Appendix 2

Agency Coordination

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Note: This appendix will be populated with comment letters and other correspondence following the resource agency review period for the Draft EA. The available coordination correspondence for the TCEQ, THC and USFWS has been included.

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Texas Commission on Environmental Quality – Air Quality General Conformity

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DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

August 25, 2015

REPLY TO ATTENTION OF
Plan Formulation Section

Mr. Steve Hagle, P.E.
Deputy Director, Office of Air
Texas Commission on Environmental Quality
MC 122, P.O. Box 13087
Austin, TX 78711-3087

Dear Mr. Hagle:

The U.S. Army Corps of Engineers (USACE) is proposing a project to address the navigation deficiencies identified in the Houston Ship Channel (HSC) Project Deficiency Report (PDR). The USACE proposes to use a hydraulic pipeline dredge to modify the HSC by easing (widening) the existing Flare connecting the HSC to the Bayport Ship Channel (BSC) to a radius of 4,000 feet, and widening the HSC at the channel turn or bend just south of the Flare on the east side of the HSC by a maximum of 235 feet to provide a straighter navigation path up the Bay. Widening the HSC bend would impact the existing east side barge lanes. The barge lanes would be relocated to the east of the proposed HSC widening and consistent with the original design. The new work dredged material would be placed in existing dredged material placement area (PA) 14. The project site is located in Galveston Bay in Chambers County, Texas.

The USACE's implementation of the proposed project modifications would be a Federal action subject to general conformity regulations under Title 40 Code of Federal Regulations (CFR) Part 93, Subpart B. Since the project is located in the Houston-Galveston-Brazoria (HGB) area, which is classified as marginal nonattainment for ozone, and the Nitrogen Oxides (NO_x) emissions are estimated to be above the 100 tons-per-year *de minimis* threshold, a general conformity determination will be required.

Representatives of the Port of Houston Authority (PHA), the project non-federal sponsor, met with members of your staff on June 16, 2015, to provide information on the proposed project modifications and a preliminary estimate of the associated emissions for review. This letter is a follow up to that meeting and is being used to formally request concurrence from the Texas Commission on Environmental Quality (TCEQ) that these estimated emissions can be accommodated in the HGB State Implementation Plan (SIP).

The preliminary emissions estimate presented to you on June 16, 2015 has been revised and is enclosed along with an explanation of the emissions estimate methodology (reference "Documentation of Emissions Estimates for General Conformity"). The emissions from the project would occur in both Harris and Chambers counties and are estimated to be 04.7 tons of NO_x in 2016 and 4.2 tons of NO_x in 2017.

Volatile Organic Compound (VOC) emissions are estimated to be 12.4 tons in 2016, so general conformity will not be required for VOC. A breakdown of the estimated emissions is as follows:

Estimated Emissions from Proposed Project Construction (Tons Per Year)

Component of Work	2016		2017		Total	
	NO_x	VOCs	NO_x	VOCs	NO_x	VOCs
Dredging	186.3	7.4	0.0	0.0	186.3	7.4
Support Vessels	115.0	4.6	0.0	0.0	115.0	4.6
Placement Site Work	0.8	0.1	4.1	0.6	4.9	0.7
Employee Vehicles	0.2	0.04	0.1	0.01	0.3	0.05
Oyster Mitigation	2.4	0.2	0.0	0.0	2.4	0.2
Total	**304.7**	**12.4**	**4.2**	**0.6**	**308.9**	**13.0**

Although the NO_x emissions are above the 100 tons *de minimis* threshold, when compared the project emissions to the emissions inventories in the SIP for the HGB area, this project represents a very small percentage of the emissions inventories in the SIP. As a result, the USACE believes that this project can be accommodated in the SIP as allowed in 40 CFR 93.158(a)(5)(i)(A), which states that the State agency responsible for the SIP can make a determination that the emissions from the Federal action, together with all other emissions in the nonattainment area, would not exceed the emissions budgets specified in the applicable SIP.

For purposes of comparing the project emissions to the applicable SIP, the general conformity regulations require that the most recent U.S. Environmental Protection Agency (EPA) approved SIP is used. For the HGB area, this is the *2010 HGB Attainment Demonstration SIP Revision for 1997 Eight-Hour Ozone* adopted by TCEQ on March 10, 2010 and approved by EPA on January 2, 2014 for marine and non-road mobile sources, and the *2013 HGB MVEB Update SIP Revision for the 1997 Eight-Hour Ozone* adopted by TCEQ on April 23, 2013 and approved by EPA on January 2, 2014 for on-road mobile sources. The following table compares the project emissions to the applicable SIP inventory categories. Since the project construction phase is expected to encompass two calendar years, the table compares the higher year of project emissions against the SIP emissions inventories.

