FREDERICK, PERALES, ALLMON & ROCKWELL*, P.C.
ATTORNEYS AT LAW
1206 San Antonio Street
Austin, Texas 78701
(512) 469-6000 / (512) 482-9346 (facsimile)
Info@LF-LawFirm.com

Of Counsel:
Richard Lowerre
*Brad Rockwell

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Corpus Christi Field Office
Regulatory Division, CESWG-RD-R
U.S. Army Corps of Engineers
5151 Flynn Parkway, Suite 306
Corpus Christi, Texas 78411-4318

SWG201900245@usace.army.mil

Ms. Bridget Bohac,
Chief Clerk, MC-105
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711

http://www14.tceq.texas.gov/epic/eComment/

Regarding: SWG-2019-00245, Comments and request for a public hearing on the application of the Port of Corpus Christi Authority to the U.S. Army Corps of Engineers and on the determination by the Texas Commission on Environmental Quality on the related Section 401 Certification

These comments and hearing requests are made on behalf of the Port Aransas Conservancy and its members, which members include many owners of property in Port Aransas, Texas including a number of individuals listed on the adjacent owners list for this application.

PCCA'S HARBOR ISLAND TERMINAL IS ONE COMPONENT OF A MUCH LARGER PROJECT

The Port of Corpus Christi Authority ("PCCA") and its partners[1] are attempting to recharacterize one large project as a set of separate projects. In fact, the proposed construction of two new

[1] The partnership is extensive, with what appears to be overlapping ownership and responsibilities. Axis Midstream Holdings, LLC, is controlled, if not owned, by Lawrence Berry, Marty Berry and Dennis Berry. The president of Axis Midstream Holdings, LLC, is Marty Berry. He is also President of Redfish Bay Terminal, Inc., which is part of the Berry Group. The Port of Corpus Christi Authority has signed a 50-year lease agreement with Lone Star Ports, LLC, to operate on Authority property a mirror terminal of

berths on Harbor Island is an integral part of PCCA's redevelopment project for Harbor Island, which includes a massive crude oil export project. That export project includes PCCA's proposals to deepen the Corpus Christi Ship Channel, to construct tank storage facilities on Harbor Island by Lone Star Ports, LLC., to use the pipelines and storage tanks proposed by Axis Midstream Holding, LLC. for transport of crude oil from the mainland to its new terminal, and that of PCCA, possibly a third terminal on property of Martin Midstream,[2] and other related activities.

The U.S. Army Corps of Engineers ("USACE") has, in the near-term past, acknowledged the interrelationship of these projects, which the applicants have only recently tried to separate. The USACE's letter of February 4, 2019 to the Port of Corpus Christi Authority documents this:

> Considering the interdependent nature of these activities in the context of the USACE's federal control and responsibility, and the fact that the location and configuration of all three of these projects require a Department of the Army permit, the USACE has concluded that the permit application does not represent a single and complete project. The single and complete project shall include the deepening of the channel, construction of the Harbor Island Terminal Facility, and the pipelines and facilities from Midway Tank Farm Facility in Taft, Texas to the Harbor Island Terminal Facility.

The USACE, Texas Commission on Environmental Quality ("TCEQ"), and the Texas Railroad Commission ("TRC") should reject the piecemeal approach proposed in these multiple applications[3] and consolidate the processing of all the applications. The Texas General Land Office, which issues leases for the use of state lands, the Texas Parks and Wildlife Department, the local governments, and the public should be allowed to evaluate the impacts of the entire project, at least those aspects clearly involved in the crude oil export project.

While individual components of this large project raise major concerns and, if handled separately, would each require a number of environmental impact statements, all components and the cumulative impacts of them should be subject to one full environmental impact

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the one that Axis claims plans to operate. Lone Star Ports is backed financially by the Carlyle Group and is apparently owned by Lawrence Berry, Dennis Berry and Marty Berry.

[2] See, for example, http://www.lonestarports.com/ which states, "Martin Midstream is also working with Lone Star Ports to establish an exclusive VLCC solution on Harbor Island."

[3] In addition to the application referenced above and PCCA's application to deepen the ship channel (SWG-2019-00067), Axis Midstream Holdings, LLC, has applied for its crude oil storage facilities and pipelines to supply its own terminal on Harbor Island. Additionally, Lone Star Ports, LLC. has applied to TCEQ for an air permit (No. 157150) for the release of contaminants from the facility that will serve to load ships at the new PCCA terminal facility. PCCA has applied to TCEQ for a discharge permit (TPDES Permit No. WQ0005253000) for a proposed desalination project to develop water supplies for industrial use, presumably the crude oil export project. As discussed below, the discharge equipment for that desalination facility will be a hazard to navigation for the crude oil export facility and other uses of the ship channel.

statement, and treated as USACE originally proposed for the project. Such an approach would assure efficiencies in the expenditures of resources by federal and state agencies, local government, and the public. Together, the magnitude of these multiple projects has the potential to disproportionally impact the marine environment in a way that is collectively much greater than the impacts of any one component alone.

The Port of Corpus Christi Authority's website still makes it clear that the applications that have been filed with the USACE by the Port of Corpus Christi Authority, Axis Midstream Holdings, LLC, and Lone Star Ports, LLC, are all part of Port of Corpus Christi Authority's crude oil export project and its Harbor Island Redevelopment Project. The web site for the Harbor Island Redevelopment Project[4] provides, among other admissions:

> Lone Star Ports, a customer of the Port of Corpus Christi Authority, and its partners are in the preliminary design phase for a liquid bulk dock terminal at Harbor Island to accommodate the demand for additional crude export capacity associated with the development of new pipelines from the Eagle Ford and Permian Basin shale plays to Corpus Christi. This terminal is expected to be operational soon after completion of the federal deepening and widening of the outer reach of Corpus Christi Ship Channel (from the Gulf of Mexico to Harbor Island, from -47' to -54'). The terminal will include marine berths and necessary equipment to support loading of vessels. The remaining tankage would be in offsite locations further inland.

Likewise, the Carlyle Group, one of the major partners and funders of the crude oil export project, admitted in May 2019 - well after the February 4 determination by USACE of the need for consideration of the components as one project - that it and its partners were seeking approval of the full infrastructure project through an expedited process:

> Carlyle Group LP this week will appeal to the Trump administration to guarantee a two-year approval of its South Texas crude export project, officials said. Carlyle-backed Lone Star Ports LLC is vying to open the first new U.S. crude export facility that can fully load supertankers, which will require dredging a South Texas ship channel deep enough to allow fully loaded supertankers to maneuver at its planned terminal. The company plans to file paperwork with the administration's Federal Permitting Improvement Steering Council (FPISC) to join a list of infrastructure projects that U.S. officials hope to ease through federal, state and local reviews. . . . In March, the U.S. Army Corps of Engineers, which issues permits for dredging projects, recommended a full environmental impact statement (EIS) for Carlyle's project. An EIS typically can add two years, if not more, to the timeline of a project, officials said. Carlyle had sought to complete a

[4] https://harborisland.info/harbor-island-terminal-redevelopment-project-faqs/

> shorter review, called an environmental assessment, which can take as little as a few months.[5]

Likewise, the Carlyle Group announced:

> Lone Star Ports LLC will lead development and operation of a Carlyle Group-backed crude export terminal in Corpus Christi, Texas, that can fully load supertankers, according to a statement from the project leaders. . . Carlyle Group (CG.O) and the Port of Corpus Christi Authority in October [2018] jointly proposed building a $1 billion crude export terminal on an island controlled by the authority. . . . Lone Star, a recently formed joint venture between Carlyle and construction company The Berry Group, reached preliminary agreements to connect the proposed terminal to crude pipelines owned by Hilcorp Energy Co's. . . Lone Star also disclosed a deal with services provider Martin Midstream Partners LP (MMLP.O) to work together on the Corpus Christi project.[6]

COORDINATION OF THE ACTIONS OF STATE AGENCIES

Given the scale and duration of the impacts of the overall project on state coastal lands and waters and on the resource management goals and programs of the General Land Office, Texas Parks and Wildlife Department, TCEQ and the TRC for this area of the Texas Coast, TCEQ and the TRC should initiate a joint process for:

1. The Section 401 certification process under the Federal Clean Water Act and state law,

2. The determination of consistency under the Texas Coastal Management Program for all of the applications to USACE for the crude oil export project, the related leases of state coastal lands, and TCEQ permits, and

3. The required hearing on the use of the Redfish Bay State Scientific Area.

Such an approach would limit the expenses and staff time for the Texas resource agencies to coordinate and participate in their decisions as well as those of the USACE.

DETAILED COMMENTS ON APPLICATION FOR PCCA HARBOR ISLAND TERMINAL

Without waiving the above comments and request for a comprehensive assessment of the cumulative impacts of the coordinated components of the crude oil export project, the following comments are provided to identify aspects of the PCCA application for which

[5] https://www.reuters.com/article/us-usa-energy-carlyle-group/carlyle-backed-firm-seeks-guarantee-on-two-year-approval-of-us-crude-export-project-idUSKCN1SQ1FP

[6] https://uk.reuters.com/article/us-carlyle-group-energy-shipping-idUKKBN1OD1VY

additional information or analysis should be required, as well as areas that will need to be addressed in any USACE permitting and NEPA compliance processes.

I. Management of materials dredged or excavated from the terminal site:

There are a number of issues with the management of the materials proposed to be moved to develop the proposed terminal. PCCA states that there will be 6,500,000 cubic yards of such material dredged from the Pass or excavated from the Pass or from the Island. The issues include:

1. The impacts at the sites where the materials will be relocated, and
2. The impacts at the terminal site.

For both sets of issues, consideration needs to be given to the fact that the materials are contaminated.

A. Contaminated materials:

While work on remediation has been done for both the soils and groundwaters at the location of the proposed terminal site, both are still contaminated and subject to use restrictions to limit the release of the contaminants. PCCA's application acknowledges that, but it fails to address the likely releases of the contaminants at disposal or placement sites or at the terminal.

The area to be used for the terminal and berths includes parts of the former Exxon Pipeline Co. Harbor Island Tank Farm and the former Fina Pipeline Co. ("FINA") Tank Farm. Attachment A to these comments is an annotated aerial photograph that shows these contaminated sites. Both areas are covered by use restrictions developed through a process at the TRC. Attachments B and C to these comments are, respectively, the restrictive covenants on the Exxon tract and on the Fina tract.

Both tracts are now owned by the Port of Corpus Christi Authority, which had agreed to significant limits on the use of the properties. PCAA's current proposal would violate those limitations.

While the much of the work at these sites was completed last century, new contamination continues to be identified. Attachment D includes two photos that may show some of the newly discovered issues. The first is a February 2019 photo of a what appears to be a release to surrounding waters, apparently associated with piling removal from land on Harbor Island. The second is an aerial photo from 2017 showing both spills and contaminated areas, some of the latter off of the PCAA property. There also is what may be oil on an area of ponded water.

While various studies have shown lessening contamination of both soils and groundwater, those studies apply older Texas risk-reduction standards and do not appear to be based on sampling at the specific locations that will be excavated from the island or dredged from the bottom of Aransas Pass. The earlier evaluations done by the former owners and PCCA for TRC apparently give no special consideration to the impacts of residual contamination on marine species if released into the waters at Harbor Island or the material placement sites. Those evaluations were based solely on the materials staying in place at Harbor Island.

Moreover, other sites that are near the PCCA terminal property are contaminated and could add to contamination in the soils and ground water at the terminal site. PCCA documents illustrate this issue. . The site referred to as the Gulf Copper Harbor Island, a property now owned by the Rachel Foundation, was used for years by Brown & Root/McDermott for fabrication of oil platforms and other heavy metal structures. The site is also adjacent to the PCCA terminal site. PCCA should be required to provide the available information on the potential contamination at that site and be required to test areas of its land adjacent to that site for contaminants, including metals, that likely resulted from the activities at that site. PCCA should be required to prepare such an evaluation of other prior industrial or waste disposal sites on Harbor Island that have added or could be adding to the contamination of PCCA's soils and groundwaters.

USACE should require PCCA to provide results of new testing of the soils and groundwater at the locations where PCCA proposes to dredge or excavate materials for the terminal or related facilities. The application does not provide the data needed to evaluate the risks of pollution at the removal sites for these materials or placement sites for them. Given that dredging and excavation techniques are not described, contaminated groundwater could be moved with the materials to the placement sites and should also be tested at multiple locations before any authorization to proceed.

All new samples of soil and groundwater should be tested and evaluated for risks using EPA/USACE approved methods appropriate for the location of the proposed disposal sites. It is not clear that the TCEQ and TRC sampling and analysis requirements at the time of testing for contaminants met the current federal requirements for disposal of contaminated materials in waters of the U.S. or even those of Texas. The earlier testing was done for contamination evaluation and remediation for future use of the site. It may not be adequate for disposal in or adjacent to waters of the U.S.

Moreover, PCCA should be required to commit in its application that it will not mix significantly contaminated materials with lesser contaminated or uncontaminated materials to dilute the levels of contamination.

Finally, if a permit is issued, PCCA should be required to develop a baseline for contaminant profile loads in benthic and other marine organisms prior to commencing dredging operations. Subsequently, this baseline testing should be routinely preformed on organisms to determine if the release of contaminants from the terminal areas is increasing the levels of contaminant in marine life.

<u>B. Disposal or relocation of the materials</u>:

PCCA appears to admit that there is a risk of releases of contaminated materials, as it proposes to use turbidity curtains to minimize these risks. PCCA's application does not explain if or how the materials would be contained at any of the placement sites. In any case, there will be movement of such materials from the sites gradually over time from erosion and wash overs, with increased movement during significant storm events.

