North Beach Navigable Canal Phase II – Cost Estimating

City of Corpus Christi / Project # 20277

6/3/2021

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Executive Summary

In December 2019, the City of Corpus Christi City Council passed an ordinance (# 031970) authorizing a $41 Million dollar project on North Beach in Corpus Christi, Texas to design and construct a navigable canal.

LAN recently completed Phase I of this project which advanced the concepts previously developed by the City and finalized the navigable canal's scope and project limits. Phase I's ultimate objective was to investigate the project for its intended use of being navigable and a improve drainage for the North Beach area.

On January 26th, 2021, LAN briefed City Council on the results of the Phase I analysis and it was concluded that three options would be further investigated for cost. On February 4th, LAN met with the city staff to discuss three options that LAN would provide cost estimates for and receive direction from staff on how to proceed. The following options were approved:

- Option 1 – Stormwater Conveyance & Ditch Improvements
- Option 2 – Natural Channel / Linear Park Improvements
- Option 3 – Navigable Canal (2 Alternatives)
    - Alternative A – Canal Exit to Rincon
    - Alternative B – Canal Exit through Beach

Phase II scope of services includes data collection, conceptual layouts, utilities research, and determination of costs for each item. Each Option includes drainage, street, pedestrian, parks, and utility improvements. Additionally, each option includes earthwork (cut and fill) required to raise elevations enough to improve drainage. All Options are conceptual and require detailed design and more investigation if the client wants to consider them for future development.

<u>Summary of Costs</u>

Project costs for each option were developed in four different categories:

- Land /Right-of-Way
- Construction Costs
- Design / Surveying / Testing
- Project / Program Management

Below represents the Total Project Costs, assuming the entire project were designed and constructed at one time (Ultimate Build-Out). Priorities of construction and phasing costs are discussed in Section 5 of the report.

Additionally, for budget considerations, each project was separated into three possible funding sources: Utilities, Drainage, and Streets / Site Improvements. The second tables below reflects those costs.

<u>Option 1 – Storm Water Conveyance & Ditch Improvements</u>

Option 1 provides for <u>short term improvements</u> to the existing drainage systems. The basis for these improvements is the 2018 Feasibility Study by HDR, Inc. however, LAN has included several recommendations from the Phase I drainage study that provide for additional benefits to North Beach. Not included in Option 1 are any natural channel or navigable canal improvements along Surfside and Timon Boulevard. Additionally, it is important to note that this project does not fully address coastal flooding, nor does it address the concerns of siltation and sedimentation in the existing systems.

Option 1 Ultimate Costs

Ultimate Build-out	
Option 1 - Storm Water Conveyance & Ditch Improvements (Base Bid)	
Land / Right-of-Way	$582,832
Construction	$14,334,850
Design / Survey / Testing (10%)	$1,433,485
Project / Program Management (5%)	$716,743
Total Opinion of Probable Project Costs	**$17,067,910**

Option 1 Costs by Funding Source

Option 1 - Total by Funding Source	
Total Utilities	$3,749,863
Total Drainage	$9,933,400
Total Streets / Site Improvements	$3,384,647
Grand Total	$17,067,910

Option 2 – Natural Channel / Linear Park Improvements

This project provides for long term improvements to the existing drainage systems through the construction of an open natural channel system through the middle of North Beach. Similar in concept to San Pedro Creek (https://spcculturepark.com/about/) in San Antonio, this natural channel system will improve drainage, protect from flooding, and incorporate the natural environment with a linear park.

With projects like this, opportunities exist to combine public art, architectural design, local craft, and historic preservation with engineering, ecosystem restoration, and native / coastal landscaping. In addition to safely conveying flood waters, low impact design elements could improve water quality. Additionally, the channel creek can be a catalyst for economic development.

Option 2 Ultimate Costs

Ultimate Build-out	
Option 2 - Natural Channel / Linear Park Improvements (Base Bid)	
Land / Right-of-Way	$582,832
Construction	$28,122,219
Design / Survey / Testing (10%)	$2,812,222
Project / Program Management (5%)	$1,406,111
Total Opinion of Probable Project Costs	**$32,923,384**

Option 2 Costs by Funding Source

Option 2 - Total by Funding Source	
Total Utilities	$5,191,668
Total Drainage	$14,230,579
Total Streets / Site Improvements	$13,501,137
Grand Total	$32,923,384

Option 3 – Navigable Canal

This project provides for long term improvements to drainage through the construction of navigable canal through the middle of North Beach.

- Alternative A - Navigable access to Corpus Christi Bay will be located adjacent to the North Beach Jetties.
- Alternative B - Navigable access to Corpus Christi Bay will be through the beach along Breakers Street, adjacent to Surfside Boulevard and Burleson Street.

This project would include the construction of a concrete, steel, or concrete-vinyl hybrid bulkhead (alternative costs are included in the OPCC's) and provides for navigation and access to Corpus Christi Bay for boats or other pleasure craft, as analyzed in Phase I of this project.

Option 3A Ultimate Costs

Ultimate Build-out	
Option3A - Navigable Canal - Rincon Outlet (Base Bid)	
Land / Right-of-Way	$1,200,250
Construction	$57,904,419
Design / Survey / Testing (10%)	$5,790,442
Project / Program Management (5%)	$2,895,221
Total Opinion of Probable Project Costs	**$67,790,332**

Option 3A Costs by Funding Source

Option 3A - Total by Funding Source	
Total Utilities	$7,587,454
Total Drainage	$43,565,689
Total Streets / Site Improvements	$16,637,190
Grand Total	$67,790,332

Option 3B Ultimate Costs

Ultimate Build-out	
Option3B - Navigable Canal - Beach Outlet (Base Bid)	
Land / Right-of-Way	$1,200,250
Construction	$58,364,762
Design / Survey / Testing (10%)	$5,836,476
Project / Program Management (5%)	$2,918,238
Total Opinion of Probable Project Costs	**$68,319,726**

Option 3B Costs by Funding Source

Option 3B - Total by Funding Source	
Total Utilities	$7,587,454
Total Drainage	$45,792,500
Total Streets / Site Improvements	$14,939,772
Grand Total	$68,319,726

Prioritization of Improvements

For each option, project improvements were categorized into three "buckets" or priorities based on importance to improve drainage on North Beach. The ultimate goal for each project is to improve drainage on North Beach; therefore Priority 1 costs support that goal. Other improvements, particularly additional earthwork, streets improvements, pedestrian facilities, and parks improvements are not in direct support of drainage, however they can improve the area further with the replacement of additional ageing infrastructure. These additional improvements were considered Priority 2 and 3.

Phasing Considerations

Each Project (Option 1, 2, 3A, 3B) should be constructed in Phases. Several factors contribute to this, in particular the Harbor Bridge project. LAN has proposed a three phased approach to completing the construction of the projects:

- Phase 1 – Utilities Relocations / Construction
- Phase 2 – Drainage Improvements
- Phase 3- Streets / Site Improvements (Priority 2-3)

Costs per Phase are detailed in Section 5 of the report, Individual line item costs are provided in Appendix A, and Conceptual Layouts are located in Appendix B.

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1 Introduction

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On January 26th, 2021, LAN briefed City Council on the results of the Phase I analysis and it was concluded that three options would be further investigated for cost. On February 4th, LAN met with the city staff to discuss three options that LAN would provide cost estimates for and receive direction from staff on how to proceed. The following options were approved:

- Option 1 – Stormwater Conveyance & Ditch Improvements
- Option 2 – Natural Channel / Linear Park Improvements
- Option 3 – Navigable Canal (2 Alternatives)
    - Alternative A – Canal Exit to Rincon
    - Alternative B – Canal Exit through Beach

1.1 Phase II - Scope of Services

Phase II will consist of all efforts required to estimate the costs of each of the three options above:

Task 100 – Data Collection & Project Management
Task 101 – Conceptual Layouts & Existing Utilities
Task 102 – Opinions of Probable Project Costs
Task 103 – Technical Memorandum

Task 100 – Data Collection & Project Management

1. <u>Data Collection</u>
   LAN gathered and reviewed readily-available reports and City-provided planning documents including long and short-range plans, area development plans, capital improvement plans, GIS data bases including streets and utility master plans.

2. <u>Meetings</u>
   a. Kickoff Meeting
   b. Client Review Meeting
   c. Phase II Presentation to Council

Task 101 – Conceptual Layouts & Existing Utilities

1. <u>Conceptual Layouts</u>
   LAN utilized the information gathered in Task 100 to develop conceptual level layouts for each of the three options including improving those layouts presented for Options 3A and 3B in LAN's Phase I report according to discussion with the City staff.

Because two of the three options were not part of LAN's Phase I Report, these options required exhibits to be made that aligned with the previous consultants recommendations and the vision / direction of the City of Corpus Christi.

Conceptual site layouts show proposed stormwater / drainage improvements (open channels, ditches, underground conveyance systems), street improvements, structures, pedestrian facilities and park amenities. Layouts will delivered on 11x17 plan sheets with one (1) typical cross section for each option. Options 3A and 3B cross sections presented in Phase I did not change.

2. Existing Utilities Maps
   a. Third-Party Utility Research – LAN completed an 811 ticket to identify third-party utilities that may be in conflict with proposed project improvements and include the locations of those utilities on the existing utilities maps. This work did not include subsurface utility engineering (SUE) or identifying the depth of existing utilities using pot-holing or other SUE methodologies. LAN completed phone calls with each of the third-party utility owners to ask or answer questions about the locations of their utilities.

   b. LAN utilized the GIS data collected from the City of Corpus Christi (Task 100) and developed existing utility base maps for water, wastewater, stormwater, and gas utilities using ARC-GIS software.

   c. LAN tabulated all existing utilities in a matrix spreadsheet. This tool could be used to track conflicts and relocations as the project develops further.

Task 102 – Opinions of Probable Project Costs

1. Cost Determination
   LAN utilized the information gathered and researched available databases such as the RSMeans, TXDOT Statewide Monthly Construction Cost Averages, and CIVCAST, to develop conceptual level opinions of probable costs for each of the options listed above.

2. Cost Validation / Quality Control
   LAN performed an internal quality control review of the opinions of probable projects costs in accordance with LAN Quality Control / Assurance Best Management Practices.

Task 103 – Technical Memorandum

1. Draft Memorandum
   LAN completed a Draft Technical Memorandum that includes the results and determinations made in the tasks above. The report will include descriptions of the features and improvements recommended for each option, summarize the data used and resources to determine unit costs, and summarize project costs for each option. The report Appendices include project exhibits, existing utility data, and the detailed opinions of probable costs for each option.