Comparison of Proposed Project Emissions to the SIP Emissions Budgets

				2018	
Project Activities	SIP Inventory Categories	Project NO_x Emissions		HGA SIP Emissions Budget (tpd)	% HGA SIP Emissions Budget (%)
		(tpy)	(tpd)		
Dredging Activities (dredge, support vessels)	Commercial Marine Vessels	302.3	0.83	39.24	2.1%
Land-side Activities (dredged material placement)	Construction and Mining	2.2	0.006	14.68	0.04%
On-road Activities (employee commuting)	On-road Mobile Sources	0.2	0.0005	103.34	0.0005%
	Overall Totals	**304.7**	**0.84**	**157.26**	**0.5%**

Overall, the proposed project construction average daily emissions of NO_x represent only 0.5% of emissions from marine, on-road, and construction sources modeled in the SIP for 2018. Emissions from the dredging equipment itself, plus support vessels, represents 2.1% of the commercial marine vessel emissions modeled in the SIP, while emissions from construction equipment represent only 0.04% on an average daily basis. These small percentages demonstrate that this proposed project can easily be accommodated into the SIP, since the NO_x emissions represent such a low percentage of the applicable SIP inventory categories.

Based on the emissions analysis presented in this letter, the USACE respectfully requests concurrence from the TCEQ per 40 CFR 93.158(a)(5)(i)(A). Please provide concurrence by written letter to Ms. Andrea Catanzaro, at the letterhead address.

If you have any questions, please contact Ms. Catanzaro at the letterhead address or by telephone at 409-766-6346. You may also email her at andrea.catanzaro@usace.army.mil if you prefer.

Sincerely,

Carolyn Murphy
Acting Chief, Plan Formulation Section
Regional Planning and Environmental Center

Enclosure

CF:
Mr. Byron D. Williams
Ms. Jamie Zech
Mr. Kenneth Gathright
Mr. Carl Sepulveda

Documentation of Emission Estimates for General Conformity
Houston Ship Channel (HSC) Project Deficiency Report (PDR) for the HSC Flare at the Bayport Ship Channel
DRAFT
22 July 2015

The U.S. Army Corps of Engineers (USACE) is proposing a project to address the navigation deficiencies identified in the Houston Ship Channel (HSC) Project Deficiency Report (PDR). Planning for these improvements has included the development of estimates of air emissions associated with the construction phase of the project, which will consist primarily of the dredging and associated work needed to make the improvements, and land-side work to place the dredged material in existing dredged material placement areas.

Emission estimates have been prepared for the dredging and associated activities in support of a Draft General Conformity Determination (GCD) that has been prepared in accordance with the General Conformity (GC) regulations promulgated in 40 CFR Part 93 (Determining Conformity of Federal Actions to State or Federal Implementation Plans). The determination evaluates and documents the GC-related air emissions that will result from the proposed project and documents that these emissions conform to the current State Implementation Plan (SIP) applicable to the Houston/Galveston/Brazoria (HGB) ozone non-attainment area.

The emission estimates used in these evaluations have been based on project-specific activity information and on emissions information drawn from published sources including the *2007 Goods Movement Air Emissions Inventory at the Port of Houston* (GMAEI) Starcrest 2009, and the emission estimating model MOVES2014.

General Conformity Evaluation for Construction Emissions

The information needed to estimate construction emissions for the proposed project includes the following:

- A description of the equipment that will be needed, in terms of type, horsepower, age, and other characteristics;
- Estimates of the operating time (e.g., hours per day, days per week, etc.) of each type of equipment during each phase or component of work;
- Emissions characteristics (emission factors) of each type of equipment;
- Emission calculation methods and equations.

Additionally, assumptions have been made regarding the number of employee commuting days to develop estimates of on-road emissions associated with the project.

Information related to the physical and operational characteristics of the equipment has been developed by the project engineers. The physical information includes the type of equipment (e.g., dredge, supporting tug boat, dozer), the type of engine on that

equipment (e.g., main engine, auxiliary engine) for equipment with more than one engine, the typical rated horsepower for the type of equipment and engine, and, for the dredge and booster pump, the average in-use load factor, which is the average percentage of full power at which the engine is typically operated. The load factors used for tugs and land-side equipment have been obtained from the GMAEI. A summary of the physical and operational characteristics is presented in Table 1 for equipment associated with the dredging and land-side dredged material management, and in Table 2 for equipment associated with the construction of oyster reef mitigation.