There certainly can be adverse impacts on sea grasses and other habitats in the placement areas, whether or not they are contaminated. While PCCA's application indicates a plan to use turbidity curtains, there is no discussion of the effectiveness of such controls during different weather conditions and given the different location and configurations of the placement sites.

Moreover, turbidity curtains have been shown to have limited success in reducing dredging impacts on seagrasses and other sensitive marine habitats, and they require a great deal of skill in their deployment. There are a number of studies showing the risks of suspended dredged materials on marine habitats, especially sea grasses. There are sea grasses very near many of the proposed disposal sites, and almost any reduction in light in the water over seagrass beds, due to sediments in the water, will have negative impacts on the sea grasses.

Moreover, the placement sites proposed by PCCA, at least sites 4,6,9 and 10, do not presently have hardened or armored fortifications needed to limit movement of the materials into the water, especially during storm or other wash-over events. There may be some such fortifications now or planned, but those proposed do not assure that the materials will not be resuspended and move over seagrass beds.

The map of those placement areas provided in Appendix B to the application is very poor quality given the advanced state of current mapping capabilities. Thus, these areas are not clearly defined, their containment features are not shown, nor are the adjacent sensitive habitats identified with sufficient detail to evaluate the proposed disposal.

The application limits the ability of experts, including those at USACE and Texas agencies to evaluate the risk of resuspension or turbidity that could affect nearby sea grass beds and emergent marshes. If PCCA intends to construct containment at the disposal sites, that should be described precisely in the application, so the risks of releases of the materials can be evaluated.

C. Management of dredging and excavation at the terminal site:

Similarly, PCCA's application lacks the details needed to evaluate the movement of materials released into the waters and into the air inside the Project Boundary due to dredging or excavation. The type of dredging and excavation, the equipment used for such activities and for controls of the materials in the water and into the air, the winds and the currents in Aransas Pass at the time of activities, and the sequencing of the activities can all affect the degree of adverse impacts that result, including the turbidity and movement of suspended solids and other pollutants in the water and through the air.

PCCA should be required to provide the information needed to allow USACE and others to evaluate the risks to marine species and habitat, as well as the risks to workers and the public that may be using nearby lands or waters.

D. Management of contaminated water:

Likewise, the PCCA application includes no data on or evaluation of the risk or impacts on water quality or marine environments, in the short or long-term. That is true for contaminants that move through groundwater into the waters around Harbor Island and those that run off from

the material placement sites. In both cases, the contaminants could cause violations of the Texas water quality standards or accumulate in the food chain of fish, possibly of humans.

The use restrictions for the Exxon and Fina sites recognize that the ground water is contaminated, but they assume different conditions. The Fina site was considered as having one interconnected set of contaminated groundwater areas throughout the entire site. Although the two sites are adjacent for a long part of their boundaries, the Exxon site was apparently viewed as having separate areas of ground water that are not interconnected.

Unless PCCA can prove otherwise through valid data and analysis that it includes in its application, USACE should treat the ground waters under both sites as one interconnected set of systems, where contamination in any location can move to other locations on and off those two tracts of land. Moreover, unless PCCA can demonstrate in its application that its proposed activities will not cause the release of significant levels of contaminated groundwaters into the surrounding waters during construction or afterwards, such as during times of heavy rainfall, storm surges, or the movement of ships from the berths, no permit should be issued.

PCCA should be required to evaluate the potential for release of contaminants and the impacts of such releases into the waters around Harbor Island.

II. Ferry Operations:

The Texas Department of Transportation has filed comments on PCCA's application to the USACE for the deepening of the ship channel that express concerns about the proximity of that dredging project to its ferry landing for a number of reasons. TxDOT says:

> [The ferry system] serves to provide a critical connection between Mustang Island and Harbor Island for local residents commuting to work and for tourists and visitors. On average, approximately 2.0 million vehicles per year are transported across the ship channel via ferry vessel. This equates to over 3.8 million passengers per year served by the Port Aransas ferry operations. This is a continuous operation, providing service 24 hours per day, 365 days per year. . . There is a potential that the proposed Channel Deepening Project could result in impacts to the Port Aransas Ferry Operations, which could adversely impact the traveling public and surrounding communities

And

> Deepening of the ship channel would require an evaluation and armoring of existing ferry operations infrastructure including but not limited to installation of deeper, larger ferry dolphins (pile clusters), bulkhead replacement, and additional shoreline protection. TxDOT will need additional information on the proposed project in order to procure the resources necessary to evaluate, design, and plan the construction of ferry infrastructure that is needed as a direct result of deepening the ship channel. Can you please provide detailed drawings (plan view and cross sections) showing the proposed channel deepening and associated work to stabilize channel slopes that are adjacent to the Port Aransas Ferry Operations?
>
> . . . On August 12, 2019, an incident occurred in which a large LNG tanker traveling in

the ship channel in the vicinity of the Port Aransas Ferry Operations was completing a maneuver that put them in very close proximity to a ferry vessel that was currently docked and loading passengers at Port Aransas. The proximity of the tanker resulted in an emergency evacuation of the ferry vessel.

The risks to the infrastructure of the ferry system are a major concern of the Port Aransas Conservancy as well. And these impacts will be exacerbated by the proposals to locate one of the two berths of the terminal adjacent to the infrastructure for the ferry. Construction of that berth will also require dredging and excavation adjacent to the landing. Damage to the ferry infrastructure would be a significant matter, given the ferry serves as a major evacuation route before and during storm events, in addition to its heavy everyday use.

There will clearly be the potential for the two projects, the deepening of the ship channel and the development of the terminal, to have a much greater impact on the ferry facilities and operations than just either one. The proposal for the Axis Midstream terminal nearby also adds to the risks of adverse impacts on ferry operations.

Dredging for both the ship channel deepening and the PCCA terminal will require that the ferry facilities be protected from several directions, and there is no indication that the work on the channel deepening will be coordinated with the work on the terminal to avoid damage from either or both.

PCCA has not provided the information needed for the evaluation of either this application or the one for the deepening of the ship channel. It is not possible from its applications to determine how close dredging for the 80 foot channel will come to the ferry property or the configuration of the sides of the berth. PCCA should be required to provide both for an evaluation of the risks.

This is one more reason USACE should require the combining the applications for the different aspects of this export project by requiring the data needed for the evaluation of the cumulative impacts. This was the position of USACE position earlier this year.

The Port Aransas Conservancy also joins TxDOT in expressing concerns with the risks of accidents.. There is nothing in the applications for the terminal or the deepening of the ship channel that will allow USACE to evaluate those risks or to limit operations of either to minimize the risks.

At a very minimum, the PCCA should be required to revise its applications with the information TxDOT has requested or needs, and with a clear assessment of the risks of accidents.

III. Aransas Pass, Redfish Bay, and the risks to the marine species and habitat:

Aransas Pass is a unique and sensitive marine environment, possibly the worst location along the Texas Coast for the proposals by PCCA to deepen the ship channel, and develop a terminal for loading Very Large Crude Carriers (VLCCs). The pass is a critical inlet, the only major inlet in the region.

As Dr. Stunz explains in his statement on the PCCA application for the deepening of the ship channel, which is provided in Attachment E to this letter, Aransas Pass is critically important to the marine life in the area and the significant economic activity that is supported by that marine life. The Pass is the "primary conduit for young marine life migrating to and from the Gulf of Mexico to either spawn or reach their nursery habitats." (Attachment E) Dr. Stunz's statements on the uniqueness and values of the Pass are supported by those of Dr. Erisman (Attachment F), Dr. Holt (Attachment G), and Dr. Buskey (Attachment H).

The construction and use of proposed berths and related activities at the terminal along Aransas Pass will also require use of the Redfish Bay State Scientific Area ("RBSSA"), a larger area of critical habitat, including sea grasses, wetlands and other important marine habitat that will be affected.

There is even an area close to the proposed terminal which is now off limits for fishing as it is an area of congregation of redfish. That area is not identified in PCCA's application.

PCCA's application simply ignores any potential impacts to the marine environment outside of the area of its "Project Boundary" as that area is shown on Figure 2 of Appendix B of its application. It asks USACE to ignore the impacts from its dredging and excavating and the use of its proposed terminal by large vessels, including the impacts to the migration of fish and other species through Aransas Pass.

For example, it ignores the direct impacts of the noise and turbidity that will result from such activities on migrations of fin and shell fish during critical periods of movement through Aransas Pass and the RBSSA for reproduction and at other vulnerable times in their lifecycles.

Moreover, the noise, turbidity, reductions of thermal refuges for marine life during freeze events, and other disruptive activities resulting from the construction of the terminal and use of it for loading VLCCs will add to the noise and other disruptive activities during initial dredging and maintenance dredging of the ship channel by PCCA. This problem has already been raised by University of Texas Professor Brad Erisman:

> any disturbances that occur in this area (e.g. increased salinity, reduced oxygen levels, turbidity, noise, habitat alteration) have the potential to reduce spawning activity and reproductive output of these fishes.[7]

Again, this application and that for the dredging of the ship channel fail to provide any of the information needed to evaluate these impacts or even a recognition of the potential impacts. The applications should be rejected if not combined and amended to provide the needed data and analysis of the impacts.

Given the requirement in Texas law for a public meeting on the proposed change in use of Redfish Bay for several aspects of the crude oil export project, including changes in use by the terminal, USACE should seek input from the Texas Parks and Wildlife Department and the

[7] See Attachment F, "Statement Regarding the Ecological and Socioeconomic Value of the Aransas Pass Tidal Inlet" by Brad E. Erisman, Ph.D. August 28, 2019, page 2.

General Land Office once it has held its public meeting. That meeting could result in changes in the location of some uses and the conditions on uses that could affect this application for the terminal and other applications pending before USACE for this export project.

IV. Oil spills:

While there will clearly be significant increased risks of oil spills if the terminals are authorized and used, the recent impacts of Hurricane Harvey and the proximity of the proposed terminals to the residential and commercial properties in Port Aransas justify much more attention in the application and the NEPA compliance process than suggested in the application.

Moreover, PCCA has reported routine spillage of oil into the water. The figure for spillage is reported by PCCA as 1036 barrels of oil into the Corpus Christi Ship Channel in the last 11 years.[8] For the current capacities, that is close to 10 gallons per day of spilled oil. With the capacities PCCA is projecting, spillage at that rate would be 5 to 6 times higher, most of that from the new terminals on Harbor Island. No such pollution loading is identified in its application or its forms for its Section 401 water quality certification.

The application simply indicates that there will be some spill response equipment, such as absorbent pads[9], but does not provide a description of the extent of the risks or likely spillage on a daily basis or for significant events, storm or major spills its tanks, loading equipment or the ships. There is no real explanation of the equipment or capabilities of personnel at the terminal that would be used to address small or large spills there or nearby as a result of a collision or grounding.

Thus, the potential impacts of oil spills on the marine environment, on endangered and threatened species, and on cultural or recreational features and activities are not discussed.

PCCA should be required to provide a detailed risk analysis and plan to address the various risks of the new terminals that will result in oil spills.

V. Water Quality:

PCCA claims its dredging and operations will have only minimal impacts on water quality, apparently arguing that there will be no short-term or long-term degradation of water quality. The application focuses on suspended solids and turbidity, ignoring potential pollutants from the current contaminants at the terminal site, the spills of oil during loading, the risks of low dissolved oxygen, the risk of disrupting the warmer waters used for refuge during winters, and the pollutants from release of ballast waters.

The first two issues related to contamination of the soils and water and to oil spills were discussed above. The other three water quality issues were not mentioned in the application under its discussion of water quality or elsewhere. PCCA should also be required to address

[8] This figure is based on PCCA's statements regarding its spillage rates.

[9] See Section 5.0 page 35 of the PCCA July 2019 application.

them, as there is sufficient information available publicly to identify and evaluate those pollution problems.

Dissolved oxygen levels can be depressed significantly in the water at the bottoms of the berths where stratification of waters can occur as a result of temperature differences or salinity differences. With the deep berths and the nearby discharge of water with elevated salinity levels from PCCA's proposed desalination facility, the risk of depressed dissolved oxygen is enhanced. It is not discussed in the application, however.

Warm waters in deep water areas create thermal refuges for fish and other marine life when the water temperatures fall. Such areas of water will likely exist in the berths and along areas dredged to allow the VLCCs and other ships access to the berths. When those ships do come and go, they will mix the normally stratified warmer and cooler waters, and it is well-known the sudden temperature drops in these thermal refuges can lead to mass mortality events. In fact, TPWD has the authority to close certain areas during events where cold stunning is predicted to occur. Moreover, this risk to thermal refuges is also why there are agreements for temporary closure of barge traffic along in the intracoastal water and other water ways during these cold events. TPWD's website discusses its authority to close areas to fishing and the voluntary programs to limit disruption of the thermal refuges.[10]

Up to 100,000 gallons of ballast water can be released by one VLCC that enters the terminal unloaded. That water will likely contain chemical and biological contaminants that would cause damage to the local marine environment. Unloaded transit will normally carry between 80,000 and 100,000 tons of sea water containing organisms that can cause damage when released into foreign ecosystems. PCCA could prohibit the release of such waters, although it would have an incentive to allow release of ballast waters, as that would allow more crude oil to be loaded on shore.

PCCA is aware of these risks, but has chosen to ignore them in its application.