2. Final Report - LAN will receive review comments from the client and incorporate those into a final, signed, and sealed technical memorandum.

1.2 Phase I Conclusions & Clarifications

The objective for Phase I of this project was to investigate the project for its intended use of improving drainage and being navigable at North Beach. LAN developed and analyzed two different options or configurations for a navigable canal; Option 1 (3A) includes an inlet/outlet to the bay at the northern end; Option 2 (3B) is a shorter canal with an inlet/outlet to the bay at the center of the North Beach. Several questions were presented during the January 26th Council meeting. We have bolded several items below to provide for additional clarification.

1.2.1 Drainage Analysis

Based on our review of previous studies and field inspections performed by LAN, we have concluded that the existing storm sewer system has issues such as siltation in the pipes and flow line elevations below mean sea level. These in of itself create problems with providing adequate drainage during routine rainfall events.

Additionally, there are **two primary sources** for flooding or ponding on North Beach:

1. **Rainfall** accumulation in lower areas, poor grading and drainage into and out through the existing underground systems.
2. Higher than normal **tides**, push water from the Bay into lower areas along the beach, including parking areas and streets, poor grading and drainage does not allow for tidal waters to drain into the existing systems

LAN's drainage analyses concluded that the proposed navigable canal could improve drainage from rainfall and tidal events; however, <u>to achieve maximum benefit</u>:

- The adjacent areas would need to be raised to a minimum elevation of +6.5 (NAVD-88) near the beach property lines and along Seagull Boulevard.
- The existing storm sewer system would have to be replaced and redirected towards the canal rather than the current north-south conveyance in-place.
- Raising of North Beach to the necessary elevations would require an average of 2-3 feet of fill over the entire project area.
- The amount of fill required, exceeds the quantities of what would potentially be dredged from the canal; therefore, suitable material would have to be imported from somewhere else.
- Raising the site would likely be a long-term initiative required as part of a master development plan that coincides with the drainage system. It would need to be developed and enforced by the City.
- Addressing existing structures and future development plans to accommodate the filling, grading and building the new storm sewer system was not included in this phase of the project.

1.2.2 Navigability

With regards to navigability, the proposed canal could be accessible to most recreational pleasure craft that are common to the Coastal Bend. There are restrictions however, for larger watercraft, such as long yachts (+50-foot length) and tall sailboats (+20-foot height). Primarily because water crossings would be necessary over the canal to accommodate traffic and provide access for public safety. These water crossings limit the types of watercraft on the canal.

1.2.3 Water Quality Clarifications

Numerical modeling was conducted to help evaluate tidal exchange between the proposed North Beach Navigable Canal and Corpus Christi Bay, and to evaluate Water Quality conditions that may occur in the

canal under various design layouts. **The modeling results show that both proposed Options could meet TCEQ's Dissolved Oxygen (DO) criteria.** The additional culvert on the south end of the proposed canal would promote better exchange of water in and out of the canal to the bay. The results of the modeling showed that DO levels at the bottom of the canal could be a concern and might produce bacteria in excess of limits established by TCEQ, but these **concerns could be addressed in design**, and are **not fatal flaws** for the design and construction of the proposed canal.

1.2.4 Access

Traffic patterns to four key destinations on North Beach were assessed to develop impacts that may come as a result of the proposed canal improvements. Based on assessments, the proposed canal will cut off traffic from east to west across the entire area, side streets that typically carried traffic from US181 to key destinations would be cut-off, and traffic would have to be routed differently than it is now.

Additionally, due to the fact that the Harbor Bridge Project will only provide for one exit to North Beach, increased quantities of traffic have the potential for reducing the levels of service at Beach Avenue. Several short term and long term recommendations to mitigate these impacts were presented in the report, including improved signage, striping, and routing of traffic at the Beach Avenue exit, capacity improvements to several key collector streets, and conversions of some of the roadways from one-way to two-way streets. To address access from one side of the canal to the other, bridge crossings were recommended for both Options.

1.2.5 Regulatory

During Phase I, we made initial contact with the United States Army Corps of Engineers (USACE) to discuss potential regulatory requirements for the proposed canal. We also completed desktop assessments to determine potential impacts to Waters of the United States, wetlands, threatened and endangered species, and cultural resources, located in or near the project area. Based on the USACE, an Individual Permit would be required; this permit may take 18-24 months to receive and will require public and interagency input and coordination. **Our initial assessments discovered minimal impacts to wetlands, endangered species, or cultural resources; however, the permitting process will determine further requirements to mitigate impacts.**

1.2.6 Phase I Conclusions

In Phase I, LAN concluded that either navigable canal option could improve drainage from both rainfall and tides, but to accomplish maximum benefits, storm sewer systems will need to be improved and certain areas filled and regraded.

Additionally, LAN concluded that effects from storm surge or hurricanes will not be addressed with construction of a canal. Only constructing other resiliency measures such a seawall (similar to the flood protection system in Downtown Corpus Christi), would provide protection from large surge events.

2 Drainage Improvement Options

Opinions of Probable Costs were developed for three primary options:

- Option 1 – Storm Water Conveyance & Ditch Improvements
- Option 2 – Natural Channel / Linear Park Improvements
- Option 3 – Navigable Canal

Option 3 involves two (2) alternatives for navigable access to Corpus Christi Bay:

- Alternative A – Canal Exit to Rincon
- Alternative B – Canal Exit through Beach

NOTES:

- Each option includes drainage, street, pedestrian, parks, and utility improvements.
- Each option includes earthwork (cut and fill) required to raise elevations enough to improve drainage.
- **All options are conceptual and will require additional analysis and detailed design if the client desires to consider them for future development.**
- **All options are based on improving drainage for existing land uses and client area development plans; the project was not conceptualized around any proposed development.**

2.1 Option 1 – Storm Water Conveyance & Ditch Improvements

This project provides for short term improvements to the existing drainage systems. The basis for these improvements is the 2018 Feasibility Study by HDR, Inc.. LAN has included several recommendations from the Phase I drainage study that provide for additional benefits to North Beach.

Not included in this project are natural channel or navigable canal improvements along Surfside and Timon Boulevard. Additionally, it is important to note that this project does not fully address coastal flooding, nor does it address the concerns of siltation and sedimentation in the existing systems.

2.1.1 Storm Water Conveyance Improvements

Like the HDR Study (2018), this project calls for a new 6-foot x 6-foot Reinforced Concrete Box culvert (RCB) system in East Surfside Boulevard from Burleson to a new outfall along Pearl Street. This system would replace the existing system along the beach that has had previous issues with siltation, requiring frequent maintenance.

A system of new storm water pipes would connect into the new RCB in Breakwater, Bridgeport, Coastal, Elm, Golf, Kleberg, Paul, Hotel, and Breakers Streets. These pipes would either be 18-inch or 24-inch diameter, based on the size of their contributing drainage basins. They would also include new street inlets and improvements to the street paving, curb, and gutter.

The existing underground conveyance system that outfalls to the south would be abandoned in place. The existing system that outfalls to the north would remain in place with new inlets and manholes. To quantify existing repairs, LAN recommends inspecting and/or smoke testing the existing systems during preliminary design to locate and identify defects that are contributing to poor drainage.

2.1.2 Open Ditch Improvements

This project calls for regrading all existing roadside ditches, including the area between Surfside and Timon Boulevard, and directing flow towards the center of the project area with new conveyance systems and the installation of cross drainage culverts at intersections and driveways.
The larger regraded ditch system along Surfside Boulevard from Burleson to Beach would provide for the collection of stormwater along the center of the project area and would outfall in to the wetlands to the north.

Additionally, consistent with HDR's Study (2018), a new open ditch would be constructed along the beach from Gulfspray to Dolphin Park to provide for improved drainage of those areas east of Gulfbreeze Boulevard to the beach and outfall into the existing system at the north. This ditch provides additional benefit by collecting high tidal waters in this area and holding them until they infiltrate into the soil.

Additionally, two at-grade crossings (Bridge-class culverts) at Gulfspray and Beach Avenues will be required to cross the open ditch system.

2.1.3 Street Improvements

A limited amount of street improvements are required for the improvements to the storm water conveyance systems and ditches. Two types of street improvements will be necessary: Pavement repair and Full-Depth Reconstruction.

Pavement Repair - It is recommended that East Surfside, Pearl, Breakwater, Bridgeport, Coastal, and Elm get pavement repairs over the proposed new storm water pipes. Pavement repairs will be made in accordance with City of Corpus Christi Standard Trenching and Backfill Standards.

Full-Depth Reconstruction - It is recommended due to the poor condition of the streets, that Golf, Kleberg, Paul, Hotel, Breakers and East Surfside (leading into the Park) receive full-depth reconstructions. These streets would get new stormwater inlets too.

Since these streets will be fully reconstructed, they should also be raised just enough to affect positive drainage but not to cause flooding of adjacent private properties. On average these streets would be raised one (1') to two (2') feet.

2.1.4 Access Improvements

Although not directly related to the drainage improvements but important to the future of North Beach, this project would include access improvements at Beach Avenue. As previously mentioned, the Harbor Bridge Project will only provide for one exit to North Beach, and increased quantities of traffic have the potential for reducing the levels of service at Beach Avenue. Any proposed drainage improvements would result in increased development and increased traffic to North Beach.

Option 1 opinions of probable costs include improvements to Beach Avenue, Seagull, and Reef Avenue to accept additional traffic to North Beach. Beach Avenue (60-foot ROW) would be widened to 80-foot; turning lanes, signing, and striping improvements, and capacity improvements are necessary.

Consistent with the Phase I report, LAN proposes that traffic entering North Beach use Reef Avenue, rather than Beach Avenue. This would allow Beach Avenue to carry exiting traffic from North Beach. Reef Avenue (60-foot ROW) would require a new street construction from the US181 feeder road to Timon Boulevard to accommodate future traffic.

2.1.5 Pedestrian Improvements

In connection with the street enhancements that are necessary with the proposed storm water conveyance & ditch Improvements, major street corridors like Timon, Surfside, and Beach will include standard concrete pedestrian sidewalks on both sides of the street. Minor cross streets, like Golf, Kleberg, etc. will include sidewalks on one side of the street. All pedestrian facilities and cross walks will be ADA compliant.

In addition to the concrete sidewalks, this project includes a shared use path between Surfside and Timon Boulevards.

2.1.6 Park and Placemaking Improvements

Option 1 will only include park improvements within the center median between Surfside and Timon Boulevards. This includes a limited amount of fill, topsoil, and seeding.