The emission factors have primarily been obtained from the harbor craft section of the GMAEI. This includes the marine vessels used in the construction of oyster reef mitigation for the project. The report lists emission factors for engines in various size and horsepower ranges, and three different "tier levels," which reflect emission standards effective when the engines were manufactured. Because the specific equipment to be used on the proposed project is not known, the engines are assumed to be Tier 1 engines, manufactured in approximately the 2000 to 2005 time frame. Emission factors for the land-side equipment (dozers and loaders) have been based on the Tier 1 emission standards for non-road diesel engines. This includes the similar equipment (e.g. excavators) used in the construction of oyster reef mitigation for the project. Emission factors for on-road vehicles used in employee commuting and oyster reef mitigation have been based on the emission estimating model MOVES2014. Employee vehicles are assumed to be a mix of gasoline passenger cars and light pickup trucks, while the pickup truck associated with oyster mitigation is assumed to be a light commercial pickup truck. Table 3 lists the emission factors used in developing the emission estimates.

Emissions from dredges, vessels, and land-side non-road equipment have been estimated using the basic equation:

$$E = \frac{hp \times LF \times hrs \times EF}{(453.59\ g/lb \times 2{,}000\ lb/ton)}$$

where:

E	=	emissions, tons per year
hp	=	rated horsepower of the engine
LF	=	load factor
hrs	=	hours of operation per year
EF	=	emission factor, grams per horsepower-hour
453.59 g/lb	=	conversion constant
2,000 lb/ton	=	conversion constant

As an example, a large tug used as a support vessel may have a main engine rated at 3,000 hp. The average load factor is estimated to be 69%, and it would be expected to operate on this project for 3,864 hours in a year. The Tier 1 emission factor for oxides of nitrogen (NO_x) for this engine is 7.3 g/hp-hr. The estimated emissions would be:

$$E = \frac{3{,}000\ hp \times 0.69 \times 3{,}864\ hrs/yr \times 7.3\ g/hp\text{-}hr}{(453.59\ g/lb \times 2{,}000\ lb/ton)} = 64.4\ tons/yr$$

Emissions from on-road vehicles used by employees while commuting to the job site have been estimated using the equation:

$$E = VMT \times EF / (453.59\ g/lb \times 2{,}000\ lb/ton)$$

where:

E	=	emissions, tons per year
VMT	=	vehicle miles of travel during the year
EF	=	emission factor, grams per mile of travel
453.59 g/lb	=	conversion constant
2,000 lb/ton	=	conversion constant

The VMT driven by employees has been calculated using the average commuting distance in the Houston area in 2010 (21.2 miles, one way) from the 2011 Urban Mobility Report prepared by the Texas Transportation Institute[1] and an estimate of the number of workers on each task and each work shift (a total of 55 workers over three shifts). With the assumption that the commuting employees would use a combination of gasoline fueled light duty cars and trucks, the average NO_x emission factor is 0.359 grams per mile (g/mile). An example of the commuting emission estimating method is as follows:

$$E = \frac{375{,}452\ miles/year \times 0.359\ g/mile}{(453.59\ g/lb \times 2{,}000\ lb/ton)} = 0.15\ tons/yr$$

Tables 4 and 5 present the emission estimates of NO_x and VOCs, respectively, developed using the methods discussed above. Subtotal and total rows may not exactly match the sums of individual line items due to the effects of rounding of values.

[1] Texas Transportation Institute, TTI's 2011 Urban Mobility Report. September 2011. Available at: http://tti.tamu.edu/documents/mobility-report-2011.pdf

Table 1: Summary of Equipment Physical and Operational Characteristics

Emission Source Description	Marine Engine Category[1]	Rated Horsepower (total)**	Load Factor	Daily Operating Hours	Weekly Operating Hours
Main Engines	Cat 2	7,200	65%	16	112
Ladder Pump	Cat 1	800	65%	16	112
Cutter & Swing	Cat 1	3,600	65%	16	112
Auxiliaries	Cat 1	2,400	60%	16	112
Subtotal hp		14,000			
Support Vessels					
Large Tug	Cat 2	3,000	69%	24	168
Large Tug	Cat 2	1,950	69%	12	84
Small Tug	Cat 1	800	69%	24	168
Crew Boat	Cat 1	800	50%	12	84
Survey Boat	Cat 1	800	50%	12	84
Subtotal hp		7,350			
Land-side Equipment					
Dozers (D6)/ Marsh Buggy*		150	59%	60	420
Loader (966)		170	59%	24	168

* 2 working 24 hrs/day, 1 working 12 hrs/day)

** Horsepower value is total installed for all pieces of equipment in listed category; some equipment types are singular engines while others are sum of multiple engines.

