements. The TCEQ, in a letter to the USACE dated December 6, 2019 (enclosed), affirmed that an offsetting strategy that relied on the purchase and retirement of DERCS could meet general conformity requirements. After review of the USACE's final conformity determination, the TCEQ concurs that the project would meet federal general conformity requirements in accordance with 40 CFR §93.158(a)(2).

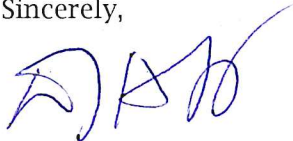
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<sup>1</sup> See Table 2-2: *Estimated Tier 1 Emissions from LPP, tons per year* of the USACE general conformity determination.

Colonel Vail  
December 10, 2019  
Page 2

The TCEQ understands that the USACE's conservative emissions estimates are based on the use of Tier 1 equipment and that the use of cleaner equipment (Tier 2 and Tier 3) may lower projected emissions and, subsequently, the amount of DERCs required to offset emissions. The TCEQ also understands that further discussions with USACE and the Port of Houston Authority may determine that other methods could be used to comply with general conformity regulations, in which case, general conformity would be re-evaluated. The TCEQ appreciates appropriate updates as this project progresses. For assistance on this matter, please contact Jamie Zech at 512-239-3935 or [jamie.zech@tceq.texas.gov](mailto:jamie.zech@tceq.texas.gov).

Sincerely,



Donna F. Huff, Director  
Air Quality Division

Enclosures

cc: Roger Guenther, Port of Houston Authority  
David Garcia, Air and Radiation Division Director, EPA Region 6



**PORT HOUSTON**  
THE INTERNATIONAL PORT OF TEXAS™

December 4, 2019

Mr. Toby Baker  
Executive Director  
Texas Commission on Environmental Quality  
P.O. Box 13087  
Austin, TX 78711-3087

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The USACE feasibility study evaluating the proposed channel improvements is in its final stages and is expected to result in a Chief's Report to Congress, with recommendations on authorizing the project. It is critical that the Chief's Report be completed in time to be included in the Water Resources Development Act, or WRDA legislation, being developed by Congress for consideration in 2020.



To address the current General Conformity matters, several possible solutions have been identified, including the option of acquiring offsetting Discrete Emission Reduction Credits (DERCs) that are presently available in the marketplace. By this letter, and to maintain project schedule, **Port Houston is committed to ensure that adequate DERCs will be acquired before the ECIP related construction emissions occur to ensure compliance with the General Conformity regulations. Port Houston also understands that if the USACE, the TCEQ and Port Houston identify an equally acceptable alternative in the future then that measure may be substituted for the purchasing of DERCs. With this commitment, Port Houston requests that the TCEQ issue a concurrence letter so that this much needed project can proceed in a timely manner.**

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Sincerely,



Roger Guenther

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Colonel Timothy Vail, Commander and District Engineer Galveston District – USACE  
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## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

December 6, 2019

Colonel Timothy Vail  
Commander and District Engineer  
USACE Galveston District  
P.O. Box 1229  
Galveston, TX 77553-1229

Subject: Agreement on General Conformity Determination Plan

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<sup>1</sup> As required by 40 CFR §93.158(a)(5)(i)(A)

<sup>2</sup> Table 2-2: *Estimated Tier 1 Emissions from LPP, tons per year* of the November 2019 draft of the USACE general conformity determination bases projected project emissions on the use of Tier 1 equipment; however, the TCEQ acknowledges that the use of cleaner equipment may reduce project emissions and the associated necessary offsets. The TCEQ understands that the USACE will apprise the TCEQ of changes in project emissions as the proposed project is finalized.

Colonel Vail  
December 6, 2019  
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of determining general conformity, and the TCEQ agrees that this path is one by which this proposed project may successfully meet federal general conformity requirements. On December 5, 2019, the TCEQ received and is currently reviewing a second revised draft determination from the USACE that includes a description of its emissions offset strategy that relies on the purchase of DERs. The TCEQ understands that offsetting project emissions is the most likely path for a general conformity determination. However, further discussions with USACE and the Port of Houston Authority may determine that other methods could be used to comply with general conformity regulations and that a revision to the conformity determination would be sought, if needed. The TCEQ expects to be able to provide a letter of concurrence on the revised draft determination by December 20, 2019.

The TCEQ acknowledges that completion of the proposed project has potential emissions reduction benefits associated with reducing transportation delays in the Houston Ship Channel. The TCEQ understands that the USACE is the approving federal agency for this proposed project and will ensure compliance with the National Environmental Policy Act and the Federal Clean Air Act general conformity requirements, and the TCEQ looks forward to further assisting the USACE as it pursues its current path to general conformity approval. Please contact Ms. Jamie Zech of Air Quality Division staff at 512-239-3935 or [jamie.zech@tceq.texas.gov](mailto:jamie.zech@tceq.texas.gov).

Sincerely,



Donna F. Huff, Director  
Air Quality Division

cc: Roger Guenther, Port of Houston Authority  
David Garcia, Air and Radiation Division Director, EPA Region 6

NOTICE OF AVAILABILITY OF THE HOUSTON SHIP CHANNEL EXPANSION CHANNEL IMPROVEMENT PROJECT FINAL GENERAL CONFORMITY DETERMINATION Interested parties are hereby notified of and provided an opportunity to comment on the Final General Conformity Determination (FGCD), provided as Appendix J to the Integrated Feasibility Report-Environmental Impact Statement. In accordance with Title 40 of the Code of Federal Regulations, Chapter I, Subchapter C, Part 93, Section 93.156(b), notice is hereby provided that the FGCD contains a description of the proposed Federal action and the Federal agency's final conformity determination. The FGCD is available at <https://www.swg.usace.army.mil/Business-With-Us/Planning-Environmental-Branch/Documents-for-Public-Review/> Comments may be mailed or emailed to: GALVESTON DISTRICT, CORPS OF ENGINEERS, ATTN: DR. HARMON BROWN, P.O. BOX 1229 GALVESTON, TEXAS 77553 or [harmon.brown@usace.army.mil](mailto:harmon.brown@usace.army.mil) **Publish Dates:** 1/8/2020 1-1/22/2020