2.1.7 Land and Right-of-Way Requirements

Generally, the proposed drainage and street improvements above will be completed within the current right-of-way, however the above-mentioned access improvements would require additional right-of-way to be acquired. Beach and Reef Avenue improvements would require approximately **two (2) acres** of private property to expand the capacities of those two roads. Option 1 would not require land acquisition in the area under the existing Harbor Bridge.

2.1.8 Utilities Relocations

This project would require the relocations of several utilities within the areas of the proposed storm water conveyance and street improvements. The Tables below include those utilities by linear feet and size for each utility within the project area that would require relocation:

Table 1 – Potential Water Line Relocations

Water Lines Lengths (LF) / Size						
	6" W	8" W	10" W	12" W	16" W	Total
Total Water Lines in Project Area	14,608	8,065	51	1,280	5,880	29,884
Option 1 - Required Relocations	**2,790**	**4,888**	**0**	**611**	**2,689**	**10,978**

Table 2 – Potential Gas Line Relocations

Gas Lines Lengths / Size					
	2" DIP	4" DIP	6" DIP	8" DIP	Total
Total Gas Lines in Project Area	17,007	5,744	3,159	3,206	29,115
Option 1 - Required Relocations	**8,225**	**1,158**	**0**	**3,028**	**12,411**

Table 3 – Potential Sanitary Sewer Line Relocations

Sanitary Sewer Lines Lengths (LF) / Size				
	8" CIPP	8" PVC	8" VCP	Total
Total Wastewater Lines in Project Area	9,324	11,226	10,938	39,052
Option 1 - Required Relocations	**490**	**1978**	**1321**	**3,789**

Sanitary Sewer Lift Stations – There are three lift stations located within the project area (Hayes Street, Surfside Park, and Coastal Avenue). Option 1 will not require the relocations of these lift stations however open ditch improvements in between Timon and Surfside Boulevards in the vicinity of Hayes Street will require consideration for maintaining the existing lift station in its' current location.

Table 4 – Existing Sanitary Sewer Lift Stations

Lift Station Name	Lift Station No.	Address	# of Pumps	Model	Imp Code or Dia.	HP	Wet Well Size (Ft)
North Beach "B"	34	3002 Timon Blvd	3	CP-3201.180	454	30	10' x 10'
North Beach "C"	35	3818 Surfside	3	NP-3127-180	438	10	10' x 10'
North Beach "D"	36	4320 Timon Blvd	2	NP-3127-185	438	10	10' x 10'

Sanitary Sewer Manholes – Streets requiring to be raised or repaved will include minor adjustments to the sanitary sewer manholes by raising the rim elevations of these manholes to the proposed elevations.

Storm Water Utilities – As previously mentioned, the existing underground conveyance system that outfalls to the south would be abandoned in place. The existing system that outfalls to the north would remain in place with new inlets and manholes, as necessary.

2.2 Option 2 – Natural Channel / Linear Park Improvements

This project provides for long term improvements to the existing drainage systems through the construction of an open natural channel system through the middle of North Beach. Similar in concept to San Pedro Creek (https://spcculturepark.com/about/) in San Antonio, this natural channel system will improve drainage, protect from flooding, and incorporate the natural environment with a linear park.

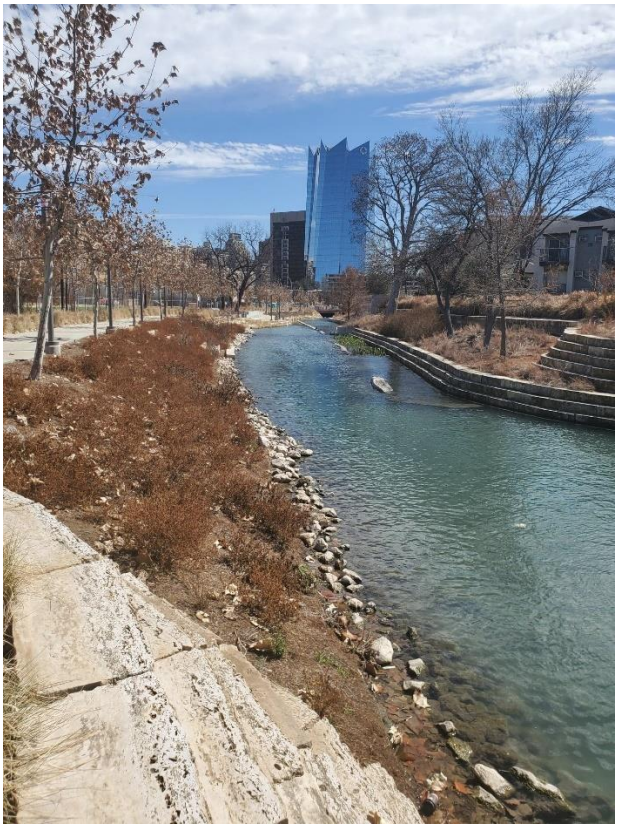


Figure 1 – Example of Natural Channel Design

Four benefits for a linear park include:

- Flood Mitigation – by deepening and widening the center median between Surfside and Timon and providing for ditch grading and improved underground systems, the project will contain the 100-year flood plain.
- Economic Development – Although an economic benefit analysis has not been performed specifically on the linear park project, similar projects of this type, size, and scope have generated economic benefits such as new housing, new businesses, tourists, and ultimately increase in property value and Ad Volerum tax revenue.
- Water Quality – through the use of low impact development features including bioswales, aquatic plantings, removal of floatables, and landscaping, the project can advance he water quality and ensure the sustainability of adjacent wetlands and habitats.
- Cultural Linkages – this project has opportunities exist to combine public art, architectural design, local craft, and historic preservation with engineering, ecosystem restoration, and native / coastal landscaping.

It is important to note that this project would not include the construction of concrete or steel bulkheads nor provide for navigable access to Corpus Christi Bay for boats or other pleasure craft, as analyzed in Phase I of this project.

2.2.1 Natural Channel Improvements

This project calls for the construction of approximately 6,800 LF of open natural channel through the center of North Beach, beginning on the south end at Breakwater Boulevard and ending near Sandbar Avenue, at the north.

The hydraulic footprint of the channel would allow for flood mitigation benefits as well as provide sufficient room for walkways to develop the project into an amenity. The channel would be a concrete channel with a natural-looking bottom, side slopes using mechanically stabilized earth walls and cut stone, and deliberately planted vegetation would allow for resiliency during significant flooding events. Local drainage that enters the channel along the project would be intercepted and discharged below the water surface to further create and maintain the natural channel look and feel.

The natural channel would generally be trapezoidal shaped, 6 to 8-feet deep (below Mean Sea Level), 2:1 to 3:1 side slopes (depending on ROW), and between 30-feet and 48-feet wide at the top of bank.

2.2.2 Storm Water Conveyance Improvements

Natural Channel Outfalls - This project includes a new 6-foot x 6-foot Reinforced Concrete Box culvert (RCB) system at the southern end of the project with a new outfall along Pearl Street to Corpus Christi Bay and a new 6-foot x 6-foot Reinforced Concrete Box culvert (RCB) system at the north end of the project with a new outfall into the wetlands.

Like the HDR Study (2018), and Option 1, this project calls for a new 6-foot x 6-foot Reinforced Concrete Box culvert (RCB) system in East Surfside Boulevard. This system will connect into the outfall and would replace the existing system along the beach that has had previous issues with siltation, requiring frequent maintenance.

A new underground stormwater conveyance system Connecting into the new RCB system would be new reinforced concrete pipes (RCP) in Breakwater, Bridgeport, Coastal, and Elm. RCPs in Golf, Kleberg, Paul, Hotel, and Breakers Streets would outfall directly into the natural channel. These pipes would either be 18-inch or 24-inch diameter, based on size of drainage basins. They would also include new street inlets and improvements to the street paving, curb, and gutter.

The existing underground conveyance system that outfalls to the south would be abandoned in place. The existing system that outfalls to the north would remain in place with new inlets and manholes, as necessary. To quantify existing repairs, LAN recommends smoke testing the existing systems during preliminary design to locate and identify defects that are contributing to poor drainage.

At-Grade Street Crossings – Option 2 will require three at-grade street crossings (RCB) located at Burleson, Gulfspray, and Beach Avenues to cross the natural channel system.

2.2.3 Open Ditch Improvements

The primary method of collecting and channeling storm water will be through roadside ditches. This project calls for regrading <u>all existing roadside ditches</u>, directing flow towards the center of the project area and into the natural channel, and the installation of cross drainage culverts at intersections and driveways. The cross culverts would drain into the natural channel.

Additionally, consistent with HDR's Study (2018), a new open ditch would be constructed along the beach from Gulfspray to Dolphin Park to provide for improved drainage of those areas east of Gulfbreeze Boulevard to the beach and outfall into the existing system at the north. This ditch provides additional benefit by preventing high tides from entering into the street ROW's and collecting high tidal waters in this area, holding them until they infiltrate into the soil.

2.2.4 Earthwork (Cut & Fill)

The construction of the natural channel improvements will require approximately 45,000 CY of excavation, mostly between Surfside and Timon Boulevards.

Additionally, to achieve positive drainage towards the proposed natural channel, a **limited number of streets and properties would have to be raised or filled**. Approximately 346,000 CY is required for street, private properties, and parks improvements. Streets and parks account for approximately 74,000 CY (21%) of fill and are described in more detail below.

Private properties account for 272,000 CY (79%) and are located along both the east and west of the proposed channel, east of Seagull Boulevard and west of the beach. These properties average in elevation of 3.3-feet above Mean Sea Level and require on average 2.4-feet of fill to raise them to achieve drainage.

2.2.5 Coastal Barrier & Protection System and Beach Parking

Phase I analyzed the effects of tides on North Beach and identified several areas that would be "inundated" or under water during higher-than-normal tide events. The highest observed tide during annual evaluation period was determined to be 3.5-feet above Mean Sea Level.

To protect North Beach from high tides a simple earthen berm system should be constructed along the edge of the beach from Kleberg Street to Dolphin Park. This vegetated berm can be trapezoidal shaped, approximately 20-feet at the base, 3:1 side slope, and approximately 4-feet high, above Mean Sea Level. Additionally benefit would be protection from the wind. The Figure below illustrates what this could like:

Figure 2 – Examples of Coastal Barriers / Protection Berms

In addition to the berm, three parking areas along the beach should be raised and improved with crushed/compacted material (to be determined in preliminary design) and tied into the berm system. Crushed material or gravel is preferred along the beach over HMAC or concrete since these materials are more permeable and would reduce runoff onto the beach and erosion. These parking areas are located at Golf Street, Breakers Street, Surfside Park, Gulfspray, and Beach Avenue.