Table 2: Oyster Mitigation Equipment Characteristics

Emission Source Description	Quantity	Rated Horse-power	Load Factor	Daily Operating Hours	Days of Operation
Diesel off-road or marine engines					
CAT 385 excavator	2	530	59%	12	25
Work boat	2	90	59%	2	25
Tug - propulsion	2	250	69%	12	25
Tug - Auxiliary	1	110	20%	12	25
Gasoline on-road engine	**Quant.**	**mi/day**		**Days**	**Miles**
Pickup truck	1	50		25	1,250

Table 3: Emission Factors

Engine Type	Marine Engine Category[1]	NO_x EF	VOC EF	EF Units
Dredge main engine	Cat 2	7.3	0.37	g/hp-hr
Dredge ladder pump	Cat 1	7.3	0.20	g/hp-hr
Dredge cutter & swing	Cat 1	7.3	0.20	g/hp-hr
Dredge auxiliaries	Cat 1	7.3	0.20	g/hp-hr
Large tug	Cat 2	7.3	0.37	g/hp-hr
Small tug	Cat 1	7.3	0.20	g/hp-hr
Crew boat	Cat 1	7.3	0.20	g/hp-hr
Survey boat	Cat 1	7.3	0.20	g/hp-hr
Dozer/loader/excavator	Non-road	6.9	1.00	g/hp-hr
On-road car/light truck	On-road	0.359	0.082	g/mile
On-road pickup truck	On-road	0.509	0.086	g/mile

[1] Marine engine categories are based on the displacement of a single engine cylinder. Category 2 engines are typically larger in overall displacement than Category 1 engines.

Table 4: Project Construction NO_x Emission Estimates

Emission Source Description	Marine Engine Category	NO_x 2016 tpy	NO_x 2017 tpy	NO_x Total tpy
Main Engines	Cat 2	97.1	0.0	97.1
Ladder Pump	Cat 1	10.8	0.0	10.8
Cutter & Swing	Cat 1	48.6	0.0	48.6
Auxiliaries	Cat 1	29.9	0.0	29.9
Subtotal tons		186.3	0.0	186.3
Support Vessels				
Large Tug	Cat 2	64.4	0.0	64.4
Large Tug	Cat 2	20.9	0.0	20.9
Small Tug	Cat 1	17.2	0.0	17.2
Crew Boat	Cat 1	6.2	0.0	6.2
Survey Boat	Cat 1	6.2	0.0	6.2
Subtotal tons		115.0	0.0	115.0
Land-side Equipment				
Dozers (D6)/ Marsh Buggy		0.57	2.83	3.4
Loader (966)		0.26	1.28	1.5
Subtotal tons		0.8	4.1	4.9
Employee Vehicles	miles			
Dredge/support	375,452	0.15	0.00	0.1
Landside	195,888	0.03	0.05	0.1
Subtotal tons		0.2	0.1	0.2
Oyster Mitigation				
CAT 385 excavator		1.4	0.0	1.4
Work boat		0.04	0.0	0.04
Tug - propulsion		0.8	0.0	0.8
Tug - Auxiliary		0.1	0.0	0.1
Pickup truck		0.001	0.0	0.001
Subtotal tons		2.4	0.0	2.4
Total tons		**304.7**	**4.2**	**308.9**

Table 5: Project Construction VOC Emission Estimates

Emission Source Description	Marine Engine Category	VOCs 2016 tpy	VOCs 2017 tpy	VOCs Total tpy
Main Engines	Cat 2	4.9	0.0	4.9
Ladder Pump	Cat 1	0.3	0.0	0.3
Cutter & Swing	Cat 1	1.3	0.0	1.3
Auxiliaries	Cat 1	0.8	0.0	0.8
Subtotal tons		7.4	0.0	7.4
Support Vessels				
Large Tug	Cat 2	3.3	0.0	3.3
Large Tug	Cat 2	0.6	0.0	0.6
Small Tug	Cat 1	0.5	0.0	0.5
Crew Boat	Cat 1	0.2	0.0	0.2
Survey Boat	Cat 1	0.2	0.0	0.2
Subtotal tons		4.6	0.0	4.6
Land-side Equipment				
Dozers (D6)/ Marsh Buggy		0.08	0.41	0.49
Loader (966)		0.04	0.19	0.22
Subtotal tons		0.41	0.60	0.71
Employee Vehicles	miles			
Dredge/support	375,452	0.03	0.00	0.03
Landside	195,888	0.01	0.01	0.02
Subtotal tons		0.04	0.01	0.05
Oyster Mitigation				
CAT 385 excavator		0.21	0.0	0.19
Work boat		0.001	0.0	0.001
Tug - propulsion		0.023	0.0	0.013
Tug - Auxiliary		0.001	0.0	0.001
Pickup truck		0.0001	0.0	0.0001
Subtotal tons		0.23	0.0	0.20
Total tons		**12.4**	**0.6**	**13.0**