VI. Loss of Wetlands Functions:

PCCA has not performed an adequate evaluation of the potential impacts of the project on freshwater or marine wetlands. It has concluded that there will be no loss of wetland functions, based on an evaluation that apparently involved one day of field work in March.[11] Even the report of that work did not conclude there would be no loss of wetland functions.

Again, PCCA should be required to perform an assessment of the extent of wetlands, and the impacts on them by the proposed terminal facilities and activities through review of the conditions during different times of the year and weather conditions.

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[10] See, for example, https://tpwd.texas.gov/newsmedia/releases/?req=20110217c and https://tpwd.texas.gov/regulations/outdoor-annual/fishing/general-rules-regulations/saltwater-freeze-events.

[11] Appendix G to the application page 5.

VII. Mangroves:

There appear to be mangroves in the vicinity of some of the material placement sites, including sites numbered 4 and 6 on Figure 6 of Appendix B of PCCA's application. The mangroves are close enough to the placement sites to warrant identification and evaluation. PCCA's application fails to identify any mangrove areas or evaluate the potential impacts of placement of dredged and excavated materials in these areas.

VIII. Impacts on endangered, threatened, rare, and important species:

The construction and use of proposed berths at the terminal will also likely impact a number of species listed on the Federal endangered species list and that of the State of Texas. PCCA's application does not identify the aerial extent of the impacts of its activities or all of the species that could be adversely affected. It limits its evaluation to the Project Boundary and to the placement areas, as if noise, dust and the suspended materials stay within those areas.

One obvious species that needs to be addressed is the Whooping Crane. The application should include a map of the critical habitat as well as locations where whooping cranes have been seen on Harbor Island, as well as many areas south and east of Harbor Island on both Mustang and St Joseph islands. There have been numerous reports of whooping cranes using Mustang Island and Harbor Island. Documented reports of the cranes on exist for 2015, 2018 and 2019, and there are probably more such reports over the last decade. The detail for some, if not all, of these sightings can be obtained from USFWS.

For example, a pair of Whooping Cranes were spotted In January, 2018, not long after Hurricane Harvey, in the Nature Preserve on Mustang Island. The cranes remained in the Nature Preserve until March 28th. They were viewed by many most of the days during that period. Then in November, 2018 one Whooping Crane was spotted on the Preserve for several days.

On December 9, 2018, two Whooping Cranes sighted by the Salt Lake Tower in the Port Aransas Nature Preserve. They were seen almost daily until March 23, 2019. PAC can provide photographs and video of the sightings of the Cranes din 2018 and 2019.

Success in expanding the populations of the cranes has already indicated that areas of Harbor St Joseph and Mustang islands and a few other areas the south of the Aransas National Wildlife Refuge are already referred to as the "Southern Expansion" of the habitat. The PCCA's proposed export project could result in significant negative impacts on this Southern Expansion, the food supply for it, and, thus, the recovery program for the Whooping Cranes.

The same situation exists for the endangered Piping Plover which is seen regularly on Mustang and St Joseph islands.

Moreover, as PCCA is well aware, dredging with the equipment being used for the current deepening, can kill sea turtles. It presumable has killed many already. There are a number of endangered sea turtles that use Aransas pass and are at risk from the continued dredging of the channel and for the terminal. There is no discussion of that issue in the application.

PCCA's application does not properly address how PCCA can or should minimize the impacts, if

the terminal permit is granted. There are no plans for training in identification of any endangered species by those involved in construction, materials placement or operations of the terminal. There are no plans for steps to be taken if an endangered species is found at or near those areas of the terminal during construction or use of it.

USACE should require that PCCA amend its application to include an analysis by a qualified entity or person of the risks to endangered species and a response plan.

IX. **Changes in hydrological conditions?**

While the major hydrological changes will result from the deepening of the ship channel, the dredging and excavation of for the terminal will add to those changes. The failure of the PCCA to use the available 3D modeling of movements through the ship channel, Aransas Pass and to and from the different bays systems is a significant problem. The comments of the Port Aransas Conservancy and others, including Robert Dickey, on PCCA's application for the USACE permits for deepening the ship channel noted the importance of such modeling for the impacts of the project on the exchange of water between the Gulf and bays and estuaries, the impacts on the inshore circulation patterns. and on the impacts of storm surges. PCCA is using 3D modeling for some of its projects, and certainly could be required to do so for the components of the export project, if not for the entire project.

X. Mitigation and mischaracterization of impacts as short-term:

PCCA's permit application incorrectly assumes that all direct impacts of construction and operations at the terminal will be temporary. Thus, PCCA proposes no mitigation.

PCCA is asking USACE to accept PCCA's theory that natural revegetation will mitigate any losses in seagrass, mangroves, wetlands and other habitat in and around the terminal area and the material placement sites. It is asking USACE to accept its theory that marine and aquatic species using these habitats and moving through Aransas Pass will adapt to the changes its activities will cause. PCCA's application also downplays or ignores all together the primary or secondary impacts of its proposed facilities and activities.

For example, PCCA assumes that there will essentially be no transport of the materials, which are dredged or excavated from the terminal site, away from the disposal sites to seagrass beds, oyster beds, or other sensitive habitats. Thus, it also assumes no impact from the contaminants that are in these materials on such locations or species. Yet, as discussed above, PCCA does not explain how it will contain such materials during placement or afterwards or during storm conditions.

PCCA also ignores the disruptions that the movement of VLCCs and other large ships to its terminal can cause.

Both the impacts from the disruptive activities and those from the transport of materials from the disposal sites will be repeated for significant periods. These impacts can persist for decades,

[12] possibly much longer that the crude oil export facilities will be used. [13]

In addition, the PCCA apparently is also willing to ask USACE to accept its position that there is no short or long-term impact on the operations of the ferry, but PCCA has not provided any data or analysis so USACE, TxDOT or the public can evaluate these claims. It has no plan for addressing the risk to thousands of people, if the ferry cannot be used to help evacuate people from Mustang Island in cases of a large storm event.

XI. Permit Evaluation Policies:

Likewise, PCCA gives very little attention, if any, to most of the of issues that it lists in its section labeled "Permit Evaluation Policies."[14] Unlike the type of studies done for issues, such as for water and sediment sampling and analysis found in Appendix F, PCCA simply provides short and unsupported claims that there will be no adverse impacts in the area on these issues, including the economy, land uses, aesthetics, flood risks, shore erosion, recreation, property value and the public welfare. For all of these issues, PCCA should be required to provide the factual information needed for consideration of PCCA's claims. For example:

A. Economics:

In its discussion of the economic impacts, PCCA ignores the adverse impacts on the local economy, which is based on tourism, recreational and commercial fishing, and other such economic drivers. PCCA should be required to obtain and provide the information available from City of Port Aransas, Nueces County and the State on the value of tourism and fishing as well as an analysis of the potential reductions in those values if the terminal is built and operated.

B. Land Use and aesthetics:

PCCA's argument is simple. It claims the City of Port Aransas allows industrial use of its property and that that use has been the historic use. Thus, there is no land use compatibility, land use trends or aesthetics issues for those who live or work in the area of for the City of Port Aransas. PCCA did not provide any support for that position other than city ordinances. PCCA's

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[12] Bureau of Ocean Energy Management. Gulf of Mexico OCS Oil and Gas Lease Sales, 2012-2017. Western Planning Area Lease Sales 229, 233, 238, 246, and 248. Central Planning Area Lease Sales 227, 231, 235, 241, and 247. Final Environmental Impact Statement. Volume I: Chapters 1-4.1 (2012).

[13] The life of export facilities in the Corpus Christi area for crude oil produced in Texas could be short lived. As one commentator has stated:

> As I have highlighted in a previous article on Oilprice.com, US shale supply is exceedingly sensitive to changes in the oil price. Should WTI dip below $50 in the coming weeks, the extent of the slowdown in US supply growth in the coming months (and in 2020) is likely to meet, if not exceed, the expected slowdown in global oil demand growth as a result of the US/China trade war. US shale oil has not only introduced a cap on oil prices, it has also introduced a floor. https://oilprice.com/Energy/Crude-Oil/The-Bullish-EIA-Message-Markets-Have-Overlooked.html

[14] Twenty one issues are addressed on less than 6 pages of the application.

argument is like that of a developer claiming it could construct a twenty story residential tower on a lot zoned and historically used for a residential purposes, even if was next to a school, because of the zoning and historic residential use.

The issue of land use compatibility is not simply one of historic use and zoning. Both the specific project and the land use trends need to be evaluated in any land use compatibility assessment.

Because of the size of the proposed terminals, the reduction in size of that area of Harbor Island, the required dredging to create the berths and the movement of ships the size of VLCCs to the berths and around in the turning basin, the terminal would be a significant change to land uses. Just the movement of the VLCCs to and the turning basin would have a major impact on use of the ship channel and Harbor Island by other ships, TXDOT's passenger ferries, and recreational boats that use Aransas Pass to get to fishing areas on and along Harbor Island, to St Joseph Island and many other areas of bays and estuaries to which Aransas Pass provides access.

The land use trends in the area are towards less industrial use and much more recreational use on or near Harbor Island. The trend in the areas is to more residential use and tourism. It is clearly tourism, not industrial use, that has expanded over the last 30 years. Even the use of Harbor Island for fabrication of drilling rigs has fallen sharply, if not completely. Clearly, the use of Harbor Islands for one or more terminals for VLCCs or other large ships would have a significant adverse impacts on the use by the thousands of people who live or work in Aransas and those who visit Mustang Island, and for those who fish in the waters in the area. It would have a major impact on aesthetics of the area.

This trend should be obvious from the growing use and expansion of the adjacent ferry operations. And, of course, PCCA's proposed terminal is incompatible with the location of the ferry operations on Harbor Island.

C. Property interests and erosion of private and publicly owned properties:.

As PCCA is aware, the current movement of VLCCs and other very large ships is already damaging property in Port Aransas. They do so by creating large wakes that inundate shorelines, the land, docks and piers. They do so by creating nuisance conditions, such as noise, light, and odors. PCCA's discussion of such issues is basically to ignore them and state again its position that the terminal and related facilities are needed.

D. Flood Hazards:

Likewise, despite the fact that PCCA knows of the storm surge of over 10 feet and flooding that occurred during Hurricane Harvey, the plan for addressing flooding hazards is simply "construction plans will take flood hazards into consideration." PCCA has not even provided an evaluation of the potential storm surge heights compared with the location of its facilities. As noted above, it has not performed the analysis needed to evaluate the potential increase in storm surge from its deepening of the ship channel and dredging and excavation of significant areas of Harbor Island, adjacent to the ferry infrastructure on the Island. There is no

assessment of any impacts that will occur west of the terminals due to the reconfiguration of the end of Harbor Island.

Clearly the fact that there may be no mapping of the flood plain on Harbor Island does not lessen the risks or justify ignoring them. To the contrary, PCCA should be required to develop the flood elevation information and surge risks. FEMA's report on the area that goes with its maps provides some assessment of flood hazards that can be used by PCCA for the information needed on risk within the PCCA Project Boundary and risks to others created by the development of the terminal and related facilities.

XII. Conflicts with PCCA's proposed desalination project:

As discussed above, PCCA has applied to TCEQ for a permit to discharge waste waters from its proposed sea water desalination facility. The discharge pipe and diffusers are proposed to be located in an area that PCCA also proposes to use for movement of ships to its terminal. Thus, there is a conflict in the two applications, but PCCA has refused direct inquiries others about how it will address this conflict.

PCCA should be required to address the conflict in its application.

XIII. Alternatives analysis:

As with other applications for aspects of the crude oil export project, the PCCA application includes narrow statements of purpose and need. USACE has criticized PCCA and its partners for such attempts to limit the alternatives that will be evaluated with such efforts.[15]

The applicant also misrepresents the facts in current and past applications in an effort to justify its choice of the location of the terminal and other aspects of its crude oil export project.

For example, on page 3 of Appendix A to the application (ENG form 4345, of May 2018), the project purpose is described as "necessary to integrate **existing** barge, pipeline and storage infrastructure to maximize the product handling efficiencies." (Emphasis added.) Yet, there apparently is no such existing infrastructure. The only infrastructure identified in the application are three existing berths that the application says are damaged and unusable.

The more recent revised application of July 8, 2019, revises that purpose statement to read, "necessary to integrate **existing and future barge**, pipeline and storage infrastructure to maximize the product handling efficiencies." (Emphasis added.) While admitting the terminal will need the new infrastructure (that which would be provided by the storage tanks and pipelines of Axis Midstream Holding, LLC.), PCCA continues to claim its terminal is needed to take advantage of and maximize the use of "existing" infrastructure for crude oil export activities, infrastructure that is not actually in existence.

These statements regarding existing infrastructure are misleading, if not worse. They are an effort by PCCA to support its position that its proposed terminal is not simply one aspect of a

[15] See for example, USACE letter of February 1, 2019 to Axis Midstream Holdings, LLC. on its Application SWG-2018-00789, page 1.

larger crude oil export project that should be evaluated under one application, one NEPA compliance effort and one state of Texas evaluation that considers the cumulative impacts of all aspects, and prior projects that affect the marine environment in the area of Harbor Island.

These statements are also improper efforts by PCCA to narrow the scope of the alternatives that USACE and others can raise or consider. Since there is no existing infrastructure for use maximization, any project that would provide for terminals for crude oil export, including off shore terminals should be considered as alternatives to this Harbor Island Redevelopment and crude oil export project.

The purpose of the construction of any of the existing crude oil export terminals or those proposed is simply for enhancing the loading of crude oil that can be sent through pipelines from West Texas to the Corpus Christi area. PCCA wants to be the organization that benefits the most from such a terminal, and, thus, it has attempted to weave a story that makes it look like it is the only organization that can rely on existing infrastructure. But it never identifies the existing infrastructure that only it can rely upon.