2.2.6 Street Improvements

Two types of street improvements will be necessary to support the natural channel and stormwater conveyance improvements in Option 2: Pavement Repair and Full-Depth Reconstruction.

Street Improvements will be necessary to Surfside and Timon to accommodate the construction of the natural channel. Additionally, to achieve positive drainage several cross streets need to be raised including West Surfside, Golf, Kleberg, Paul, Hotel, Breakers, Bushick, and Stewart. On average these streets would be raised one (1') to two (2') feet. Due to alignment of the natural channel, it will be necessary to extend Timon Boulevard south and connect it into Seagull Boulevard. Seagull Boulevard south to Breakwater will be repaired as well.

Streets along the west side of the channel and north of Burleson (Seagull, Churchdale, St Charles, Tourist, Surfboard, and Gulfspray) would remain at their current elevations but would get improved roadside ditches as part of this project. Additionally, roadside ditch improvements along streets at the north and east like Gulfbreeze, Neal, Hayes, Gulden, and Sandbar are included in this project. All these cross streets should be considered for future improvements (not related to this project) due to their poor condition.

2.2.7 Access Improvements

Although not directly related to the drainage improvements but important to the future of North Beach, this project would include traffic improvements at Beach Avenue. As previously mentioned, the Harbor Bridge Project will only provide for one exit to North Beach, and increased quantities of traffic have the potential for reducing the levels of service at Beach Avenue. Any proposed drainage improvements would result in increased development and increased traffic to North Beach.

Option 2 opinions of probable costs include improvements to Beach Avenue, Seagull, and Reef Avenue to accept additional traffic to North Beach. Beach Avenue (60-foot ROW) would be widened to 80-foot; turning lanes, signing, and striping improvements, and capacity improvements are necessary.

Consistent with the Phase I report, LAN proposes that traffic entering North Beach use Reef Avenue, rather than Beach Avenue. This would allow Beach Avenue to carry exiting traffic from North Beach. Reef Avenue (60-foot ROW) would require a new street construction from the US181 feeder road to Timon Boulevard to accommodate future traffic.

2.2.8 Pedestrian Improvements

In connection with the street enhancements that are necessary with the proposed natural channel and stormwater conveyance improvements, major street corridors like Timon, Surfside, and Beach will include standard concrete pedestrian sidewalks on both sides of the street. Minor cross streets, like Golf, Kleberg, etc. will include sidewalks on one side of the street. All pedestrian facilities and cross walks will be ADA compliant.

In addition to the concrete sidewalks along the streets, the natural channel will include a shared use path between Surfside and Timon Boulevards along the alignment of the channel. This proposed path is consistent with previously approved concepts in Mobility CC (adopted in 2013).

2.2.9 Park & Placemaking Opportunities

Although not directly related to the drainage improvements but important to the future of North Beach and consistent with North Beach Redevelopment Initiatives, the City has opportunities to include placemaking and park improvements in this project. Below are several opportunities:

Community Park - The City should consider constructing a community park with walkable trails in the area under the existing Harbor Bridge. This park can tie in North Beach history, art, entertainment, and nature features. The park would be close in vicinity to the Texas State Aquarium and USS Lexington and improved walkways can easily connect these areas for visitors. Since this proposed park ties into the proposed natural channel improvements, it is **included** in the opinions of probable costs (Priority 2-3).

Eco-Park - Although not part of this project nor included in the cost estimates, several elements of this project interface with the City of Corpus Christi's future Eco-Park, originally conceived in 2018, and the surrounding wetlands. During preliminary design, the City should consider integrating proposed stormwater conveyance improvements, such as open ditches, into the Eco-Park plans and consideration must be made not to impact the existing wetlands. These improvements are **NOT included** in the opinions of probable costs.

Surfside Park - Surfside Park is currently prone to coastal flooding and high tides. It is one of the lowest areas in elevation on North Beach. This project should include raising of this area and redevelopment of the park to drain towards the natural channel. New comfort stations should be constructed at the beach, improved playgrounds, and opportunities exist to tie this project into the natural channel with additional natural water features on the west, along Surfside Boulevard. These improvements are **NOT included** in the opinions of probable cost.

North Beach Entrance / Signing – This project should include relocating and reconstructing the North Beach entrance arch at Burleson / Breakers Street to Beach Avenue. Opportunities for landscaping and art should be investigated as well at Beach Avenue and along Timon and Surfside Boulevards. Additionally, the area will need updated wayfinding and directional signs directing traffic / visitors to the key destinations detailed in Phase I of this project. These improvements are **NOT included** in the opinions of probable cost.

Figure 3 – Existing North Beach Entrance Arch

2.2.10 Land and Right-of-Way Requirements

Generally, the proposed street improvements above will be completed within the current right-of-way, however the above-mentioned traffic improvements would require additional right-of-way to be acquired. Beach and Reef Avenue improvements would require approximately **two (2) acres** of private property to expand the capacities of those two roads.

If the City considers constructing a community park (as mentioned above) with walkable trails in the area under the existing Harbor Bridge, the ownership of the property beneath the Harbor Bridge must be finalized prior to design. If that property is converted back to private property ownership, the City of Corpus Christi would have to acquire it for the construction of this park. This area consists of approximately **26 acres**.

2.2.11 Utilities Relocations

This project would require the relocations of several utilities within the areas of the proposed natural channel, stormwater conveyance, and street improvements. The below table includes the approximate linear feet by size for each utility within the project area that would require relocation:

Table 5 – Potential Water Line Relocations

Water Lines Lengths (LF) / Size						
	6" W	8" W	10" W	12" W	16" W	Total
Total Water Lines in Project Area	14,608	8,065	51	1,280	5,880	29,884
Option 2 - Required Relocations	**3,892**	**5,134**	**0**	**611**	**5,880**	**15,517**

Table 6 – Potential Gas Line Relocations

Gas Lines Lengths / Size					
	2" DIP	4" DIP	6" DIP	8" DIP	Total
Total Gas Lines in Project Area	17,007	5,744	3,159	3,206	29,115
Option 2 - Required Relocations	**9,351**	**1,158**	**670**	**3,028**	**14,207**

Table 7 – Potential Sanitary Sewer Line Relocations

Sanitary Sewer Lines Lengths (LF) / Size						
	8" CIPP	8" PVC	8" VCP	10" VCP	15" VCP	Total
Total Wastewater Lines in Project Area	9,324	11,226	10,938	10,938	10,938	39,052*
Option 2 - Required Relocations	**490**	**4,255**	**1,950**	**1,362**	**399**	**8,456**

**Note – Total reflects all sanitary sewer lines in Project Area.*

Sanitary Sewer Lift Stations – There are three lift stations located within the project area (Hayes Street, Surfside Park, and Coastal Avenue). Option 2 may require the relocation of the lift station in between Timon and Surfside Boulevards in the vicinity of Hayes Street. Opinions of Probable Cost include the construction of a new lift station however LAN recommends that during preliminary design, to look at options to route the proposed natural channel around the lift station, if feasible.

Table 8 – Existing Sanitary Sewer Lift Stations

Lift Station Name	Lift Station No.	Address	# of Pumps	Model	Imp Code or Dia.	HP	Wet Well Size (Ft)
North Beach "B"	34	3002 Timon Blvd	3	CP-3201.180	454	30	10' x 10'
North Beach "C"	35	3818 Surfside	3	NP-3127-180	438	10	10' x 10'
North Beach "D"	36	4320 Timon Blvd	2	NP-3127-185	438	10	10' x 10'

Sanitary Sewer Manholes – Streets requiring to be raised or repaved will include minor adjustments to the sanitary sewer manholes by raising the rim elevations of these manholes to the proposed elevations.

Storm Water Utilities – As previously mentioned, the existing underground conveyance system that outfalls to the south would be abandoned in place. The existing system that outfalls to the north would remain in place with new inlets and manholes, as necessary.

2.3 Option 3A – Navigable Canal – Exit at Rincon

This project provides for long term improvements to drainage through the construction of navigable canal through the middle of North Beach. Navigable access to Corpus Christi Bay will be located adjacent to the North Beach Jetties.

As with Option 2, opportunities exist to combine public art, architectural design, local craft, and historic preservation with engineering, ecosystem restoration, and native / coastal landscaping long the proposed canal. In addition to safely conveying flood waters, low impact design elements could improve water quality. The intent is for the canal to be a focal point for North Beach, serve as a catalyst for economic development and tourism, and be a facility for boaters, tourists, and residents to gather.

This project would include the construction of a concrete, steel, or vinyl bulkhead (alternative costs are included in the OPCC's) and provide for navigation or access to Corpus Christi Bay for boats or other pleasure craft, as analyzed in Phase I of this project.

2.3.1 Navigable Canal Improvements

This project calls for the construction of approximately 6,000 LF of bulkhead supported canal through the center of North Beach, beginning on the south end at Breakwater Boulevard and ending just north of Beach Avenue. North of Beach Avenue the structural bulkhead would terminate and transition to an open trapezoidal channel out falling into Corpus Christi Bay near the Rincon Canal and Jetties to the north. The trapezoidal channel would be navigable similar to bulkhead section. This transition to a trapezoidal channel complements the City's future plans for an Eco-Park in this area and limits the impacts to environmental wetlands.

The hydraulic footprint of the canal would allow for flood mitigation benefits as well as provide sufficient room for walkways to develop the project into an amenity. The bottom of the channel would be natural, not concrete-lined and thus would require maintenance dredging in the long-term. Local drainage that enters the channel along the project would be intercepted and discharged below the water surface.

The bulkhead section of the canal is rectangular shaped, 6 to 8-feet deep (below Mean Sea Level) and ranges in width from 50-feet (narrowest) to 60-feet though the center. It opens at the south end to provide for boat docking and turning of watercrafts and at the north end to provide access in and out of Corpus Christi Bay. The approximate length of concrete or steel bulkhead would be 12,500 LF.

2.3.2 Jetty & Breakwater Improvements

Navigable access to Corpus Christi Bay will be located adjacent to the North Beach Jetties. LAN assumes that improvements to this jetty system will be required to influence the currents and tides to protect the navigable canal and reduce sedimentation transport into and out of the proposed canal. Although substantial coastal sedimentation modeling would be required to determine the size and shape of any jetty improvements, LAN has assumed that in addition to the exiting jetty (to remain) an additional jetty/breakwater system would be required on the north side of the proposed canal. This system would be approximately 570-feet long, 30-40-feet wide, with a top elevation of 6.50-feet (NAVD-88).