Texas Historical Commission & State Historical Preservation Officer - Cultural Resource Investigations

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DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

August 9, 2012

CESWG-PE

Mr. Mark Wolfe
State Historic Preservation Officer
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

Dear Mr. Wolfe:

The U.S. Army, Corps of Engineers, Galveston District (USACE) Staff Archeologist has reviewed the enclosed draft report entitled, *Remote-Sensing Survey along the Bayport and Houston Ship Channels and Assessment of Two Anomalies for Improvements to the Bayport Ship Channel Project, Chambers County, Texas,* prepared for the USACE by Southeastern Archaeological Research, Inc. (SEARCH), and dated July 2012 (Enclosed). As documented in the report, the marine remote sensing survey resulted in the identification of three magnetic anomalies (M1.6252, M2.6252, and M3.6252) that had characteristics similar to that of known shipwrecks. Diver investigations revealed that all three of the anomalies were modern debris. In addition, target #28/W5, previously identified HRA Gray & Pape in the report titled *Marine Archaeological Survey for the Proposed Bayport Ship Channel Improvement and Flare Projects, Harris and Chambers Counties, Texas,* was also investigated by divers and the source was identified as modern debris.

The USACE is requesting your concurrence with our determination that no Historic Properties are present within the proposed Bayport Ship Channel Improvement Project. Thank you for your cooperation in this review process. If you have any questions concerning our review or if we can be of further assistance, please contact Jerry Androy at 409-766-3821.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

CC w/o enclosures

PE-PR – Jerry Androy

CONCUR
by _____
for Mark Wolfe
State Historic Preservation Officer
Date 8/22/2012
Track# 20121217

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U.S. Fish and Wildlife Service – Draft Planning Aid Letter

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United States Department of the Interior
FISH AND WILDLIFE SERVICE

Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 FAX: 281/488-5882

November 29, 2012

Colonel Christopher Sallese
U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Dear Colonel Sallese:

This planning aid letter (PAL) serves to provide the United States (U.S.) Fish and Wildlife Service's (Service) comments and recommendations regarding the U.S. Army Corps of Engineers, Galveston District (Corps) Bayport Ship Channel (BSC) Improvements Project, located in Harris and Chambers Counties, Texas. The Corps has modified the alternatives outlined in the previous PAL, dated August 31, 2010, and anticipates permanent impacts to adjacent oyster reefs from the alternatives currently under consideration. The Preferred Alternative, outlined in this document and illustrated in Figure 1, is based in part on pilot questioners and a ship simulation study conducted by the Engineering Research and Development Center (ERDC). Construction of the Preferred Alternative will permanently impact approximately 44 acres of oyster reef, and the Corps proposes to mitigate for the permanent oyster reef impacts by constructing 44 acres of oyster pads in an undetermined location.

Through this planning aid letter, the Service describes existing fish and wildlife resources within the proposed project area; discusses the proposed alternatives; identifies potentially significant impacts; identifies modifications or alternatives which address fish and wildlife related problems, opportunities, or planning objectives; and recommends measures for resource protection early in the project planning process. Our comments are provided in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661-667(e)) and are intended to assist in the preparation of any further project assessments. This information does not represent a final report of the Secretary of the Interior within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act. A review of Service files indicates previous Service input to the study on January 7, 1993 (letter), December 4, 2002 (Supplemental Fish and Wildlife Coordination Act Report), and August 31, 2010 (PAL).

Alternatives under Consideration

No Action Alternative – Under this alternative there would be no improvements to the Bayport Flare and vessels would continue to require tug assistance to transition the turn between the Houston Ship Channel (

HSC) and the BSC. No oysters will be impacted as a result of this alternative.

Alternative 1 – This alternative would increase the existing 3,000-foot flare radius to a 4,000-foot radius combined with a 60-foot bend easing (channel widener) on the eastern side of the HSC at the location of the turn to align with Morgans Point Ranges. No deepening of the authorized channel depth would be performed. Direct impacts to oyster habitat are expected to total 26 acres as a result of this alternative.

Alternative 2 – This alternative would increase the existing 3,000-foot flare radius to a 4,000-foot radius combined with a 300-foot bend easing (channel widener) on the eastern side of the HSC at the location of the turn to align with Morgans Point Ranges. No deepening of the authorized channel depth would be performed. This alternative would directly impact 53 acres of oyster habitat.

Alternative 3 (Preferred Alternative) – This alternative would increase the existing 3,000-foot flare radius to a 4,000-foot radius combined with a 250-foot bend easing (channel widener) on the eastern side of the HSC at the location of the turn to align with Morgans Point Ranges. No deepening of the authorized channel depth would be performed (Figure 1). The preferred alternative is expected to impact 44 acres of oyster habitat.