PCCA also ignores the fact that existing terminals already partially load VLCCs and do what PCCA proposes initially, filling the VLCCS after they move back into the Gulf of Mexico. Thus, it proposes somewhat deeper berths. In reality, it is clear that it intends to seek approval in the future to deepen its berths terminals to match the proposed deepening of the ship channel.

CONCLUSION

PCCA's proposed export terminal project is clearly one component of PCCA's larger crude oil export project, if not the even larger "Harbor Island Redevelopment Project" described on PCCA's website as including the export project. Among the activities described by PCCA for Harbor Island, apparently to allow the terminal aspect to proceed, are: 1) pipelines and storage facilities for transport of crude oil to and at the PCCA's terminal, as well as the proposed terminal of Axis Midstream, and possibly of Martin Midstream 2) efforts toward further restoration of soils and remediation of ground water contamination, and 3) a new desalination facility to provide fresh water for industrial use. Only recently has the 80 foot channel deepening been removed by PCCA from its description of the crude oil export project, but it remains as part of the larger redevelopment. It is clearly going to be part of the longer-term crude oil export project for the PCCA terminal and those of others.

The Port Aransas Conservancy urges the USACE and the Texas state agencies to advise PCCA, Midstream and Lone Star that the applications for federal permits and state authorizations for the full crude oil export project on Harbor Island must be consolidated, including the application for the deepening of the ship channel.

In the event that such consolidation of the applications is not required, still one NEPA compliance process should be completed by USACE for all related projects.

USACE should also require PCCA to address the deficiencies identified in the comments above and those of other commenters. USACE should either return the application or require its amendment with the type of data and analysis identified above, including:

1. A restatement of the purpose of the export project to assure that the full range of alternatives, including offshore terminals and expansions of existing terminals, will be considered,
2. A description of the existing infrastructure that PCCA has claimed or may claim as justifying the use of its terminal rather than the use of alternatives that clearly exist onshore and off,
3. The level of contaminants in the specific materials within the Project Boundary that are proposed to be dredged and excavated,
4. The levels of contaminants in the groundwater within the Project Boundary and related infrastructure,
5. A characterization of the ground water within in the Project Boundary and adjacent properties systems to identify pathways for movement of contaminants into waters of the U.S. ,
6. A full description of the containment and any other turbidity controls proposed to be used at the terminal or material placement sites and an analysis of the effectiveness of those controls for the materials that PCCA is managing,
7. The location, extent and characterization of seagrass beds, oyster beds, assemblages of mangrove trees and related saltwater tolerant shrubs and trees, other wetland areas and other sensitive habitat that will be affected and mitigation for any losses in the short and long-term,
8. The process PCCA proposes to use to limit the time of and extent of construction, materials placement and operations that affect the movement of fin and shell fish through Aransas Pass, in the RBSSA or in the area of the materials placement,
9. The process PCCA proposes to use to train workers and other staff to identify endangered species, to report such sightings and to limit the construction, materials placement and operations that affect may “take” such species, including endangered sea turtles, as they use or move through Aransas Pass, in the RBSSA or in the area of the materials placement,
10. The design and evaluation of the dredging, temporary, and permanent structures proposed to be constructed by PCCA at or near the ferry landing infrastructure on Harbor Island to allow TxDOT and others to evaluate the risks to that infrastructure and recommend steps to protect, it
11. Practices that PCCA proposes to require for movement of ships to and from its terminals to minimize the risks of accidents with the ferry and other ships in the channel,
12. Equipment and practices that PCCA proposes to use for respond to oil spills,
13. A proper evaluation of upland wetlands on Harbor Island and resulting proposals for mitigation,
14. A proper evaluation of the impacts of the potential for creating zones of low levels of dissolved oxygen in the waters around the berths,
15. A proper evaluation of the issues PCCA identified in its section on Permit Evaluation Policies, including the impacts on the local economy, private property, shoreline erosion, land uses, aesthetics, flooding, and public health and welfare, and

16. An explanation of how PCCA will address the conflict that exists for its terminal and the discharge infrastructure for its proposed desalination plant.

The Port Aransas Conservancy also requests a public hearing on both the permit application to the USACE and the Section 401 certification request to the TCEQ.

Sincerely,
/s/ Richard Lowerre
Richard Lowerre, for
The Port Aransas Conservancy

Attachments

Attachment A: Photo showing areas of contamination on Harbor Island.
Attachment B: Use restrictions of prior Exxon site.
Attachment C: Use restrictions of prior Exxon site.
Attachment D: Photos showing new contamination identified in 2017 and 2019.
Attachment E: Statement Regarding the Ecological Value of the Aransas Pass Inlet by Gregory W. Stunz, Ph.D. August 21 2019.
Attachment F: Statement Regarding the Ecological and Socioeconomic Value of the Aransas Pass Tidal Inlet" by Brad E. Erisman, Ph.D. August 28, 2019.
Attachment G: Comments of Scott Holt on application SWG-2019-00067.
Attachment H: Recruitment of estuarine dependent species of commercial and recreational importance through the Aransas Ship Channel, White paper prepared by Edward J. Buskey, Professor, Department of Marine Science, The University of Texas at Austin, in December 2018.

Copy by email or U.S. mail:

The Honorable John Cornyn, United States Senate, info@johncornyn.com
The Honorable Ted Cruz, United States Senate, central_texas@cruz.senate.gov
The Honorable Michael Cloud, United States House of Representatives, michael.cloud@mail.house.gov
The Honorable Lois Kolkhorst, Texas Senate, lois.kolkhorst@senate.texas.gov, lois.kolkhorst@senate.texas.gov
The Honorable Todd Hunter, Texas House of Representatives, todd.hunter@house.texas.gov
The Honorable George P. Bush, Land Commissioner, Texas General Land Office, gpb@glo.texas.gov
The Honorable Wayne Christian. Chair, Texas Railroad Commission, wayne.christian@rrc.texas.gov
The Honorable Charles R. Bujan, Mayor of Port Aransas, mayor@cityofportaransas.org
Mr. Valente Olivarez Jr., P.E., District Engineer, 1701 S. Padre Island Drive

Corpus Christi, TX 78416, Valente.Olivarez@txdot.gov.
Mr. James Murphy, Legal Division, TPWD, James.Murphy@tpwd.texas.gov
Emily Rogers, Attorney for City of Port Aransas, ERogers@bickerstaff.com
Mr. Charles Maguire, Director of the Water Division, EPA, Region 6, maguire.charles@EPA.gov
Ms. Dawn Gardiner, Assistant Field Supervisor, Texas Coastal Staff. USFWS, dawn_gardiner@fws.gov
Mr. Rusty Swafford Branch Chief, Habitat Conservation Division Gulf of Mexico Branch NMFS, rusty.swafford@noaa.gov

ATTACHMENT A

h:\ben vasquez\drawings & exhibits\environmental exhibits\former exxon tank farm.dwg

NORTH

0 1,500' 3,000'

PORT CORPUS CHRISTI

PORT OF CORPUS CHRISTI AUTHORITY

FORMER EXXON TANK FARM

SCALE:	1:1,500'	EXHIBIT "A"	DATE:	2014/09/30
DWN. BY:	BEN V		TIME:	14:12:00

Google Maps Harbor Island

Imagery ©2019 Google, Imagery ©2019 Maxar Technologies, Texas General Land Office, U.S. Geological Survey, USDA Farm Service Agency, Map data ©2019 1000 ft

Attachement A: Page 2 of 2

ATTACHMENT B

OCR# 04-2329
AK

PORT CORPUS CHRISTI

December 15, 2014

RECEIVED RRC
SITE REMEDIATION
DEC 19 2014
OIL & GAS DIVISION
AUSTIN, TEXAS

Project No. 09-002B

CERTIFIED MAIL / RETURN RECIEPT
NO. 7012 3460 0001 0535 1888

Ms. Amanda Kindt
Technical Coordinator
Railroad Commission of Texas
Oil and Gas Division
Site Remediation Section
P.O. Box 12967
Austin, Texas 78711-2967

Subject: **Evidence of Deed Recordation of Environmental Restrictive Covenant**
For Former Exxon Pipeline Company - Harbor Island Station
Aransas Pass, Nueces County, Texas
RRC Operator Cleanup Program No. 04-2329

Dear Ms. Kindt,

Please find enclosed a copy of the Railroad Commission of Texas Environmental Restrictive Covenant for the above referenced site that was recorded at the Nueces County Clerk's Office on December 5, 2014.

If you have any questions, please call me at (361) 885-6163.

Sincerely,

Sarah L. Garza
Environmental Compliance Manager

SLG/jls
Enclosure

cc: Michael Lamarre, Exxon Mobil
Scott Chaffey, CRA
John LaRue
Frank Brogan
David Krams

Railroad Commission of Texas Environmental Restrictive Covenant

STATE OF TEXAS §
§
COUNTY OF **NUECES** §

This Restrictive Covenant is filed pursuant to the authority of the Railroad Commission of Texas (RRC) to control and clean up pollution caused by activities over which the RRC exercises jurisdiction in accordance with Section 91.113 of the Texas Natural Resources Code, and affects the real property (Property) described as follows:

The Port of Corpus Christi Authority of Nueces County, Texas (PCCA) is the current Owner of the Property and premises, and appurtenances thereto, located in Nueces County, Texas, consisting of 214.168 acres of land, more or less, portions of which are submerged, comprised of three tracts, Parcel A and B being out of Survey 960 conveyed to Humble Pipe Line Company by the State of Texas in Letter Patent #313 recorded in Volume 239, Page 45, Deed Records of Nueces County, Texas, and Parcel C being out of Survey 806 conveyed to Humble Oil and Refining Company by the State of Texas in Letter Patent #380 recorded in Volume 175, Page 364, Deed Records of Nueces County, Texas, and Parcel A containing 6.744 acres of land, more or less, being the portion of Survey 960 lying southwest of State Highway 361, Parcel B containing 56.249 acres of land, more or less, being the portion of Survey 960 lying northeast of State Highway 361, and Parcel C containing 151.175 acres of land, more or less, being the portion of Survey 806 lying northeast of State Highway 361, and each tract being more particularly described by metes and bounds on **Exhibit A**, which exhibit is attached hereto and incorporated herein.

Portions of the **soil** of the Property contain certain identified chemicals of concern. These portions, consisting of six parcels and considered to be Affected Properties, are presented on **Exhibit B** which exhibit is attached hereto and incorporated herein. The six parcels are as follows: SWW-2A, TT-1A, TT-1B, TT-21/TT-2B, TT-2E, and TT-5A.

This restrictive covenant is required for the following reasons:

> The Affected Properties are a result from historical operations of a former crude oil bulk storage terminal, otherwise known as the former Exxon Pipeline Company Harbor Island Station (Former Station) that was operated by Exxon Pipeline Company from the 1920's to 1993. Chemicals of concern (COCs) attributable to the operations of the Former Station were investigated by ExxonMobil Pipeline Company (ExxonMobil) and PCCA in accordance with regulations under the RRC. In addition, ExxonMobil submitted remedial work plans which were subsequently approved by the RRC, allowing specific remedial action to address the remaining COCs. The remediation was performed in such a manner that total petroleum hydrocarbons (TPH) are the only residual COC exceeding RRC clean-up standards in both soil and groundwater at the time of restrictive covenant

filing. The following maximum levels of TPH were left in soil and groundwater:

- In parcel SWW-2A, the maximum residual concentration of TPH in soil is14,000 mg/kg and in groundwater is 21.3 mg/L.
- In parcel TT-1A, the maximum residual concentration of TPH in soil is 30,300 mg/kg and in groundwater is not detected above a laboratory reporting limit of 5 mg/L.
- In parcel TT-1B, the maximum residual concentration of TPH in soil is 11,800 mg/kg and groundwater was not sampled.
- In parcel TT-2A/TT-2B, the maximum residual concentration of TPH in soil is 117,000 mg/kg and in groundwater is 18.1 mg/L.
- In parcel TT-2E, the maximum residual concentration of TPH in soil is 25,600 mg/kg and groundwater was not sampled.
- In parcel TT-5A, the maximum residual concentration of TPH in soil is 66,700 mg/kg and in groundwater is not detected above a laboratory reporting limit of 2 mg/L.
- In parcel TT-5B, the maximum residual concentration of TPH in groundwater is 66.9 mg/L.

The investigation, assessment, remediation and analytical data are contained in the following reports submitted by various consultants on behalf of ExxonMobil and its predecessors, and the PCCA:

- EPC – Environmental Investigation, KEI Consultants (KEI) report dated April 15, 1994
- EPC – Soil Remediation, KEI report dated August 16, 1995
- PCCA – Soil and Groundwater Assessment, Fluor Daniel/GTI report dated August 2, 1996
- EPC – Area 10 Phase Separated Hydrocarbon Investigation, KEI report dated January 15, 1997
- EPC – Area 10 Remediation, KEI report dated January 26, 1998
- PCCA – Confirmation Sampling Investigation, Applied Petroleum Technologies, LTD report dated June 22, 1998
- EPC – Additional Areas Remediation and Closure Report, KEI reports both dated July 7, 1999
- PCCA – Soil Sampling Report, Rosengarten, Smith & Associates, Inc., report dated December 22, 2003
- ExxonMobil – Additional Soil Delineation, Conestoga-Rovers & Associates (CRA) report dated December 2007
- ExxonMobil Environmental Services Company (EMES) – Site History Request, CRA letter report dated January 11, 2008
- PCCA – Environmental Activities Report, Gainco report dated January 19, 2011

- EMES – 2011 Monitoring Well Installation and Quarterly Groundwater Monitoring and Sampling, CRA report dated June 2012
- EMES – Remediation Summary Report, CRA report dated November 2012

Copies of these reports and analytical data collected from the former Exxon Pipeline Company Harbor Island Station may be obtained from the Site Remediation Section of the Railroad Commission of Texas, Oil and Gas Division, William B. Travis Building, 1701 N. Congress, Austin, Texas 78711-2967, under OCP No. 04-2329.