2.3.3 Storm Water Conveyance Improvements

This project includes a new 6-foot x 6-foot Reinforced Concrete Box culvert (RCB) system at the southern end of the project with a new outfall along Pearl Street to Corpus Christi Bay.

Like the HDR Study (2018), and Options 1 & 2, this project calls for a new 6-foot x 6-foot Reinforced Concrete Box culvert (RCB) system in East Surfside Boulevard. This system will connect into the outfall and would replace the existing system along the beach that has had previous issues with siltation, requiring frequent maintenance.

Connecting into the new RCB system would be new reinforced concrete pipes (RCP) in Breakwater, Bridgeport, and Coastal. RCPs in Golf, Kleberg, Paul, Hotel, and Breakers Streets would outfall directly into the navigable canal. These pipes would either be 18-inch or 24-inch diameter, based on size of drainage basins. They would also include new street inlets and improvements to the street paving, curb, and gutter.

The existing underground conveyance system that outfalls to the south and to the north would be abandoned in place.

2.3.4 Open Ditch Improvements

The primary method of collecting and channeling storm water into the navigable canal will be through roadside ditches. This project calls for regrading all existing roadside ditches, directing flow towards the center of the project area and into the navigable channel, and the installation of cross drainage culverts at intersections and driveways. The cross culverts would drain into the canal.

2.3.5 Earthwork (Cut & Fill)

The construction of the navigable canal will require approximately 230,000 CY of excavation, mostly between Surfside and Timon Boulevards. There are two methods to excavation – dry excavation and dredging (wet).

To achieve positive drainage towards the proposed canal, several streets and properties would have to raised. Approximately 542,000 CY is required for street, private properties, and parks improvements. Streets and parks account for approximately 186,000 CY (34%) of fill and are described in more detail below.

Private properties account for 356,000 CY (66%) and are located along both the east and west of the proposed channel, east of Seagull Boulevard and west of the beach. These properties average in elevation of 3.4-feet above Mean Sea Level and require on average 2.3-feet of fill to raise them to achieve drainage.

2.3.6 Coastal Barrier & Protection System and Beach Parking

Similar to Option 2, Option 3A will require a simple earthen berm system to constructed along the edge of the beach from Kleberg Street to Dolphin Park. Additionally, beach parking areas will need to be improved. See Option 2 for details.

2.3.7 Street Improvements

Two types of street improvements will be necessary to complete the natural channel and stormwater conveyance improvements in Option 3: Pavement Repair and Full-Depth Reconstruction.

Several street Improvements will be necessary to accommodate the construction of the navigable canal, Surfside and Timon Boulevards. Additionally, to achieve positive drainage several cross streets need to be raised including West Surfside, Seagull, Bridgeport, Coastal, Elm, Golf, Kleberg, Paul, Hotel,

Breakers, Bushick, Stewart, Gulfbreeze, Gulfspray, Neal, Hayes, Beach Avenue, Reef, Gulden, and Sandbar. On average these streets would be raised one (1') to two (2') feet.

Except for Seagull Boulevard, streets along the west side of the channel and north of Burleson (Churchdale, St Charles, Tourist, Surfboard, and Gulfspray) would remain at their current elevations but would get improved roadside ditches as part of this project. Additionally, roadside ditch improvements along streets at the north and east like Gulfbreeze, Neal, Hayes, Gulden, and Sandbar are included in this project.

2.3.8 Access Improvements

Like Options 1 & 2, Option 3A will include improvements to Beach Avenue, Seagull, and Reef Avenue to accept additional traffic to North Beach. See Option 2 for more details.

2.3.9 Pedestrian Improvements

In connection with the street enhancements that are necessary with the proposed navigable canal and stormwater conveyance improvements, major street corridors like Timon, Surfside, Seagull, Gulfbreeze, and Beach will include standard concrete pedestrian sidewalks on both sides of the street. Minor cross streets, like Golf, Kleberg, etc. will include sidewalks on one side of the street. All pedestrian facilities and cross walks will be ADA compliant.

In addition to the concrete sidewalks, the natural channel will include a shared use path between Surfside and Timon Boulevards along the alignment of the channel. This proposed path is illustrated in Figure 4 and consistent with previously approved concepts in Mobility CC (adopted in 2013).

2.3.10 Park & Placemaking Improvements

Like Option 2, Option 3A has opportunities for park improvements that are not directly related to the drainage improvements but important to the future of North Beach and consistent with North Beach Redevelopment Initiatives. See Option 2 for more details.

2.3.11 Land and Right-of-Way Requirements

Similar to Option 2, Option 3A will require two areas for land or right-of-way acquisition. See Option 2 for more details.

2.3.12 Utilities Relocations

This project would require the relocations of several utilities within the areas of the proposed natural channel, stormwater conveyance, and street improvements. The below Tables include the approximate linear feet by size for each utility within the project area that would require relocation:

Table 9 – Potential Water Line Relocations

Water Lines Lengths (LF) / Size						
	6" W	8" W	10" W	12" W	16" W	Total
Total Water Lines in Project Area	14,608	8,065	51	1,280	5,880	29,884
Option 3A - Required Relocations	**14,608**	**8,065**	**0**	**611**	**5,880**	**29,164**

Table 10 – Potential Gas Line Relocations

Gas Lines Lengths / Size					
	2" DIP	4" DIP	6" DIP	8" DIP	Total
Total Gas Lines in Project Area	17,007	5,744	3,159	3,206	29,115
Option 3A - Required Relocations	**15,292**	**3,160**	**3,086**	**3,206**	**24,744**

Table 11 – Potential Sanitary Sewer Line Relocations

Sanitary Sewer Lines Lengths (LF) / Size						
	8" CIPP	8" PVC	8" VCP	10" VCP	15" VCP	Total
Total Wastewater Lines in Project Area	9,324	11,226	10,938	10,938	10,938	39,052*
Option 3A - Required Relocations	**490**	**4,255**	**1,950**	**1,362**	**399**	**8,456**

**Note – Total reflects all sanitary sewer lines in Project Area.*

Sanitary Sewer Lift Stations – There are three lift stations located within the project area (Hayes Street, Surfside Park, and Coastal Avenue). Option 3A will require the relocation of the lift station in between Timon and Surfside Boulevards in the vicinity of Hayes Street. Opinions of Probable Cost include the construction of a new lift station, location to be determined in preliminary design.

Table 12 – Existing Sanitary Sewer Lift Stations

Lift Station Name	Lift Station No.	Address	# of Pumps	Model	Imp Code or Dia.	HP	Wet Well Size (Ft)
North Beach "B"	34	3002 Timon Blvd	3	CP-3201.180	454	30	10' x 10'
North Beach "C"	35	3818 Surfside	3	NP-3127-180	438	10	10' x 10'
North Beach "D"	36	4320 Timon Blvd	2	NP-3127-185	438	10	10' x 10'

Sanitary Sewer Manholes – Streets requiring to be raised or repaved will include minor adjustments to the sanitary sewer manholes by raising the rim elevations of these manholes to the proposed elevations.

Storm Water - The existing underground conveyance system that outfalls to the south would be abandoned in place. The existing system that outfalls to the north would remain in place with new inlets and manholes, as necessary. Proposed systems are detailed above.

2.4 Option 3B – Navigable Canal – Exit thru Beach

This project provides for long term improvements to drainage through the construction of navigable canal through the middle of North Beach. Navigable access to Corpus Christi Bay will be through the beach along Breakers Street, adjacent to Surfside Boulevard and Burleson Street.

As with Options 2 and 3A, opportunities exist to combine public art, architectural design, local craft, and historic preservation with engineering, ecosystem restoration, and native / coastal landscaping along the proposed canal. In addition to safely conveying flood waters, low impact design elements could improve water quality. The intent is for the canal to be a focal point for North Beach, serve as a catalyst for economic development and tourism, and be a facility for boaters, tourists, and residents to gather.

This project would include the construction of a concrete or steel bulkhead and provide for navigation or access to Corpus Christi Bay for boats or other pleasure craft, as analyzed in Phase I of this project.

2.4.1 Navigable Canal Improvements

This project calls for the construction of approximately 5,700 LF of bulkhead supported canal through the center of North Beach, beginning on the south end at Breakwater Boulevard and ending at Beach Avenue to the north.

The outlet to the Bay is 60-feet wide and approximately 750 LF from the main canal, through the beach to shore.

The hydraulic footprint of the canal would allow for flood mitigation benefits as well as provide sufficient room for walkways to develop the project into an amenity. The bottom of the channel would be natural, not concrete-lined. Local drainage that enters the channel along the project would be intercepted and discharged below the water surface.

Like Option 3A, the canal is rectangular shaped, 6 to 8-feet deep (below Mean Sea Level) and range in width from 50-feet (narrowest) to 60-feet though the center. It opens at the south end to provide for boat docking and turning of watercrafts. The approximate length of concrete or steel bulkhead would be 11,750 LF.

2.4.2 Jetty & Breakwater Improvements

Navigable access to Corpus Christi Bay will be through the beach along Breakers Street, adjacent to Surfside Boulevard and Burleson Street. LAN assumes that a new jetty or breakwater system will be required to influence the currents and tides to protect the navigable canal and reduce sedimentation transport into and out of the proposed canal. Although substantial coastal sedimentation modeling would be required to determine the size and shape of any jetty improvements, LAN has assumed that this jetty/breakwater system would require two rock rip-rap structures 250-feet long each (total of 500 LF), 30-40-feet wide, with a top elevation of 6.50-feet (NAVD-88).

2.4.3 Stormwater Conveyance Improvements

This project includes a new 6-foot x 6-foot Reinforced Concrete Box culvert (RCB) system at the southern end of the project with a new outfall along Pearl Street to Corpus Christi Bay.

Like the HDR Study (2018), and Options 1 & 2, this project calls for a new 6-foot x 6-foot Reinforced Concrete Box culvert (RCB) system in East Surfside Boulevard. This system will connect into the outfall

and would replace the existing system along the beach that has had previous issues with siltation, requiring frequent maintenance.

Connecting into the new RCB system would be new reinforced concrete pipes (RCP) in Breakwater, Bridgeport, and Coastal. RCPs in Golf, Kleberg, Paul, Hotel, and Breakers Streets would outfall directly into the navigable canal. These pipes would either be 18-inch or 24-inch diameter, based on size of drainage basins. They would also include new street inlets and improvements to the street paving, curb, and gutter.

The existing underground conveyance system that outfalls to the south and to the north would be abandoned in place.