Alternative 4 – This alternative would increase the existing 3,000-foot flare radius to a 5,375-foot radius. No bend easing/channel widening is proposed on the eastern side of the HSC at the location of the turn to align with Morgans Point Ranges. No deepening of the authorized channel depth would be performed. The Corps has indicated that 34 acres of oyster habitat would be impacted as a result of this alternative.

Alternative 5 – This alternative would increase the existing 3,000-foot flare radius to a 5,375-foot radius combined with a 300-foot bend easing (channel widener) on the eastern side of the HSC at the location of the turn to align with Morgans Point Ranges. No deepening of the authorized channel depth would be performed. Direct impacts to oyster habitat are expected to total 63 acres as a result of this alternative.

Alternative 6 – This alternative would increase the existing 3,000-foot flare radius to a 5,375-foot radius combined with a 250-foot bend easing (channel widener) on the eastern side of the HSC at the location of the turn to align with Morgans Point Ranges. No deepening of the authorized channel depth would be performed. This alternative would impact 54 acres of oyster habitat.

Should the Preferred Alternative be selected and subsequently constructed with a 250-foot channel widener, the existing barge lane on the eastern side of the HSC at the BSC would be removed. The barge lane is an element of the HSC and will be considered as part of the ongoing Navigation Study conducted by ERDC.

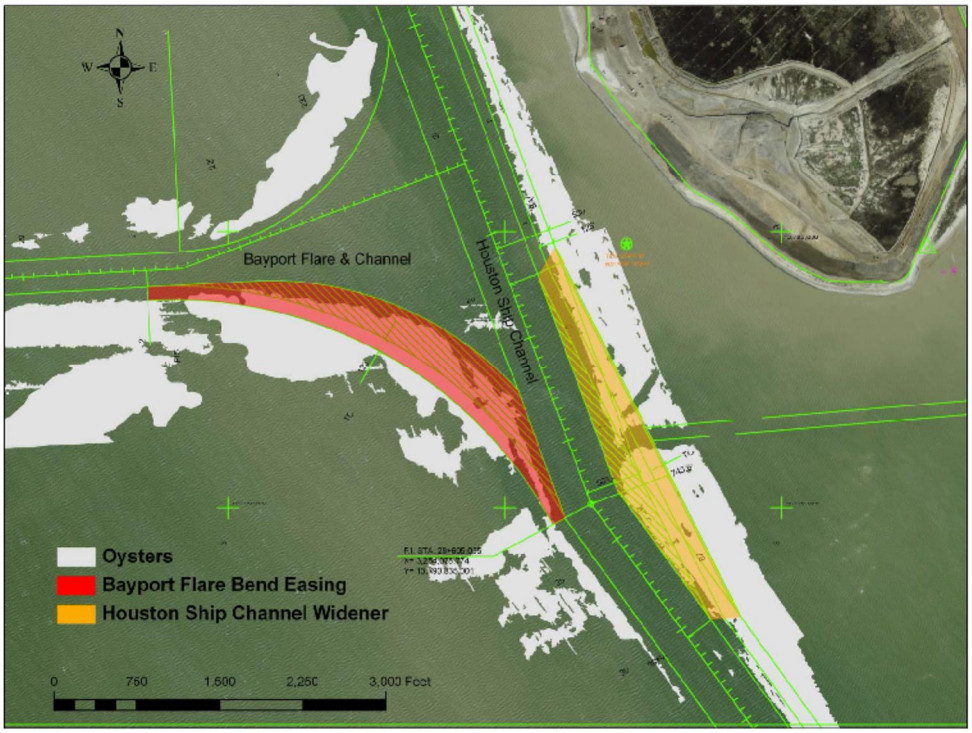

Figure 1: Preferred Alternative for Bayport Flare

Oysters Status and Importance

Previously mentioned Service (USFWS 1995) input extensively documents the life cycle and the ecological and commercial importance of oysters in Galveston Bay. Oyster reefs occur naturally throughout Galveston Bay and various studies conducted by Benefied and Hoffstetter (1976) and Powell et. al. (1994) document the presence of oyster habitat lining the ship channels in upper Galveston Bay. This may be due to the presence of spoil banks that create an artificially elevated environment and the presence of scattered shell hash, both of which may promote oyster settlement, refuge, and accumulation.