The response action has been approved by the RRC based on the presumption that the Affected Properties will be used exclusively for commercial/industrial purposes, and will not be put to residential use, and the shallow groundwater beneath the Affected Properties will not be used for any purpose, except monitoring. Shallow groundwater is defined as the vertical zone between the ground surface and a depth of 15 feet below the ground surface. The RRC has determined that the Affected Properties currently meet standards for commercial/industrial use. Based on information contained in the reports identified above, the chemicals of concern pose no significant present or future risk to humans or the environment based on commercial/industrial use. With the filing of this document, the RRC does not require any further remediation of the Affected Properties as long as the Affected Properties are not put to residential use and/or the shallow groundwater is not used for any purpose other than monitoring. For purposes of this Covenant, the term "residential use" means use for dwellings such as single family houses and multi-family apartments, children's homes, nursing homes, residential portions of government-owned lands (local, state or federal), day care facilities, educational facilities, hospitals, residential portions of ranch and farm land, and parks (local, state or federal). This restrictive covenant is necessary to assure that all present and future owners of the Affected Properties are aware of its condition and do not use the Affected Properties in any manner inconsistent with this restriction. If any person desires to use the Affected Properties in the future in any manner inconsistent with the restrictions described in this covenant, the RRC must be notified at least 60 days in advance of such use. Additional response action contemplating a change in land use or in the size of the assumed exposure area may be necessary. The additional response action must be approved by the RRC and completed prior to commencement of the new use of the Affected Properties.

In consideration of the Response Action leading to final approved remediation of the Affected Properties, the Port of Corpus Christi Authority of Nueces County, Texas, the Owner of the Property, has agreed to place the following restrictions on the Properties in favor of the RRC and the State of Texas. Now therefore, in consideration of these premises and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the following restrictive covenants in favor of the RRC and the State of Texas are placed on the Properties described in Exhibit "A," to-wit:

1. Use of the Affected Properties shall not be allowed for residential purposes as defined in this Covenant.

2. Use of the shallow groundwater beneath the Affected Properties shall not be allowed except for monitoring purposes.
3. Penetration or excavation of the impacted soil and/or groundwater zones for any purpose shall only be conducted in such a manner as to prevent the migration or release of contaminants to any other zone or media and to prevent uncontrolled exposure to human and ecological receptors.
4. These restrictions shall be a covenant running with the land.

For additional information, contact:

Railroad Commission of Texas
Oil and Gas Division
Site Remediation Section
P. O. Box 12967
1701 N. Congress
Austin, Texas 78711-2967

Railroad Commission of Texas Operator Cleanup Program No.: **04-2329**

As of the date of this Covenant, the record owner of fee title to the Property is the **Port of Corpus Christi Authority of Nueces County, Texas** with an address of **P.O. Box 1541, Corpus Christi, Texas 78403.**

This Restrictive Covenant may be rendered of no further force or effect only by a release executed by the RRC and filed in the same Real Property Records as those in which this Restrictive Covenant is filed.

Executed this 14th day of October, 2014

Port of Corpus Christi Authority of Nueces County, Texas

Signature: _____

Printed Name: JOHN P. LaRUE

Title: EXECUTIVE DIRECTOR

LEGAL FORM APPROVED
WELDER LESHIN, LLP

STATE OF TEXAS
(Nueces) COUNTY

BEFORE ME, on this the 14th day of October, 2014 personally appeared John P. LaRue, Executive Director known to me to be the person whose name is subscribed to the foregoing instrument, and they acknowledged to me that they executed the same for the purposes and in the capacity herein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE

NOTARY PUBLIC STATE OF TEXAS
SHERRY L DUBOIS
Notary Public
STATE OF TEXAS
My Comm. Exp. 06-25-2015

Signature _____

Notary Public in and for the State of TEXAS

County of NUECES

My Commission Expires: 06-25-15

ExxonMobil Environmental Services Company

Signature: _____

Printed Name: Joel C. Lackie

Title: Assistant Attorney In Fact

STATE OF TEXAS
(Harris) COUNTY

BEFORE ME, on this the 29 day of September 2014 personally appeared Joel Lackie, _____ known to me to be the person whose name is subscribed to the foregoing instrument, and they acknowledged to me that they executed the same for the purposes and in the capacity herein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE

Signature _____

MARKA C. RISLEY
Notary Public, State of Texas
My Commission Expires
February 13, 2016

Notary Public in and for the State of Texas

County of Harris

My Commission Expires: February 13, 2016

Accepted as Third Party Beneficiary this_____ day of _____, _____.

Railroad Commission of Texas

By:_____

Title:_____

STATE OF TEXAS
(_____) COUNTY

BEFORE ME, on this the _____ day of _____, 2014 personally appeared _____, _____ on behalf of the Site Remediation Section of the Oil and Gas Division of the Railroad Commission of Texas, known to me to be the person whose name is subscribed to the foregoing instrument, and they acknowledged to me that they executed the same for the purposes and in the capacity herein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE

Signature _____

Notary Public in and for the State of _____

County of _____

My Commission Expires:_____

Accepted as Third Party Beneficiary this 7th day of November 2014

Railroad Commission of Texas

By: Kathy Keils

Title: Attorney, General Counsel Section

STATE OF TEXAS
(Travis) COUNTY

BEFORE ME, on this the 7th day of November 2014 personally appeared Kathy Keils, Attorney on behalf of the Site Remediation Section of the Oil and Gas Division of the Railroad Commission of Texas, known to me to be the person whose name is subscribed to the foregoing instrument, and they acknowledged to me that they executed the same for the purposes and in the capacity herein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE

Signature Kathy Way

Notary Public in and for the State of Texas

County of Travis

My Commission Expires: July 22, 2017

KATHY WAY
Notary Public, State of Texas
My Commission Expires
JULY 22, 2017

Notary without Bond

ATTACHMENT C

Doc# 2003036613

RESTRICTIVE COVENANT

STATE OF TEXAS §
§
COUNTY OF NUECES §

KNOW ALL PERSONS BY THESE PRESENTS THAT:

Pursuant to the requirements of the Railroad Commission of Texas (Commission) pertaining to Oil and Gas Waste and pollution resulting from activities over which the Commission exercises jurisdiction in accordance with Section 91.113 of the Texas Natural Resources Code and Section 26.131 of the Texas Water Code, this Restrictive Covenant is hereby filed in the Real Property Records of Nueces County, Texas in compliance with the remediation requirements of the Commission.

This Restrictive Covenant is filed to provide information concerning certain environmental conditions at the real property described in Attachment 1 and shown on the plat map attached hereto as Attachment 2 (hereinafter "the Former Tank Farm Property"). This Restrictive Covenant further restricts use of the Former Tank Farm Property as set forth herein.

RECITALS:

A. As of the date of this Restrictive Covenant, the record owner of fee title to the Former Tank Farm Property is the Port of Corpus Christi Authority ("Owner"), a political subdivision of the State of Texas, whose address is 222 Power Street, Corpus Christi, Texas 78401.

B. The Former Tank Farm Property was, at one time, owned and operated by American Petrofina Pipeline Company, a former subsidiary of FINA, Inc. (now ATOFINA Petrochemicals, Inc. hereinafter referred to as "ATOFINA") and was used for the storage and handling of crude oil and various substances and chemicals associated with the storage and handling of crude oil. Waste materials associated with these operations at the Former Tank Farm Property and which required remedial action by the Commission are hereinafter referred to as "Oil and Gas Waste Materials".

C. The Former Tank Farm Property is subject to certain regulatory requirements, established by the Commission for investigation and remediation of Oil and Gas Waste Materials in the soil and groundwater on and beneath the Former Tank Farm Property. The remediation requirements for the Former Tank Farm Property are described in "Remediation Completion Report, ATOFINA Petrochemicals, Inc., Harbor Island Crude Terminal Port Aransas, Texas, November, 2002." D. Remediation of the Oil and Gas Waste Materials was conducted by ATOFINA in accordance with a plan approved by the Commission. In accordance with the approved plan, soil containing Total Petroleum Hydrocarbons (TPH) in concentrations exceeding applicable residential TPH-mixture cleanup levels were allowed to remain at the Former Tank

Farm Property. Confirmation excavations of remediated soil that penetrated groundwater in interior portions of the Former Tank Farm Property revealed a hydrocarbon sheen on the water table at a depth of two to three feet below ground surface. Groundwater sampling of monitor wells installed in interior portions of the Former Tank Farm Property and along the perimeter of the Former Tank Farm Property revealed an absence of hydrocarbon sheen and TPH in concentrations below laboratory detection limits

E. The Commission approved the remediation of the Former Tank Farm Property by ATOFINA in a letter dated June 4, 2003.

F. The extent of cleanup approved by the Commission is predicated upon the fact that the Former Tank Farm Property is presently used solely for commercial/industrial purposes, will continue to be used solely for commercial/industrial purposes for the indefinite future, and that groundwater beneath the Former Tank Farm Property will not be used except for purposes of groundwater monitoring. The Commission has determined that the Former Tank Farm Property currently meets all applicable remedial standards for commercial/industrial use.

G. Based on reports submitted by ATOFINA pursuant to the approved work plan, the chemicals of concern at the Former Tank Farm Property pose no significant present or future risk to humans or the environment based on commercial/industrial use. No further remediation of the Former Tank Farm Property is required by the Commission as long as the Former Tank Farm Property is not put to residential use. For purposes of this Restrictive Covenant, the term "residential use" means use for dwellings such as single family houses and multi-family apartments, children's homes, nursing homes, residential portions of government-owned lands (local, state or federal), day care facilities, educational facilities, hospitals, and parks (local, state or federal). If any person intends in the future to use the Former Tank Farm Property for any residential use, the Commission must be notified at least 60 days in advance of such intended use. Additional response action contemplating a change in land use for the Former Tank Farm Property may be necessary before the Former Tank Farm Property may be put to residential use.

H. Information concerning remediation of the Former Tank Farm Property may be obtained from ATOFINA. The mailing address to obtain such information is 15710 JFK Boulevard, Houston, Texas 77032, ATTN: Remedial Manager.

NOW THEREFORE, in consideration of remedial action taken by ATOFINA, and other good and valuable consideration the receipt and sufficiency of which Owner hereby acknowledges, Owner agrees to the following restrictions being placed upon the Former Tank Farm Property, and hereby does place in favor of the Commission, the following restrictions upon the Former Tank Farm Property, to wit:

1. All future uses of the Former Tank Farm Property shall be strictly limited to commercial/industrial use. No part of the Former Tank Farm Property shall be converted to residential use without the prior express written approval of the Commission.

2. Use of groundwater from beneath the Former Tank Farm Property is prohibited except for monitoring purposes.

3. This Restrictive Covenant applies to the entire Former Tank Farm Property as shown on Attachments 1 and 2 attached hereto and incorporated herein fully by reference.

4. These restrictions shall be a covenant running with the land.

For additional information, contact:

Railroad Commission of Texas
Site Remediation Section
Oil and Gas Division
William B. Travis Building
1701 N. Congress Avenue
P.O. Box 12967
Austin, TX 78711-2967
Reference: Operator Cleanup Program (OCP) # 04-1060

This Restrictive Covenant may be rendered of no further force or effect only by written release executed by the Commission or its successor agencies and filed in the same Real Property Records as those in which this Restrictive Covenant is filed.

Executed this 10th day of June 2003.

Port of Corpus Christi Authority
of Nueces County, Texas

By: _____

Name: John P. LaRue

Title: Executive Director

LEGAL FORM APPROVED KLEBERG LAW FIRM

Executed this 27th day of JUNE 2003.

ATOFINA Petrochemicals Inc.

By: _____

Name: Richard L. Charter

Title: Chief Administrative Officer

Accepted as Third Party Beneficiary this 9th, day of July 2003.

Railroad Commission of Texas

By: _____

Name: David W. Cooney, Jr.

Title: Assistant Director, Environmental Law

H:\sarah\TENANT SITE FILES\ATOFINA - REMEDIATION\Restrictive Covenant 6-9-03.DOC

STATE OF TEXAS §
§
COUNTY OF NUECES §

BEFORE ME, on this the 10th day of June, 2003, personally appeared John P. LaRue, Executive Director of the Port of Corpus Christi Authority, known to me to be the person whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 10th day of June 2003.

PEGGY E METTLEN
Notary Public
STATE OF TEXAS
My Comm. Exp. 07 - 09 - 2005

Peggy E. Mettlen
Notary Public in and for the State of Texas,
County of Nueces.

My commission expires: 7-9-05

STATE OF TEXAS §
§
COUNTY OF HARRIS §

BEFORE ME, on this the 27th day of June, 2003, personally appeared Richard L. Charter [*Name*], Chief Administrative Officer [*Title*] of ATOFINA Petrochemicals, Inc., known to me to be the person whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 27th day of June 2003.

JACKIE L. REMINGTON
MY COMMISSION EXPIRES
August 24, 2003

Jackie L. Remington
Notary Public in and for the State of Texas,
County of Harris.