2.4.4 Open Ditch Improvements

The primary method of collecting and channeling storm water into the navigable canal will be through roadside ditches. This project calls for regrading all existing roadside ditches, directing flow towards the center of the project area and into the navigable channel, and the installation of cross drainage culverts at intersections and driveways. The cross culverts would drain into the canal.

2.4.5 Earthwork (Cut & Fill)

The construction of the navigable canal will require approximately 190,600 CY of excavation, mostly between Surfside and Timon Boulevards. There are two methods to excavation – dry excavation and dredging (wet).

Additionally, to achieve positive drainage towards the proposed canal, several streets and properties would have to raised. Approximately 542,000 CY is required for street, private properties, and parks improvements. Streets and parks account for approximately 186,000 CY (34%) of fill and are described in more detail below.

Private properties account for 356,000 CY (66%) and are located along both the east and west of the proposed channel, east of Seagull Boulevard and west of the beach. These properties average in elevation of 3.4-feet above Mean Sea Level and require on average 2.3-feet of fill to raise them to achieve drainage.

2.4.6 Coastal Barrier & Protection System and Beach Parking

Similar to Option 2, Option 3B will require a simple earthen berm system to constructed along the edge of the beach from Kleberg Street to Dolphin Park. Additionally, beach parking areas will need to be improved. See Option 2 for details.

2.4.7 Street Improvements

Two types of street improvements will be necessary to complete the natural channel and stormwater conveyance improvements in Option 3: Pavement Repair and Full-Depth Reconstruction.
Several street improvements will be necessary to accommodate the construction of the navigable canal, Surfside and Timon Boulevards. Additionally, to achieve positive drainage several cross streets need to be raised including West Surfside, Seagull, Bridgeport, Coastal, Elm, Golf, Kleberg, Paul, Hotel, Breakers, Bushick, Stewart, Gulfbreeze, Gulfspray, Neal, Hayes, Beach Avenue, Reef, Gulden, and Sandbar. On average these streets would be raised one (1') to two (2') feet.

Except for Seagull Boulevard, streets along the west side of the channel and north of Burleson (Churchdale, St Charles, Tourist, Surfboard, and Gulfspray) would remain at their current elevations but would get improved roadside ditches as part of this project. Additionally, roadside ditch improvements along streets at the north and east like Gulfbreeze, Neal, Hayes, Gulden, and Sandbar are included in this project.

2.4.8 Access Improvements

Like Option 2, Option 3A should include improvements to Beach Avenue, Seagull, and Reef Avenue to accept additional traffic to North Beach. See Option 2 for more details.

2.4.9 Pedestrian Improvements

In connection with the street enhancements that are necessary with the proposed navigable canal and stormwater conveyance improvements, major street corridors like Timon, Surfside, Seagull, Gulfbreeze, and Beach will include standard concrete pedestrian sidewalks on both sides of the street. Minor cross streets, like Golf, Kleberg, etc. will include sidewalks on one side of the street. All pedestrian facilities and cross walks will be ADA compliant.

In addition to the concrete sidewalks, the natural channel will include a shared use path between Surfside and Timon Boulevards along the alignment of the channel. This proposed path is consistent with previously approved concepts in Mobility CC (adopted in 2013).

2.4.10 Park & Placemaking Improvements

Like Option 2, Option 3A has opportunities for park improvements that are not directly related to the drainage improvements but important to the future of North Beach and consistent with North Beach Redevelopment Initiatives. See Option 2 for more details.

2.4.11 Land and Right-of-Way Requirements

Similar to Option 2, Option 3A will require two areas for land or right-of-way acquisition. See Option 2 for more details.

2.4.12 Utilities Relocations

This project would require the relocations of several utilities within the areas of the proposed natural channel, stormwater conveyance, and street improvements. The below Table includes the approximate linear feet by size for each utility within the project area that would require relocation:

Table 13 – Potential Water Line Relocations

Water Lines Lengths (LF) / Size						
	6" W	8" W	10" W	12" W	16" W	Total
Total Water Lines in Project Area	14,608	8,065	51	1,280	5,880	29,884
Option 3A - Required Relocations	14,608	8,065	0	611	5,880	29,164

Table 14 – Potential Gas Line Relocations

Gas Lines Lengths / Size					
	2" DIP	4" DIP	6" DIP	8" DIP	Total
Total Gas Lines in Project Area	17,007	5,744	3,159	3,206	29,115
Option 3A - Required Relocations	15,292	3,160	3,086	3,206	24,744

Table 15 – Potential Sanitary Sewer Line Relocations

Sanitary Sewer Lines Lengths (LF) / Size						
	8" CIPP	8" PVC	8" VCP	10" VCP	15" VCP	Total
Total Wastewater Lines in Project Area	9,324	11,226	10,938	10,938	10,938	39,052*
Option 3A - Required Relocations	490	4,255	1,950	1,362	399	8,456

**Note – Total reflects all sanitary sewer lines in Project Area.*

Sanitary Sewer Lift Stations – There are three lift stations located within the project area (Hayes Street, Surfside Park, and Coastal Avenue). Option 3A will require the relocation of the lift station in between Timon and Surfside Boulevards in the vicinity of Hayes Street. Opinions of Probable Cost include the construction of a new lift station, location to be determined in preliminary design.

Table 16 – Existing Sanitary Sewer Lift Stations

Lift Station Name	Lift Station No.	Address	# of Pumps	Model	Imp Code or Dia.	HP	Wet Well Size (Ft)
North Beach "B"	34	3002 Timon Blvd	3	CP-3201.180	454	30	10' x 10'
North Beach "C"	35	3818 Surfside	3	NP-3127-180	438	10	10' x 10'
North Beach "D"	36	4320 Timon Blvd	2	NP-3127-185	438	10	10' x 10'

Sanitary Sewer Manholes – Streets requiring to be raised or repaved will include minor adjustments to the sanitary sewer manholes by raising the rim elevations of these manholes to the proposed elevations.

Storm Water - The existing underground conveyance system that outfalls to the south would be abandoned in place. The existing system that outfalls to the north would remain in place with new inlets and manholes, as necessary. Proposed systems are detailed above.

3 Basis of Costs

The Opinions of Probable Costs (OPC's) presented herein are AACE International Class 3 level estimates suitable for project budgeting. As a Class 3 level estimate, the expected accuracy on the high end can range 10% to 40%. We have applied a 20% cost contingency factor for the purposes of this conceptual level analysis to account for unknowns at this stage of the design process. As the design progresses and more details are known, the contingency will be reduced accordingly. The costs are also tied to the February 2021 Construction Cost Index (11,628) as published by Engineering News-Record.

The OPC's provided herein are made based on the Engineer's experience and qualifications and represent the Engineer's best judgment as an experienced and qualified professional engineer generally familiar with the construction industry. However, since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions, the Engineer cannot and does not guarantee that proposals, bids, or actual Construction Costs will not vary from the opinions of probable Construction Cost or Project Cost prepared by the Engineer. If the Owner wishes greater assurance as to probable Construction Cost or Project Cost, the Owner shall employ an independent cost estimator.

3.1 Project Cost Categories

Project costs for each Option were developed in four different categories:

- Land /Right-of-Way
- Construction Costs
- Design / Surveying / Testing
- Project / Program Management.

3.1.1 Project Soft-Costs

Land / Right-of-Way - Opinions of Probable Cost include land acquisition and right-of-way that may be necessary for the proposed improvements. Unit costs per acre are derived from adjacent real property values researched through the Nueces County Appraisal District.

Design / Surveying / Testing – Costs for this category professional services required for the design of the project, including surveying, geotechnical and materials testing. For the purposes of this project, **LAN assumes 10% for these professional services**.

Project / Program Management – Costs in this category could include project management, permitting, meetings, coordination with regulatory agencies, construction management and inspection, and other soft costs that support the design and construction of the project. **LAN assumes 5% for these professional services**.

3.1.2 Construction Costs

Construction Unit Costs are based on TXDOT Statewide Monthly Construction Cost Averages and local City of Corpus Christi contractor bid documents located in CIVCAST. Costs are in 2021 dollars and include labor and materials for the installation and construction of the project components. The following sub-categories are explained further below:

- Part A - General
- Part B - Earthwork and Dredging
- Part C - Stormwater Conveyance
- Part D – Transportation / Streets

- Part E – Pedestrian / ADA
- Part F - Structural and Bridge
- Part G - Parks
- Part H - Utilities

3.1.3 General Assumptions

The storm water conveyance and channel improvements for each Option are based on the same design criteria, storms, and provide the same benefit, using City of Corpus Christi Drainage Criteria Manual (DCM).

Options 2 and 3A / 3B will be required to be constructed in two phases: Phase I – North of Burleson and Phase II- South of Burleson, due to the Harbor Bridge construction. See phasing discussion in Section 5.

Routine and long-term maintenance costs for the canal, drainage structures, streets, and utilities are excluded from these Opinions of Probable Cost.

3.2 Basis of Construction Costs

3.2.1 Part A – General

Contractor Mobilization is assumed at 5% of total construction costs; Bonds & Insurance are assumed to be 2%.

Traffic Control Plans are included in the OPC's as a Lump Sum cost based on the size and scope of the street and drainage improvements and projects of similar size and complexity.

Storm Water Pollution Protection Plans are included in the OPC's as a Lump Sum cost based on similar projects of size and complexity.

3.2.2 Part B - Earthwork and Dredging Basis of Costs

Earthwork, excavation, and fill are based on Cubic Yards (CY) of material. Dry excavation (canal, channel, ditch, etc.) is based on TXDOT Standard Specification Item 110 – Excavation (Channel) and Fill is based on TXDOT Standard Specification Item 132 – Embankment. This type of material is used to raise roadways and/or properties where additional material may be required for construction.

Dredging – dredging costs are based on the costs per CY for projects of similar size and complexity in the coastal areas. Dredging frequency and maintenance costs were determined based on comparisons with projects of similar nature; detailed modeling to quantify the amounts of siltation or sedimentation occurring at the entrance/exits of the channels or within the channels was not performed during this phase of the project.

Raising of properties - To achieve the greatest benefit from the proposed stormwater systems, some private properties need to be raised. LAN assumed a maximum elevation of 6.5-feet at the most upstream end of the drainage basin and assume the site will slope downward towards the proposed stormwater conveyance improvements. **Not all sites need to be raised to an elevation of 6.5-feet to achieve positive drainage.**

For Options 2 and 3 only, project costs for filling or raising properties are divided into three priorities. See Section 5 for prioritizations.