The complex oyster reef structures found in Galveston Bay provide increased nursery habitat and refuge for fish, invertebrates, and shellfish of commercial, recreational, and ecological importance. Likewise, oyster reefs provide shoreline stabilization and improve water quality by filtering suspended particles in the water column. Hoffstetter (1990) estimates filtering rates of oysters from five to 30 quarts of water per hour of feeding time thus significantly improving water quality throughout portions of Galveston Bay. While water quality in Galveston Bay continues to be a challenge and some portions of the Bay remain closed to oyster harvest due to harmful toxin levels, Galveston Bay supports the largest oyster production in the state.

The Texas Parks and Wildlife Department (TPWD) estimates that sediment from the 15-20 foot high storm surge from Hurricane Ike (2008) covered approximately half of the 16,000 acres of oyster reefs in Galveston Bay, thus significantly reducing the $60 million per year oyster industry. This devastating loss has spurred recent recovery efforts concentrating on reef restoration and new reef creation in Galveston and surrounding bays. During the four years since

Hurricane Ike, more than 100 acres of oyster reefs have been restored or created in Galveston Bay.

Oyster Reef Assessment

The Service's review of the proposed project and alternatives, historic oyster reef documentation, and discussions with TPWD biologists reveal historic subtidal longitudinal reefs along the HSC and BSC adjacent to the project area. Oyster habitat along both ship channels are severely scoured due to previous channel widening and deepening efforts and the majority of oysters from Atkinson Island, south, past Redfish Reef are dead; however, spat has been settling on the dead shell along the ship channel and key ridge reefs in Galveston Bay.

To verify existing and potential oyster habitat, the Corps' representatives performed a survey to map the oyster reefs impacted by the proposed dredge efforts associated with the Preferred Alternative. Side scan sonar data, a proven industry method and preferred survey approach by the TPWD, was obtained with the purpose of mapping areas of existing oyster reef or hard bottom substrates that would be suitable for oyster colonization. Post survey field checks were conducted with a ponar grab sampler to verify that the acoustic signatures found during the side scan sonar were reflective of actual bottom conditions. Independent contract divers, visually recorded the bay bottom conditions, presence of oyster reefs, and shell areas previously identified in the side scan sonar. These groundtruthing efforts provided validity of using side scan sonar data to delineate the hard bottom and oyster reef habitat.

Results of the groundtruthing work indicated that the first 500 feet (buffer) outside the immediate channel revealed a majority of hard-bottom signatures (shell hash and unconsolidated shell hash). Validation surveys were conducted at 48 points within the 500-foot buffer area which identified oyster habitat along the navigational channel borders characterized by moderate density shell hash (Class II and Class III) covered with intermittent oysters clusters (Habitat Class 2 and 3). Additionally, the buffer area was found to contain high sediment deposition (fine to medium sands with silts) which covered viable oyster clusters as well as areas of contiguous reef (Turner Collie & Braden, 2011). Also, the buffer area was found to have poor water visibility (less than 2 feet), have limited aquatic fauna, and be void of submerged aquatic vegetation.

Impacts

Direct Impacts

The August 31, 2010 PAL provides a detailed description of the project area and existing fish and wildlife habitats. All the previously described alternatives currently under consideration will permanently impact adjacent oyster habitat. The Corps has informally proposed to mitigate these damages at a ratio of 1:1 by creating oyster reef habitat at one of three sites within Galveston and/or Trinity Bays. However, functional assessment modeling efforts using the American Oyster Habitat Suitability Index model have not been undertaken and are not expected to be completed until 2013. Likewise, formal mitigation and monitoring plans will not be available for Service review until 2013.

Indirect Impacts

Should the Preferred Alternative be selected, a 250-foot bend easing on the eastern side of the HSC will be constructed using hydrologic dredging. In addition to direct oyster impacts resulting from this action, indirect impacts are predicted to occur and include disturbance to existing bay bottoms and resultant loss of marine benthic productivity, potential resuspension of chemical contaminants, siltation, and elevated turbidity levels during construction. Areas with high turbidity can restrict flow through oysters gills and interfere with respiration, filter feeding, and spawning activities.

Mitigation

Because of the significant ecological and commercial importance of oyster reefs to Galveston Bay, oyster reef creation and restoration have become a focus for state and federal natural resource agencies. Although a formal mitigation plan has not been submitted for Service review (anticipated next fiscal year), the Corps has coordinated with TPWD staff to identify three potential mitigation sites in Galveston and/or Trinity Bays based on water temperature, salinity, substrate conditions, water quality, previous existence of oyster reef, tidal range, and ease of construction access. The following is a list of potential mitigation sites that have been identified:

1. Fisher Reef Site –Four pads totaling 40 acres
2. San Leon Reef Site – Four pads totaling 40 acres
3. Levee Reef Site – Four pads totaling 40 acres

Each of the sites have a minimum depth of six feet (to allow for construction barge access), consist of existing oyster reef or hash, and contain adjacent silted-over bay bottom most likely caused by Hurricane Ike in 2008. The Corps anticipates placing 1-3 inches of rock (river stone or limestone) on the bay bottom to serve as substrate on which oyster larvae can attach.