My commission expires: 8-24-2003

STATE OF TEXAS §
§
COUNTY OF TRAVIS §

BEFORE ME, on this the 9th day of July, 2003, personally appeared David W. Cooney, Jr. [*Name*], Asst. Dir. ENVT. LAW [*Title*], of the Railroad Commission of Texas, known to me to be the person whose name is subscribed to the foregoing instrument, and they acknowledged to me that they executed the same for the purposes and consideration herein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 9th day of July 2003.

K. WILLIAMSON
Notary Public, State of Texas
My Commission Expires
JUNE 14, 2007
Notary without Bond

K Williamson
Notary Public in and for the State of Texas,
County of ~~Nueces~~. TRAVIS

My commission expires: 6-14-2007

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ATTACHMENT 1

Legal Description of the Former Tank Farm Property

EXHIBIT A

Land

Attachment 1

FIELDNOTE DESCRIPTION of part of Survey No. 651, part of Survey No. 961, and all of Survey No. 653, situated on Harbor Island, Nueces County, Texas, described as follows:

All of Survey No. 653, recorded in Volume 94, Page 532, part of Survey No. 651, recorded in Volume 94, Page 529, and part of Survey No. 961, recorded in Volume 442, Page 327, all in the Deed Records, Nueces County;

BEGINNING at a concrete monument with a brass pin found at the common corner of Surveys No. 653, 961, 960 and 806;

THENCE, along the southeasterly boundary of that land described as Tract 1 in the deed recorded under Clerk's File No. 888919, Deed Records and continuing along a common boundary with Nueces County Road District No. 4 property as described in deed recorded in Volume 519, Page 158, Deed Records, North 10 degrees-15 minutes-07 seconds East, 962.01 feet to a concrete monument with brass pin found;

THENCE, along the southwesterly boundary of said Road District property, South 45 degrees-59 minutes-12 seconds East, at 2,484.52 feet pass a concrete monument with brass pin found, in all 3,638.05 feet to a 5/8 inch iron rod set on the northwesterly boundary of an 11.47 acre tract described in deed recorded under Clerk's File No. 917610, Deed Records;

THENCE, along the boundaries of said 11.47 acre tract; South 41 degrees-58 minutes-25 seconds West, 33.96 feet to a 6 inch metal fence post found; South 28 degrees-39 minutes-05 seconds West, 353.96 feet to a 5/8 inch iron rod set; South 61 degrees-58 minutes-52 seconds East, 265.00 feet to a 3/4 inch iron rod found; South 26 degrees-01 minutes-28 seconds East, 224.50 feet to a 5/8 inch iron rod found; North 57 degrees-26 minutes-07 seconds East, 243.47 feet to a 5/8 inch iron rod found; South 42 degrees-29 minutes-09 seconds East, 112.08 feet to a 5/8 inch iron rod found; North 50 degrees-48 minutes-44 seconds East, 334.75 feet to a 5/8 inch iron rod found; North 45 degrees-58 minutes-04 seconds West, 72.12 feet to a chiseled cross mark in concrete found; and North 44 degrees-01 minutes East, at 126.48 feet pass a 5/8 inch iron rod found, in all 216.48 feet to the common northeasterly boundary of Survey No. 651 and southwesterly boundary of a 155.00 foot wide strip reserved by the State of Texas for the Aransas Pass Channel, in the waters of the channel;

THENCE, along said common boundary South 45 degrees-59 minutes East, 200.00 feet to the southeasterly corner of Survey No. 651 in the waters of Lydia Ann Channel;

THENCE, along the southeasterly boundary of Surveys No. 651 and No. 653 and a northwesterly boundary of the tract described in the Patent recorded in Volume 455, Page 586, Deed Records, South 44 degrees-01 minutes West, 1,200.00 feet to the southwesterly corner of Survey No. 653 in the waters of the Corpus Christi Channel;

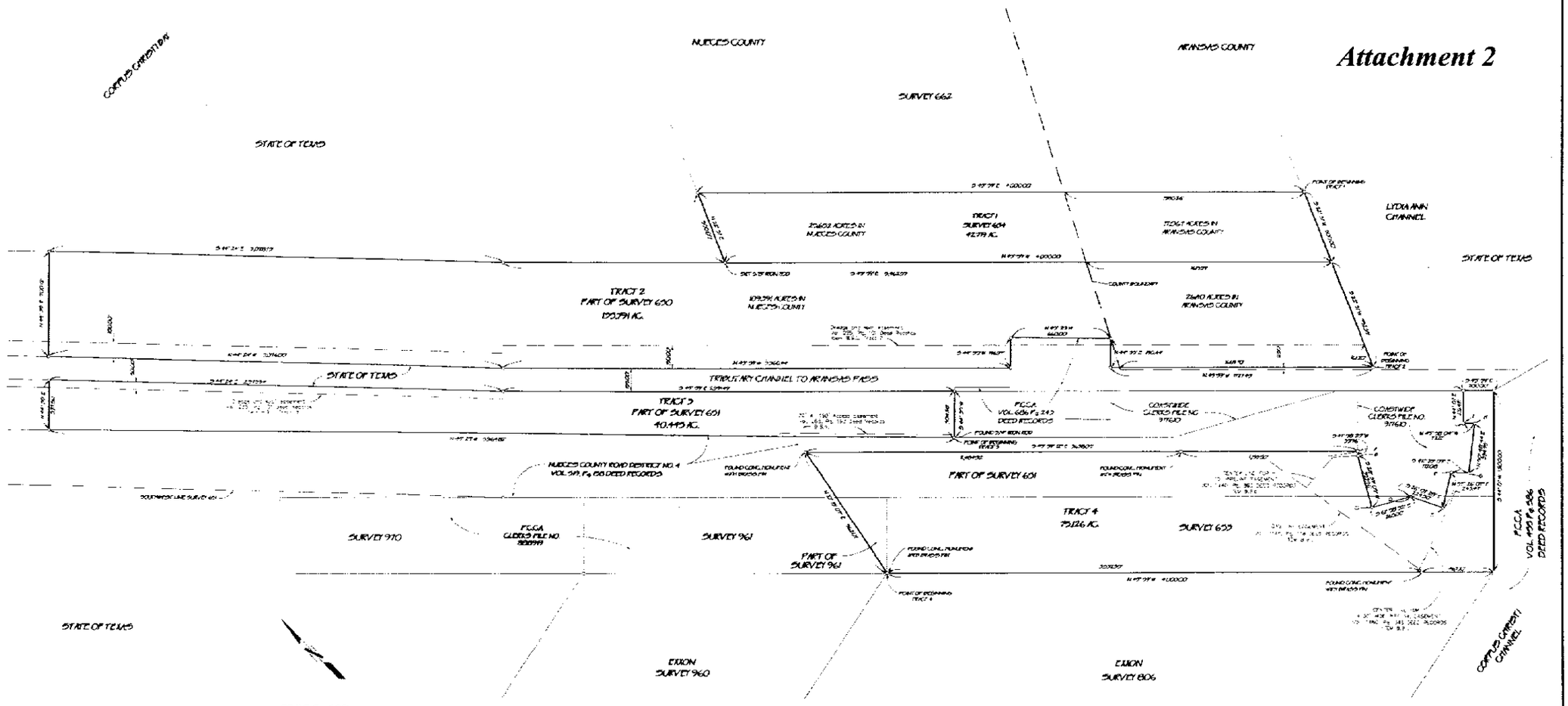
THENCE, along the common boundary between Surveys No. 653 and No. 806, North 45 degrees-59 minutes West, at 467.10 feet pass a concrete monument with brass cap found, in all 4,000.00 feet to the POINT OF BEGINNING.

CONTAINING 75.126 acres.

ATTACHMENT 2

Plat Map of the Former Tank Farm Property

Attachment 2



MONUMENT TABULATION

A SET 5/8" IRON ROD
B FOUND 6" METAL FENCE POST
C SET 5/8" IRON ROD
D FOUND 3/4" IRON ROD
E FOUND 5/8" IRON ROD
F FOUND 5/8" IRON ROD
G FOUND 5/8" IRON ROD
H FOUND 5/8" IRON ROD
I FOUND CHISELED MARK IN CONCRETE

LICENSED STATE LAND SURVEYOR

12-15-95

I HEREBY CERTIFY TO THE PORT OF CORPUS CHRISTI AUTHORITY OF NUECES COUNTY, TEXAS AND TO SAN JACINTO TITLE COMPANY OF CORPUS CHRISTI, TEXAS, THAT I HAVE PERFORMED A SURVEY ON THE GROUND OF THE PROPERTY SHOWN HEREON, THAT THIS SURVEY MEETS THE REQUIREMENTS OF A CATEGORY 1A, CONDITION 2, LAND TITLE SURVEY, AND THAT THERE ARE NO VISIBLE MAN MADE CONFLICTS, PROTRUSIONS, OR ENCROACHMENTS, EXCEPT AS SHOWN.

Michael Haas Licensed State Land Surveyor

HAAS SURVEYING
3370 AVENUE A INGLESIDE, TEXAS 78362
(512) - 776 - 7007

SURVEY OF

Part of Survey No. 650, Part of Survey No. 651, Part of Survey No. 961, All of Survey No. 659 and All of Survey No. 654, Harbor Island, Aransas and Nueces Counties, Texas

Any provision herein which restricts the Sale, Rental or use of the described REAL PROPERTY because of Race, Color Religion, Sex, Handicap, Familial Status or National Origin, is Invalid and unenforceable under FEDERAL LAW, 3/12/89

STATE OF TEXAS
COUNTY OF NUECES
I hereby certify that this instrument was FILED in File Number Sequence on the date and at the time stamped herein by me, and was duly RECORDED, in the Official Public Records of Nueces County, Texas

COUNTY CLERK
NUECES COUNTY, TEXAS

Doc# 2003036613
Pages 10
07/16/2003 09:29:03 AM
Filed & Recorded in
Official Records of
NUECES COUNTY
ERNEST M. BRIONES
COUNTY CLERK
Fees $27.00

Return to: Sarah Kowalski
Port of Corpus Christi Authority
P.O. Box 1541
Corpus Christi, TX 78403

ATTACHMENT D

Harbor Island Investigation & Assessment Activities

Newly Identified Contaminated Areas

- Spill Near Docks
- Contaminated Area

Exxon Restrictive Covenants

- Exxon Restrictive Covenants

PORT CORPUS CHRISTI

ATTACHMENT E

Statement Regarding the Ecological Value of the Aransas Pass Inlet

Prepared by:

Gregory W. Stunz, Ph.D.
Endowed Chair for Fisheries and Ocean Health
Professor of Marine Biology
Harte Research Institute for Gulf of Mexico Studies
Texas A&M University-Corpus Christi
361-825-3254
greg.stunz@tamucc.edu

August 21, 2019

I. BACKGROUND AND EXPERIENCE TO COMMENT ON INLET DYNAMICS

My name is Gregory W. Stunz. I hold the Endowed Chair for Fisheries and Ocean Health and a Professor of Marine Biology at the Harte Research Institute for Gulf of Mexico Studies at Texas A&M University – Corpus Christi. A summary of my career accomplishments is included on my curriculum vitae and is available upon request. It also describes my expertise and includes the complete list of my peer-reviewed publications relating to this subject. I have been promoted through all the academic ranks to Full Professor of Marine Biology, and now hold the Endowed Chair for Fisheries and Ocean Health. I am also the Director for the Center for Sportfish Science and Conservation. My expertise as it relates to this subject involves research on inlet dynamics and marine life recruitment through these areas, ocean/estuarine health, marine fish biology, marine ecology, fisheries management, and fish interactions within their marine ecosystems. I have over 20 years of experience working directly with fish/crustaceans and habitat use in the Harbor Island, Texas area and the associated adjacent bay systems. Moreover, I have been directly involved with reporting and scientific studies delineating desalination plant siting analyses and recommendations for this area.

II. STATEMENT REGARDING ECOLOGICAL VALUE OF THE ARANSAS PASS INLET

This Aransas Pass inlet and associated region is unlike any other along the Gulf Coast in terms of key ecological interactions that occur in the area. This Aransas Pass is the primary conduit for young marine life migrating to and from the Gulf of Mexico to either spawn or reach their nursery habitats. Harbor Island is located at a channel confluence for this major tidal inlet for the region, and the area has a remarkable bottlenecking effect that concentrates marine life, resulting in an extraordinarily high abundance of economically and ecologically important species in the vicinity of the potentially impacted areas due to various development projects (e.g., desalination outflows, VLCC, dredging, and others).[1,2,3]

Thus, detrimental activities, and especially alterations to the water chemistry, flow, and quality have the potential for exponential negative impacts on the marine life using this migration corridor compared to other areas. In addition to marine life impacts, negative alteration to water regimes in this area could affect the population of residents and visitors that rely on a healthy ecosystem for their livelihood and recreation. For example, Aransas Pass connects the Nueces and Mission-Aransas Estuaries to the Gulf of Mexico. This channel has been artificially deepened to allow for ship traffic. An unintended consequence of deepening and increasing the water flow through the inlet was a reduction in the ability of other nearby inlets to remain open, causing them to close due to sedimentation, and resulted in loss

of access to nursery and spawning habitats for marine animals. As a result, the Aransas Pass channel is now the primary conduit for larvae and early juvenile access from the Gulf of Mexico to their nursery areas in Texas' Coastal Bend region.

The Aransas Pass tidal inlet, and passes in general, represent tremendously important ecological hotspots. These conduits are necessary for the Bay-Gulf exchange for a host of marine life including some of the most economically and ecologically important species that occur in the area, and they facilitate key characteristics of their life history (i.e., estuarine dependence) and persistence of their populations. This area is also a key spawning aggregation site for a variety of other important species.[4] Interactions that occur in tidal inlets cannot be compromised, or we risk losing the sustainability that supports multi-billion dollar fisheries (e.g., finfish, crab, and shrimp), livelihoods for residents, and recreation (e.g., fishing) for many local residents and visitors to the region. The fisheries and marine life that support these activities rely on healthy and key water quality attributes, as they move from their adult spawning to nursery grounds in the Gulf of Mexico through these narrow tidal inlets.[2,3] Disrupting these natural processes by impairing water quality has the potential to affect the persistence and sustainability of these species.

For these reasons, this area has been defined as "*Essential Fish Habitat,*" as specified by the Magnuson-Stevens Fishery Conservation and Management Act. Altering the water chemistry and flow through these areas affects fish and other marine species that depend on access through these inlets for survival and reproduction.

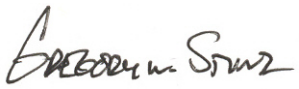
The physical oceanographic and ecological dynamics in inlets result in a concentration of marine life; and in particular, an extraordinarily high concentration of larval finfish and crustaceans. This life stage of these marine animals is extremely sensitive and intolerant of any changes to ambient water conditions, especially salinity.[5] Small changes in ambient water attributes can cause high mortality.[5] These tiny (often microscopic) individuals are transported by tidal currents and lack the ability to maneuver away from impacted areas such as desalination outflows, turbid waters, contaminates, and other impairments. Moreover, spawning adults, larvae, and early juveniles queue on navigational signals provided by lower salinity waters during ebbing tides.[6,7,8] In addition to elevated salinities, decreases in oxygen and water stratification are a major concern that would lead to additional mortality events. Since this area is characterized by an extraordinarily high abundance of animals in their most sensitive live stages, this could have a disproportionate effect on their population dynamics.[9] Together, even with conservative calculations, elevated salinities alone have the potential to result in mortality for literally millions of larvae and nekton during peak recruitment season, and perhaps more depending on the circumstances.

My research team along with other experts performed a recent siting analysis study for desalination in this region[10], and the Harbor Island area was not given consideration due to the importance of this area for many of the reasons described above. There are very feasible alternatives to the location described here that would have much less impact. For example, our analyses show intake/discharge should occur nearshore in the Gulf using infiltration galleries and submerged jet diffusers for effluent. A recent report by the Texas General Land Office and Texas Parks and Wildlife for the 84th legislature for HB 2031, "A Joint Study by the Texas Parks and Wildlife Department and the Texas General Land Office required by HB 2031 (84th Texas Legislature) concerning marine seawater desalination diversion and discharge zones,"[11] recommended permitting zones for brine discharge and diversion. In this report, there was clear

avoidance of tidal inlets that included buffers of several miles away from these ecological hotspots for the reason delineated in this statement.

In conclusion, Harbor Island is one of the key ecological hotspots along the Gulf Coast that is the main conduit that supports the tremendous productivity of our estuaries and provides the underpinning services for key economic drivers in the region. Suitable alternative options to intake, brine discharge, and extensive dredging exist, and these options should be carefully and scientifically vetted against potential environmental impacts. It will be paramount to minimize disruption of these natural processes to preserve the persistence and sustainability for these species and the ecological services provided by the Aransas Pass inlet.

I reserve the right to supplement this report as more information becomes available.



Gregory W. Stunz, Ph.D.

Key Scientific Literature Resources:

1. Brown,C.A., S.A.Holt, G.A.Jackson, G.A.Brooks, and G.J. Holt. 2004. Simulating larval supply to estuarine nursery areas: how important are physical processes to the supply of larvae to the Aransas Pass Inlet? Fisheries Oceanography 13: 181–196
2. Reese, M.M., G.W. Stunz, and A.M. Bushon. 2008. Recruitment of estuarine-dependent nekton through a new tidal inlet: the opening of Packery Channel in Corpus Christi, TX, USA. Estuaries and Coasts 31: 1143–1157.
3. Hall, Q., M.R. Robillard, J. Williams, and G.S. Stunz. 2016. Reopening of a remote tidal inlet increases recruitment of estuarine-dependent nekton. Estuaries and Coasts 39, 1769–1784. https://doi.org/10.1007/s12237-016-0111-3.
4. Bolser, D.G., J.P. Egerton, and B.E. Erisman. (accepted). Spatio-temporal variation in fish abundance and distribution in a large Gulf of Mexico shipping channel. Proceedings of the Gulf and Caribbean Fisheries Institute
5. Holliday, F.G.T. 1969. Fish Physiology. The Effects of Salinity on the Eggs and Larvae of Teleosts. Volume 1: 293-311. ISSN 1546-5098, ISBN 9780123504012.
6. Weinstein, M.P., S.L. Weiss, and M.F. Walters. 1980. Multiple determinants of community structure in shallow marsh habitats, Cape Fear river estuary, North Carolina, USA. Marine Biology 58: 227–243. doi:10.1007/BF00391880.
7. Moser, M.L., and L.R. Gerry. 1989. Differential effects of salinity changes on two estuarine fishes, *Leiostomus xanthurus* and *Micropogonias undulatus*. Estuaries 12: 35–41. doi:10.2307/1351448.
8. Kneib, R.T., and S.L. Wagner. 1994. Nekton use of vegetated marsh habitats at different stages of tidal inundation. Marine Ecology Progress Series 106: 227–238. doi:10.3354/meps106227.
9. Levin, P.S. and G. W. Stunz. 2005. Habitat triage for exploited fishes: Can we identify essential "Essential Fish Habitat?". Estuarine, Coastal and Shelf Science 64:70-78. doi:10.1016/j.ecss.2005.02.007.
10. Stunz, G.W., and P. Montagna. 2015. Identification and Characterization of Potential Environmental Impacts Mitigation Measures Related to Intake and Discharge Facilities of Seawater Desalination Plants. Variable Salinity Desalination Demonstration Project for City of Corpus Christi.
11. TPWD. 2018. Marine Seawater Desalination Diversion and Discharge Zones Study. Accessible at: https://tpwd.texas.gov/publications/pwdpubs/media/hb2031dz.pdf

ATTACHMENT F

Statement Regarding the Ecological and Socioeconomic Value of the Aransas Pass Tidal Inlet

Prepared by:

Brad E. Erisman, Ph.D.
Assistant Professor of Fisheries Ecology
The University of Texas Marine Science Institute
361-749-6833
berisman@utexas.edu
http://fisheries.utexas.edu

August 28th, 2019

Disclaimer: This statement reflects my professional, expert opinion as a fisheries ecologist and is completely independent of my appointment at The University of Texas at Austin. The ideas and perspectives contained in this statement do not represent the position of the University on this topic in any way.

Background and Professional Experience to Comment on Inlet Dynamics

My name is Dr. Brad Erisman. I am an Assistant Professor of Fisheries Ecology in the Department of Marine Science at The University of Texas at Austin, and my research program is housed at the UT Marine Science Institute in Port Aransas, Texas. I am also a resident of Port Aransas. My professional qualifications, achievements, and research activities are summarized within my curriculum vitae, which can be found on my website (http://fisheries.utexas.edu) and is also available upon request. These resources provide substantial evidence of my professional reputation as a well-respected scientist in research related to the reproductive behavior and ecology of economically important fishes, the ecology and management of recreational and commercial marine fisheries, and spatial-temporal interactions between environmental conditions, fisheries, and fish populations. More specifically, I am recognized as a leader in research that focuses on fish spawning aggregations of commercial and recreational marine fishes both regionally and globally, with 20 years of experience in this field. I currently lead a multi-institutional, cooperative research program on fish spawning aggregations and fisheries in the U.S. Gulf of Mexico (https://geo.gcoos.org/restore). As part of this program, I have been studying the spawning, population, and fishery dynamics of fishes within the Aransas tidal inlet for the past five years, with a particular emphasis on understanding the dynamics of sportfishes (e.g. red drum, spotted seatrout, sheepshead) that utilize the inlet as critical spawning habitat. Moreover, my lab has been monitoring the spatial and temporal patterns of fish distributions within the inlet consistently over the past two years, including ongoing collections of environmental, habitat, and bathymetric data.

Statement Regarding the Value of the Aransas Pass Tidal Inlet as Critical Spawning Habitat for Ecologically and Economically Important Marine Fishes

The Aransas Pass tidal inlet is the most important multi-species, spawning site for the most economically valuable sportfishes in the region, which includes red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), sheepshead (*Archosargus probatocephalus*), and black drum (*Pogonias cromis*). In addition, the tidal inlet is the only migratory pathway for the offshore and inshore spawning migration of the local population of southern flounder (*Paralichthys lethostigma*), which is an important recreational and commercial species. Each of these fish species forms spawning aggregations, which are predictable large gatherings of fish at specific times and locations solely for the purposes of spawning. Moreover, the Aransas Pass holds the largest and most productive spawning aggregations for these species in the entire region. Collectively, this site houses large spawning aggregations of different species at different times of the year (e.g. sheepshead in winter and spring; seatrout in spring and summer; red drum in the fall). Therefore, the productivity and resilience of local populations of these sportfishes and the fisheries they support are directly linked to and dependent upon the reproductive activity that successfully occurs at this inlet. Moreover, any disturbances that occur in this area (e.g. increased salinity, reduced oxygen levels, turbidity, noise, habitat alteration) have the potential to reduce spawning activity and reproductive output of these fishes. Given the disproportional number of fish that spawn in this area compared to adjacent areas and the fact that it is the only site for a large expanse of coastline that connects the Gulf to the bays, this could result in a measurable, negative impact on the size and productivity of the regional populations of these fishes. In turn, such a scenario could directly impact local fisheries by reducing the number of fish in the region that are available to be harvested.

From a regional perspective, research led by myself and colleagues from around the Gulf of Mexico (including commercial fishers, recreational fishers, resource managers, scientists) has clearly demonstrates that tidal inlets represent the most important spawning sites in the northern and western Gulf for coastal marine fishes of economic and ecological importance (*see references below*), including species that are managed by both state (e.g. Texas Parks and Wildlife Department) and federal agencies (NOAA National Marine Fisheries). In this region, tidal inlets and channel passes represent ecological nexus points that connect inshore estuarine habitats with coastal, offshore waters and house fish populations that influence the structure of these ecosystems. Tidal inlets are therefore recognized as essential fish habitat (EFH), areas that are necessary for fish spawning, breeding, feeding or growth to maturity (16 U.S.C 1802 (10)). The protection of EFH is a provision of the Magnuson-Stevens Act, the law governing marine fisheries management in U.S. federal waters. EFH is widely recognized by both state and federal agencies as a priority for the management and conservation of coastal marine fishes and their fisheries, because its protection is necessary to maintain productive fisheries and to rebuild depleted stocks.

The characterization and idenfication of the Aransas Pass and other tidal inlets as essential spawning habitat is due to their disproportional productivity (i.e. many species spawn there and in large numbers), and because these sites are very few and separated by large distances (i.e.

represent population bottlenecks). Therefore, the structure, function, resilience, and productivity of fish populations and fisheries are highly dependent upon the maintenance of these key habitats. Stressors and disturbances caused by development activities (e.g. channel deepening, widening, dredging, desalination, pollution, VLCCs, pollution, oil spills) can reduce spawning and productivity through reduced spawning activity, reduced egg production, displacement of fish away from the area, and other non-fatal or fatal effects. Given that fisheries stocks and productivity rely on the production and recruitment of new fish into the population, reducing spawning activities in these crucial sites can directly reduce regional fish population sizes and fisheries production.

The dynamic environmental conditions that define tidal inlets such as the Aransas channel support thriving recreational fisheries that represent the lifeblood of coastal communities and local economies while also serving as important areas for commercial shipping, oil and gas production, and other industrial activities. Currently, there is much need for more robust baseline information and data to create a scientifically-based, sound, predictive framework necessary to assess the potential of the planned activities to impact ecosystem health or the subsequent effects on local communities. There is an urgent need for scientists of multiple disciplines to collaborate with stakeholders and management end-users to understand baseline interactions within these coupled human-natural systems and to assess the potential impacts of industrial developments on ecosystem health and services in tidal inlets. All of these research activities should happen BEFORE any coastal development projects are approved or carried out. This approach will promote resilience by ensuring that the most informed decisions are made when designing development projects in these socially, economically, and ecologically important areas.

I reserve the right to supplement this report as more information becomes available.

Listed below is an abbreviated set of references relevant to this report. More resources and references are available upon request.

Brad E. Erisman

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ATTACHMENT G

(24)

TCEQ Public Meeting Form
April 8, 2019

Port of Corpus Christi Authority of Nueces County
Industrial Wastewater
New TPDES Permit No. WQ0005253000

PLEASE PRINT

Name: Scott Holt

Mailing Address: PO Box 1199

Physical Address (if different): 258 La Joya

City/State: Port Aransas TX **Zip:** 78373

****This information is *subject to public disclosure under the Texas Public Information Act*****

Email: scott.holt@utexas.edu

Phone Number: 361 749 5656

- Are you here today representing a municipality, legislator, agency, or group? ☐ Yes ☐ No

  If yes, which one? _____

☐ **Please add me to the mailing list.**

☒ **I wish to provide formal *ORAL COMMENTS* at tonight's public meeting.**

☒ **I wish to provide formal *WRITTEN COMMENTS* at tonight's public meeting.**

(Written comments may be submitted at any time during the meeting)
Please give this form to the person at the information table. Thank you.