Monitoring Plan

The Corps expects to submit a formal monitoring plan to the Service in 2013. However, through informal meetings, the Corps has indicated that the following monitoring protocol may be used pre- and post-restoration to assess the success of the project. Success criteria will include one structural and one functional endpoint and are defined as follows:

Structural endpoint - Includes the number of actual acres restored. Pre and post-restoration side scan sonar will be collected and processed in ArcGIS, and success would be determined by the increase of reef acreage by subtracting pre-restoration reef acreage from post-restoration reef acreage.

Functional endpoint -Is the oyster density (oysters per square meter [oysters/m^2]). Oyster density would be measured using scuba divers twice a year (pre- and post-oyster harvest season) for three years. Divers will sample random points along a transect line by placing 0.25 square meter quadrat on the bay bottom and placing all shells and live oysters from within the quadrat into a mesh bag. All live oysters will be enumerated and a maximum of ten individuals would be measured for shell length. Success is defined as post restoration

> density equal to or greater than densities observed during a pre-construction survey of a nearby control site to be identified by TPWD.

Monitoring efforts at other Corps' oyster reef mitigation sites in Galveston and Trinity Bays typically span three years post construction. Personal communications with Corps' representatives (Catanzaro, September 11, 2012) have indicated post construction monitoring will be consistent with previous monitoring efforts.

In an effort to assess any indirect impacts caused by dredging activities associated with the Preferred Alternative, Corps' representatives will employ methodologies from Powell et al. (1994), Benfield and Hofstetter (1976), to establish monitoring at random control site locations within the 500-foot buffer zone that includes shell hash and oyster reef habitat features with varying distances from the edge of the dredging activities. The Corps will monitor representative oyster shell hash and consolidated reefs outside of the buffer zone that are similar in density and consistency to sites located within the buffer zone for comparison. Monitoring will begin six months prior to and end six months following dredging activities.

Reporting

The results of all monitoring activities shall be summarized in an annual report and presented to the BUG for review. An initial report will be completed no more than 90 days post-construction detailing the restored reef acreage as determined by a side scan sonar. The subsequent three annual reports will include oyster density findings at restoration and control sites. Mitigation success is achieved once oyster density is identical to the reference site.

Summary and Recommendations

The Corps has re-evaluated the findings from the previous Modification of the Bayport Flare – Houston Ship Channel feasibility level investigation and determined that permanent oyster impacts will result from the seven alternatives now under consideration. The Corps anticipates 44 acres of direct oyster impacts by increasing the existing 3,000-foot flare radius to a 4,000-foot radius combined with a 250-foot bend easing on the eastern side of the HSC at the location of the turn to align with Morgan's Point (Preferred Alternative).

The Service believes the Preferred Alternative will have permanent impacts on fish and wildlife resources (oyster reef). Therefore, mitigation is recommended for permanent impacts to oyster reefs found within the Preferred Alternative footprint. In addition, the Service recommends that the Corps evaluate and provide compensatory mitigation for any indirect impacts associated with the proposed project. At this time, the Corps plans to mitigate direct oyster impacts at a ratio of 1:1 at one of three potential sites in Galveston or Trinity Bays. However, the Service recommends the Corps conduct functional assessment modeling efforts using the American Oyster Habitat Suitability Index model to assist in determining the appropriate amount of mitigation that is commensurate with both direct and indirect impacts.

The Service also recommends continued coordination with the BUG and TPWD to finalize the mitigation site selection once all alternatives and formal mitigation/monitoring plans have been fully evaluated. All mitigation and monitoring plans should be evaluated by the BUG prior to

the commencement of any dredging activities. In addition, any adaptive management of the mitigation sites should not begin without input of the BUG.

Monitoring efforts and associated reports should not be limited to oyster density, but should include oyster size, frequency, spat density, associated fauna, reef size, reef architecture, fragmentation, salinity, temperature, turbidity, and dissolved oxygen when conducting the twice-a-year assessment. These criteria should be evaluated at each mitigation and reference site. Summarized reports should be submitted annually to the BUG for review and comment and should continue as outlined in the formal monitoring plan; however the Service recommends a minimum of three years of monitoring.

Should the scope of the project change, impacts to fish and wildlife resources should be re-evaluated and coordination with the Service re-initiated. We appreciate the opportunity to participate in the planning of the BSC Improvement project. If you have any questions or comments concerning this planning aid letter, please contact staff biologist Donna Anderson at 281/286-8282.

Sincerely,

Edith Erfling
Field Supervisor

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