Scott Holt
258 La Joya, Port Aransas, Texas 78373
scott.holt@utexas.edu

Re: Permit number WQ0005253000

The proposed location of the brine discharge is in an area of high biological productivity and of great importance for the immigration of larval stages of marine organisms on their way to critical nursery areas within the estuary. While estuarine organisms are generally tolerant of a range of salinities and temperatures, larval stages are not particularly tolerant. This is especially true where the individual organisms encounter a sharp or sudden change in conditions such as might be expected in a brine discharge zone.

Because of this, it is very important that proper hydrodynamic modeling of the discharge be available to evaluate potential effects on marine life. The CORMIX model was used for this application. While that model is officially recognized by TCEQ and others it is quite generic in its assumptions about the hydrodynamics of the site and seems to assume a laminar flow at a very slow rate (0.05 m/s). Hydrodynamic conditions in the inlet are anything but slow and laminar. While turbulence and strong currents might intuitively suggest more mixing, the actual behavior of the plume can only be known (or approximated) by a full three-dimensional model with real channel configurations and real tidal conditions. Such modeling seems to be underway and verified and critiqued results of that model should be the basis of the decision-making process.

In regard to real conditions, the model conditions for the permit application show the multipoint diffuser located in 63 feet of water. While there might be some 60' plus deep holes in the inlet, the current authorization is for 45' and the new permitted depth is only 54'. Even the CORMIX model should be run at realistic depths. Further, the diffusers are said to be located 300' from the shore or bulkhead. In addition, current plans by the permit applicant are to put two or even three VLCC tankers at essentially the same spot as the discharge diffusers. How will the tankers avoid destroying the diffusers; surely the tankers will be docked within 300' of the bulkhead. Even if the two components (ships and diffusers) are designed and placed to avoid each other, what will the presence of one or two VLCC tankers do the hydrodynamics of that exact location. A generic

conditions model is not sufficient. The aforementioned 3-D model should also be parameterized to adequately account for not only the existing configuration and hydrodynamics of the inlet but must also take into account the presence of one or more VLCC tankers in the immediate vicinity of the brine discharge.

Thank you.

ATTACHMENT H

Recruitment of estuarine dependent species of commercial and recreational importance through the Aransas Ship Channel

White paper prepared by Edward J. Buskey, Professor, Department of Marine Science, The University of Texas at Austin, in December 2018

Several species of shellfish and finfish of commercial or recreational importance in the Nueces and Mission-Aransas Estuaries possess life history patterns that are dependent upon estuaries, whereby juvenile members of these species live and mature in these estuary "nurseries", then migrate to the Gulf of Mexico as reproductive adults, releasing their eggs and planktonic larvae in the open ocean. The larvae feed, grow and develop in the Gulf of Mexico, but must return back to these estuaries to complete their life cycle. These planktonic larvae possess weak swimming skills and are too small to migrate directly back into the estuaries under their own power, so they must depend on hydrodynamic and environmental signals to selectively ride tidal and meteorologically driven currents back into the estuaries and avoid being flushed back out when these currents reverse. Tides are relatively small in the Northwestern Gulf of Mexico, and especially for estuaries in South Texas with little inflow of freshwater, meteorological forcing over times scales of several days play a significant role in estuarine-shelf water exchanges (Smith 1978). The Aransas Pass connecting the Nueces and Mission-Aransas Estuaries to the Gulf of Mexico was originally a shallow inlet between Mustang and San Jose Islands and it has been dredged to allow access for ocean-going vessels to the Port of Corpus Christi. This deeper channel now delivers most of the water exchange between the Nueces/Mission-Aransas Estuaries and the Gulf of Mexico, which has reduced the flow through other shallow historical passes between these estuaries and the Gulf, causing them to fill in with sediments and close unless maintained through dredging (e.g. Fish Pass, Cedar Bayou). As a result of historical passes closing due to the already permitted deepening of the Aransas Pass, this channel is now the main route available for larvae to recruit from the Gulf to local estuaries. It is unclear how additional alterations to the depth of the Aransas Pass and adjacent waters will alter hydrodynamics in this channel, or other remaining channels, and affect the recruitment of estuarine dependent larvae. Below are several examples of important estuarine species that could be impacted.

Shrimp

Brown and white shrimp are both estuarine-dependent species and have similar life history stages (see Figure below). Adult shrimp migrate out to the open Gulf of Mexico through the narrow passes between barrier islands and females spawn their eggs there. Each female will release between 100,000 and one million eggs (a in Figure 1) that typically hatch within one day into larvae called nauplii (b in

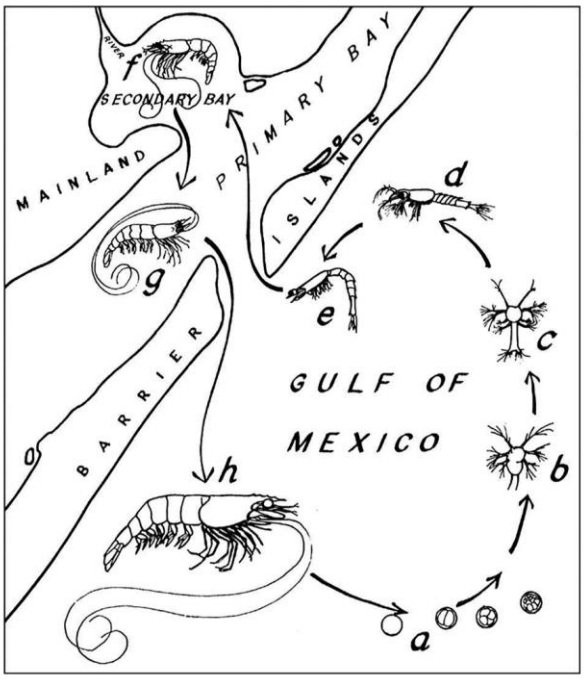

Figure 1. Estuarine dependent life cycle of brown and white shrimp (source: TPWD).

Figure 1). Like all crustaceans, these shrimp possess exoskeletons, and must shed their external shells and molt when they grow. The shrimp larvae molt through several additional developmental stages: protozoea (c), mysis (d) finally becoming postlarvae (e) that are still small (~1/4 inch), transparent, weakly swimming and planktonic, but begin to more closely resemble adult shrimp. Larval shrimp feed on phytoplankton and zooplankton, and are dispersed along the coast by oceanic currents. The postlarvae are carried shoreward by wind-driven currents, and are transported along the shore by longshore currents. When they approach passes between the Gulf and their estuarine nursery grounds they detect the presence of the estuary by sensing the lower salinity waters from the estuary (Matthews et al., 1991). The detection of estuarine water triggers a change in behavior called selective tidal stream transport (Forward et al., 2003), where these small, weakly swimming larvae swim up into the water column on flood tides that carry them into the estuary when they detect increases in salinity. When ebb tides that would carry them back out of the estuary are detected, they swim down towards the bottom where current speeds are slower (Duronslet et al., 1972). When they reach areas of the estuary with seagrasses or other structures that help hide them from predators, they molt into juvenile shrimp (f) and adolescent shrimp (h) before molting to adults that migrate back to the gulf and start the cycles over again (Minello et al., 1989; Rogers et al., 1993).

Blue Crabs

Blue crabs also spawn in the Gulf of Mexico, and possess a complex estuarine dependent life cycle. Spawning females migrate to higher salinities at the mouths of estuaries (Carr et al. 2004, Aguliar et al. 2005) to release multiple clutches of larvae known as zoea, which require full ocean salinity to develop (Darnell et al. 2009). The planktonic zoea live in the ocean for 4-7 weeks before molting into a megalopal stage (Costlow and Bookhout 1959). The megalopae are advected towards estuary mouths by wind driven currents (Epifanio 1995) and move farther up estuary with behavioral adaptations that take advantage of hydrologic movements, such as tides (Forward et al. 2003). These behavioral responses are

triggered by physical factors such as changing salinity and turbulence (Welch and Forward 2001), and possibly by chemical cues associated with estuaries (Forward and Rittschof 1994). The Texas coast has nearly continuous barrier islands separating the Gulf of Mexico from the estuaries, with widely separated narrow passes. These limited passes into the estuaries may make larval recruitment an especially important component of blue crab population dynamics on the South Texas coast.

The behaviors that govern blue crab transport via tides are well understood from studies performed on the US Atlantic coast. Transport is generally limited to the night, as the chemical signature of estuarine waters induces photoinhibition of megalopae activity during daylight, and megalopae only actively swim at night when in the estuarine plume. Welch and Forward (2001) experimentally demonstrated a mechanism for the transport of blue crab megalopae into Atlantic coast estuaries known as selective tidal-stream transport (later reviewed by Forward et al. 2003). Their model proposed that megalopae utilize nocturnal flood tides to move up estuaries, and avoid being transported back out to sea on the ebb tide through a series of responses to changes in salinity and turbulence: (1) Megalopae swim up into the water column in response to increasing salinity and pressure indicating flood tides (2) Megalopae remain swimming in response to high levels of turbulence indicating tidal current (3) Megalopae descend when turbulence declines during slack tide and (4) Megalopae are inhibited from rising again with the ebb tide by decreasing salinity and pressure. While this model is plausible for estuaries on the Atlantic coast that have larger tidal ranges and more consistent freshwater inflows, several issues arise when applying this behavior-response model to transport in systems like the Mission-Aransas Estuary in Texas. In the Gulf of Mexico, tidal ranges are relatively small (Smith 1977). These weaker tides may result in rates of pressure and salinity change too low to stimulate a swimming response (Tankersley et al., 1995), and move smaller volumes of water than more extreme tides observed on the Atlantic. However, recent studies indicate that blue crab megalopae from the Aransas Pass of South Texas have adapted to local conditions and are more sensitive to small changes in salinity than megalopae from the Atlantic Coast (Bittler et al., 2014). Tidal currents alone may not be enough to transport blue crab megalopae into Texas estuaries, and a model of planktonic larval transport for the area has suggested that wind forcing by persistent storm-related or onshore winds is a more important process driving transport of estuarine dependent larvae (Brown et al., 2005).

Fish species of commercial and recreational importance: spawning aggregations

The Aransas Ship Channel is the only connection between local bays and estuaries and the coastal ocean for tens of miles in either direction. As such, it is a critical area for the movement of fishes between these two habitats. The Red Drum (*Scianops ocellatus*), Southern Flounder (*Paralichthys lethostigma*),

Speckled Trout (*Cynoscion nebulosus*), and Sheepshead (*Archosargus probatocephalus*) are some of the best-known fishes that take advantage of this passageway, and all of these important fishery species do so for reasons associated with spawning. While Southern Flounder just pass through, Red Drum, Sheepshead, and Speckled Trout (*Cynoscion nebulosus*) come from miles around to spawn in the channel itself. The Aransas Channel and other ship channels like it have recently been identified as crucial multi-species fish spawning aggregation sites in the Gulf of Mexico (Grüss et al. 2018). Fish spawning aggregation sites are massive gatherings of fish for breeding, a behavior shared by many species across the globe in many different habitats. Fishes select sites such as the Aransas Channel due to their specific physical properties (e.g. geomorphology, currents) (Heyman and Kjerfve 2008), and these areas support the fish populations and fisheries of the wider region (Sadovy de Mitcheson and Erisman 2012). Spawning aggregations occur at all times of year - in the Aransas Channel, Red Drum form large spawning aggregations in mouth of the channel during the fall months (the 'Redfish Run') (Holt 2008), Sheepshead form large spawning aggregations on the rocky jetties that line the channel in the spring (Bolser et al. *in prep*), and Speckled Trout form spawning aggregations in the channel in the summer (Biggs et al. *in prep*). The predictable presence in time and space of these aggregations facilitates the success of Port Aransas' highly productive fishing industry, which is an indispensable part of the region's economy.

The effects of short-term physical disturbances such as dredging and longer-term changes such as significant deepening of the Aransas ship channel on fish spawning aggregations have not been studied in this region. It is likely that the specific geomorphology of the channel has caused fish species to select it as an spawning site, and alterations in depth might cause it to no longer be suitable. In addition, disruption of the current flow regime could affect the transport of eggs and larvae that result from spawning aggregations to the bays and estuaries of the area, which are critical nursery areas for economically-important sport fishes (Rooker et al., 1998). Therefore, it is of critical importance to fully understand the movement, spawning, and larval transport dynamics of fishes in the area before undertaking major alterations to this critical habitat and use the information to eliminate or severely reduce any impacts on these critical natural resources, and monitor these spawning and larval transport activities before and after any significant changes are made.

Fish larval supply and retention in estuaries: role of physical processes

The supply of larval fishes from the Gulf of Mexico to South Texas estuaries may be controlled by circulation through tidal inlets into estuaries (Jenkins et al., 1997). Episodic pulses of high abundances

of fish larvae in tidal passes are commonly observed for estuarine-dependent fish species (Hettler et al., 1997). The spatial and temporal variability of both larval abundance and tidal and meteorological influenced currents (Smith, 1977, 1979) make it challenging to determine the respective roles of larval abundance, hydrodynamics other factors to determine the dominant factors affected recruitment of estuarine dependent larval fishes. Efforts to correlate abundances of larval fish with environmental variables have proved to be especially challenging (Dixon et al., 1999). Combining direct observations with numerical models of site-specific hydrodynamics and simulated larval transport can aid in understanding of the roles of the dominant processes affecting larval recruitment, and can aid in the design of field based studies (Werner et al., 1999).

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