Transportation of fill material from an off-site source is subsidiary to the cost of fill and not included in the OPC's. These costs would be included in design phase OPC's but are subsidiary for the purposes of this effort. Additionally, LAN does not assume that the material excavated from the proposed channel/canal will be suitable for placement on rights-of-way or properties, detailed soil analysis will be required in preliminary design to determine this.

Option 3 (A&B) will require dredging into Bay to a depth of 10-feet for navigability. Opinions of Probable Cost assume that the City of Corpus Christi is successful in receiving a permit for dredging the canal into Corpus Christi Bay.

3.2.3 Part C – Stormwater Conveyance

For the purposes of this project, stormwater conveyance refers to underground pipe and box culvert structures, including those structures at cross streets (bridge-class culverts).

Reinforced Concrete Box Culverts are based on TXDOT Standard Specification Item 462 – Concrete Box Culverts and Drains to furnish, construct, and install concrete box culverts and drains. This item is measured by Linear Foot.

Reinforced Concrete Pipe is based on TXDOT Standard Specification Item 464 – Reinforced Concrete Pipe to furnish and install reinforced concrete pipe, materials for precast concrete pipe culverts, or precast concrete storm drain mains, laterals, stubs, and inlet leads. This item is measured by Linear Foot.

Excavation and Backfill (E&B) for stormwater conveyance structures is included in the OPC's. E&B is based on TXDOT Standard Specification Item 400 – Excavation and Backfill for Structures for the excavation and placement and backfilling of stormwater structures. It excludes cut and restoring pavement, included in Part D – Transportation / Streets. This item is measured by Cubic Yard.

Trench Excavation Protection is also included in the OPC's. This item is based on TXDOT Standard Specification Item 402 – Trench Excavation Protection for trenches 5-foot deep or greater. This item is measured by Linear Foot.

3.2.4 Part D – Transportation / Streets

Project costs for improving local streets are divided into three priorities, detailed in Section 5.

Based on recent traffic studies (by Others), levels of service are expected to be reduced at US181 and Beach Avenue. Included in the OPC's, for all options, are street and traffic improvements in this area that would increase capacity of Beach Avenue, improve Reef Avenue, add a traffic circle to improve flow of traffic, improved signing and striping. See Figure 4 below.

Figure 4 – Example of Access Improvements at Beach Ave

Full depth street reconstruction is based on the preliminary geotechnical findings completed in Phase I and include a flexible hot-mixed asphaltic concrete (HMAC) pavement. Figure 5 below shows a typical section. Full-depth reconstruction is measured in Square Yards.

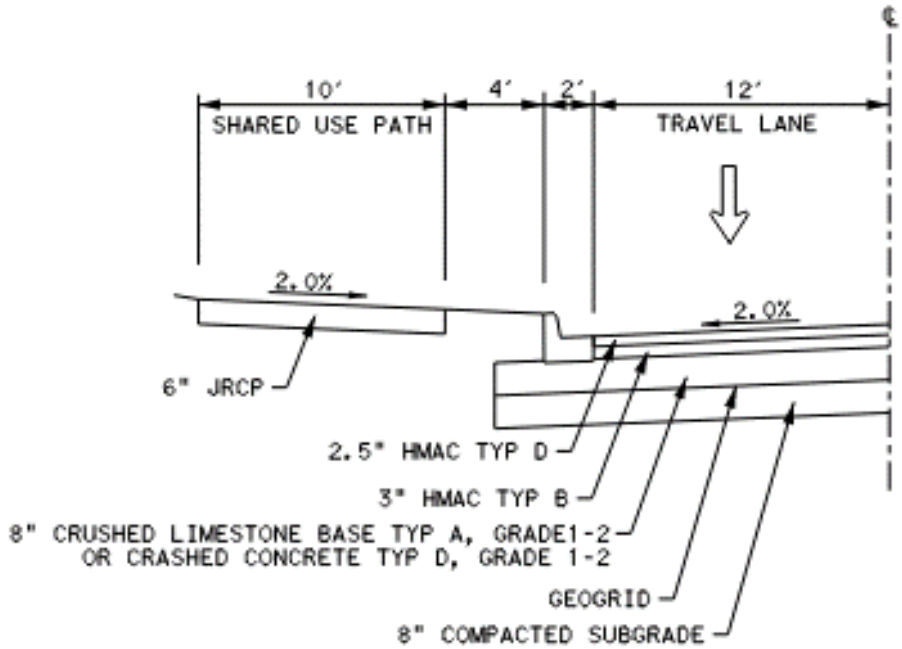
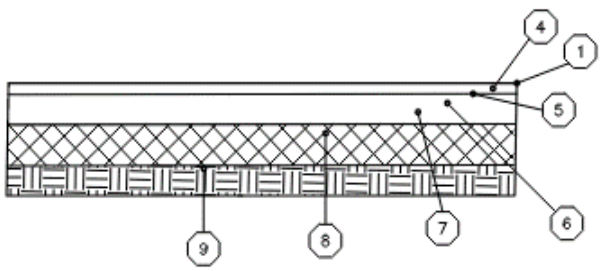


Figure 5 – Typical Full-Depth Reconstruction Pavement Section

In support of the full-depth reconstruction street improvements, several streets will require the installation of curb and gutter, others will only have shallow roadside ditches to convey stormwater. Curb & Gutter is based on TXDOT Standard Specification Item 529 – Concrete Curb, Gutter, and Combined Curb and Gutter. This item is measured by Linear Foot.

In support of the full-depth reconstruction street improvements, driveways will require to be replaced. All driveways will be concrete and in conformance with City of Corpus Christi Standard Driveway specifications and details. This item is measured in Square Yards.

Pavement Repair is based on TXDOT Standard Specification Item 400 – Excavation and Backfill for Structures. Included in that specification is the cut and restoration of paving for the installation of stormwater structures. LAN assumes a 12-foot repair section for each stormwater pipe. This item is measured in Square Yards.



TYPICAL PROPOSED FULL DEPTH PAVEMENT REPLACEMENT & REPAIR

SCALE: N.T.S.

KEY NOTES

1. SAWCUT EDGE OF PAVEMENT FOR PROPOSED NEW TRAVEL & PARKING LANES, PARKING, CURB & GUTTER, DRIVEWAYS AND UTILITY EXCAVATIONS PER PART 3 IN SECTION 025205
2. 5' CONCRETE SIDEWALK
3. 6" CURB & GUTTER
4. 3" HMAC TYPE D, TXDOT ITEM 340, PG64-22
5. TACK COAT (SUBSIDIARY TO HMAC PAY ITEMS)
6. 5" HMAC TYPE B, TXDOT ITEM 340, PG64-22
7. PRIME COAT – 0.20 GALLONS PER SY
8. 11" CRUSHED LIMESTONE FLEXIBLE BASE – TYPE A, GRADE 1-2; COMPACTED TO 98% MODIFIED PROCTOR DENSITY (ASTM D1557); +/- 2% OF OPTIMUM MOISTURE; BASE SHALL BE PLACED IN UNIFORM LIFTS NOT TO EXCEED 10-INCH LOOSE LIFTS OR 8-INCH COMPACTED LIFTS.
9. PROVIDE TENSAR GEOGRID BX1100 OR TENSAR GEORGRID TX-5 (OR APPROVED EQUAL) ABOVE PROPERLY COMPACTED SUBGRADE. UPPER 12" OF EXPOSED RAW SUBGRADE COMPACTED TO A MINIMUM DENSITY OF 98% OF THE MAXIMUM DRY DENSITY, AS DETERMINED BY THE STANDARD PROCTOR TEST (ASTM D698), AND AT, OR ABOVE THE OPTIMUM MOISTURE CONTENT; 0% TO 3% OF OPTIMUM MOISTURE CONTENT. ANY SOFT AREAS IDENTIFIED SHALL BE REMOVED AND PROPERLY RECOMPACTED IN PLACE

Figure 6 – Typical Pavement Repair Section

3.2.5 Part E – Pedestrian / ADA

For the purposes of this project, pedestrian accommodations include concrete sidewalks and ADA curb ramps. These improvements are made as streets are developed and follow the same three priorities as streets (#5 above). Additionally, LAN assumes that Surfside Boulevard (East), Timon Boulevard, Seagull Boulevard, Beach Avenue, and Gulfbreeze Boulevard will have sidewalks on both sides of the street. The remainder of the streets will have a sidewalk on one side, as they are reconstructed based on priorities detailed in Section 5.

Sidewalks will be concrete and in conformance with City of Corpus Christi Standard specifications and details. Sidewalks are measured in Square Yards. ADA Curb Ramps are measured by Each.

3.2.6 Part F – Structural, Bridge, and Jetties

This section includes those costs associated with the canal bulkhead improvements, bridge crossings and jetties, necessary in Options 3A and 3B. Options 1 and 2 exclude these costs.

Canal Crossings – the costs associated with the proposed bridge(s) spanning the canal are based on an average unit cost of $85/SF. This is based on the FY 2019 Average Unit Cost Analysis published by TxDOT Bridge Division. This preliminary study assumes a conventional 5-span, four-lane prestressed concrete TxDOT I-girder bridge with cast-in-place concrete abutments and interior bents. The average cost per SF includes the cost of foundations, concrete abutments & bents, prestressed girders, CIP concrete deck & approach slab, bridge railing, and raised sidewalk (SUP/ADA). The average unit cost also includes an allowance for aesthetic treatments using concrete form liners. See Figure 7 below:

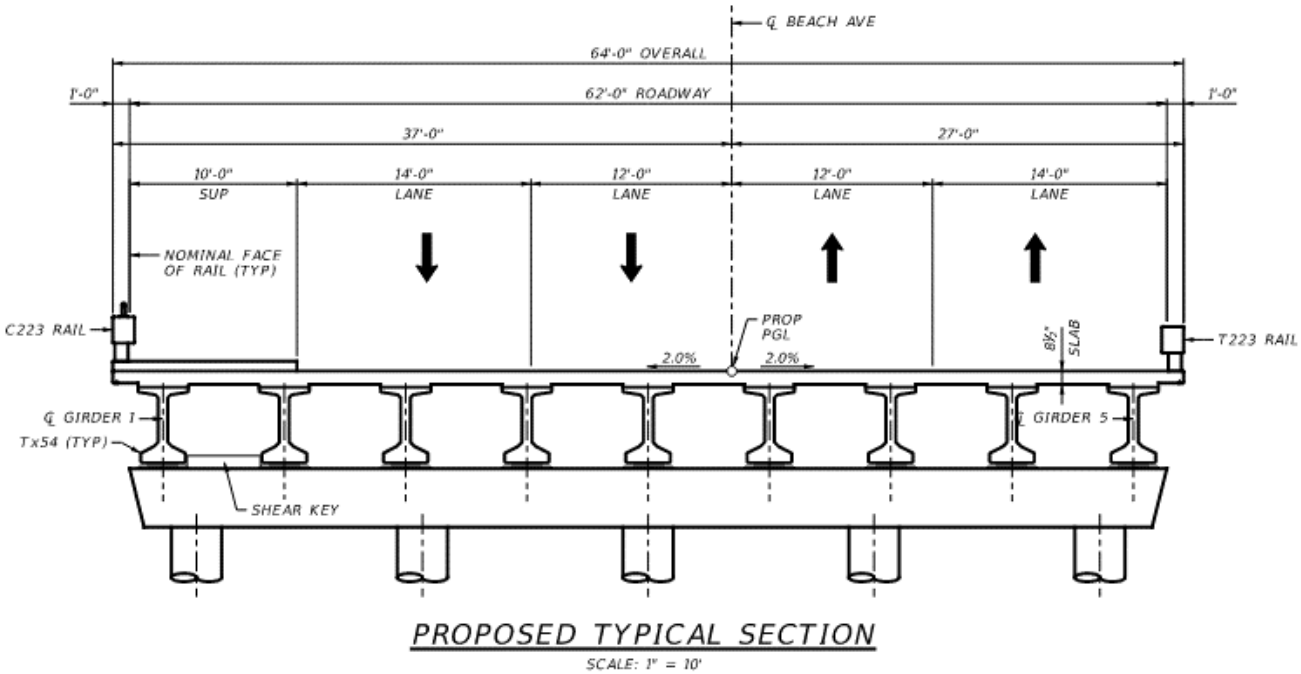


Figure 7 – Typical Bridge Cross Section

Bulkheads – the costs associated with the bulkhead improvements are based on those preliminary recommendations made in Phase I. Phase I recommendations were based on preliminary geotechnical findings and it was concluded that **further analysis would be required** to continue design of the bulkhead.

For client consideration, LAN is providing individual costs for **three material alternatives: steel, concrete, and vinyl**. All alternatives would require further analysis in the preliminary engineering phase.

Steel Sheet Pile - $1,000 / Linear Foot
Concrete Sheet Pile - $750 / Linear Foot
Vinyl Sheet Pile - $500 / Linear Foot

For the purposes of the OPCC, LAN assumed a concrete sheet pile.

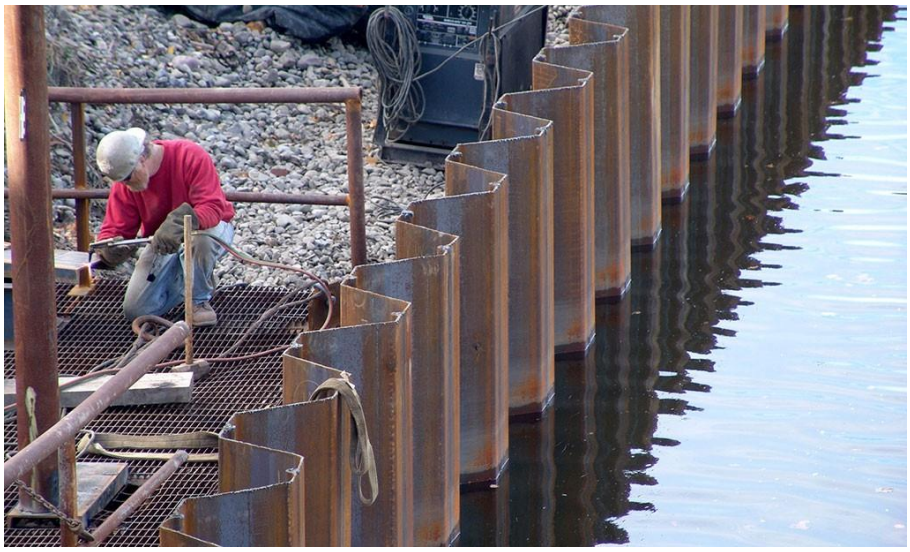


Figure 8 – Example of Steel Sheet Pile Bulkhead

Figure 9 – Example of Hybrid Concrete & Vinyl Sheet Pile

Figure 10 – Example of Vinyl Sheet Pile Bulkhead

Jetties – LAN assumes that a new jetty or breakwater system will be required to influence the currents and tides to protect the navigable canal and reduce sedimentation transport into and out of the proposed canal. Although substantial coastal sedimentation modeling would be required to determine the size and shape of any jetty improvements, LAN has assumed that this jetty/breakwater system would be constructed with rock rip-rap, similar to the breakwaters at the Corpus Christi Marina. LAN assumed a structure 30-40-feet wide, with a top elevation of 6.50-feet (NAVD-88). Average costs of rock riprap this size were derived from recent CIVCAST bid tabs and discussions with contractors at $190 / TON.

3.2.7 Part G – Parks Improvements

As previously mentioned, the City has opportunities through these proposed drainage improvement projects to include park improvements into the design. Similar to streets, not all park improvements are directly related to drainage so for that reason, LAN has divided the costs into three priorities (Reference Section 5).

Parks improvements include earthwork/fill, topsoil, and seeding to create usable greenspace. Also included are shared use paths and pedestrian lighting.

Similar to Part B, Earthwork is based on TXDOT Standard Specification Item 132 – Embankment. This type of material is used to raise properties where additional material may be required for construction. This item is measured by Cubic Yard.

Topsoil is based on TXDOT Standard Specification Item 160 – Furnishing and Placing Topsoil (4-inch) and Seeding is based on TXDOT Standard Specification Item 164 – Drill Seeding (PERM) (URBAN) (SANDY). Both items are measured in Square Yards.

The proposed share use path is based on TXDOT Standard Specification Item 360 Concrete Paving (Joint Reinforced) and Item 260 Lime Treated Subgrade (6-inch). The costs associated with the shared use path are based on TXDOT Roadway Design Manual, Section 4; Bicycle Facilities and **AASHTO Guide for the Development of Bicycle Facilities, which recommends a 10-foot wide path**. Figure 11 below shows a typical shared use path in a coastal environment.

Figure 11 – Typical Shared-Use Path

Lighting – for pedestrian safety, all project include lighting. The opinions of costs assume pedestrian lighting along sidewalks and shared use paths. It is also assumed that poles are located 200-feet apart. This item is measured by Lump Sum.

Figure 12 – Example of Pedestrian Lighting

3.2.8 Part H – Utilities

Opinions of Probable Cost are specified for the relocations of water, wastewater, and gas utilities. Existing stormwater utilities are either abandoned in place or will remain in place and be cleaned and repaired, as necessary. Costs for cleaning and maintaining are considered subsidiary and not included in the project costs.

Utility adjustments are measured by Linear Feet by Size and Type of utility and include subsidiary costs such as valves, manholes, appurtenances, hydrants, and service connections.

4 Project Cost Summaries

Below represents the **Total Project Costs**, assuming the entire project were designed and constructed at one time (Ultimate Build-Out). Priorities of construction and phasing costs are discussed in Section 5.

Additionally, each Project can be divided into three possible funding sources: Utilities, Drainage, and Streets / Site Improvements.

4.1 Option 1 – Storm Water Conveyance & Ditch Improvements

Table 17 – Option 1 Ultimate Costs

Ultimate Build-out	
Option 1 - Storm Water Conveyance & Ditch Improvements (Base Bid)	
Land / Right-of-Way	$582,832
Construction	$14,334,850
Design / Survey / Testing (10%)	$1,433,485
Project / Program Management (5%)	$716,743
Total Opinion of Probable Project Costs	**$17,067,910**

Table 18 – Option 1 Costs by Funding Source

Option 1 - Total by Funding Source	
Total Utilities	$3,749,863
Total Drainage	$9,933,400
Total Streets / Site Improvements	$3,384,647
Grand Total	$17,067,910

4.2 Option 2 – Natural Channel / Linear Park Improvements

Table 19 – Option 2 Ultimate Costs

Ultimate Build-out	
Option 2 - Natural Channel / Linear Park Improvements (Base Bid)	
Land / Right-of-Way	$582,832
Construction	$28,122,219
Design / Survey / Testing (10%)	$2,812,222
Project / Program Management (5%)	$1,406,111
Total Opinion of Probable Project Costs	**$32,923,384**

Table 20 – Option 2 Costs by Funding Source

Option 2 - Total by Funding Source	
Total Utilities	$5,191,668
Total Drainage	$14,230,579
Total Streets / Site Improvements	$13,501,137
Grand Total	$32,923,384

4.3 Option 3A – Navigable Canal – Exit at Rincon

Table 21 – Option 3A Ultimate Costs

Ultimate Build-out	
Option3A - Navigable Canal - Rincon Outlet (Base Bid)	
Land / Right-of-Way	$1,200,250
Construction	$57,904,419
Design / Survey / Testing (10%)	$5,790,442
Project / Program Management (5%)	$2,895,221
Total Opinion of Probable Project Costs	**$67,790,332**

Table 22 – Option 3A Costs by Funding Source

Option 3A - Total by Funding Source	
Total Utilities	$7,587,454
Total Drainage	$43,565,689
Total Streets / Site Improvements	$16,637,190
Grand Total	$67,790,332

4.4 Option 3B – Navigable Canal – Exit thru Beach

Table 23 – Option 3B Ultimate Costs

Ultimate Build-out	
Option3B - Navigable Canal - Beach Outlet (Base Bid)	
Land / Right-of-Way	$1,200,250
Construction	$58,364,762
Design / Survey / Testing (10%)	$5,836,476
Project / Program Management (5%)	$2,918,238
Total Opinion of Probable Project Costs	**$68,319,726**

Table 24 – Option 3B Costs by Funding Source

Option 3B - Total by Funding Source	
Total Utilities	$7,587,454
Total Drainage	$45,792,500
Total Streets / Site Improvements	$14,939,772
Grand Total	$68,319,726

5 Project Priorities and Phasing Considerations

5.1 Prioritization of Improvements

For each option, project improvements have been categorized into three "buckets" or priorities based on importance to improve drainage on North Beach. Appendix A includes Opinions of Costs categorized into these priorities.

The ultimate goal for each project is to improve drainage on North Beach. Priority 1 costs support that goal. Other improvements, particularly additional earthwork, streets improvements, pedestrian facilities, and parks improvements are not in direct support of the drainage improvement, however they can improve the area further with the replacement of additional ageing infrastructure. These additional improvements are considered Priority 2 and 3.

5.1.1 Earthwork Priorities

- Priority 1 Earthwork – fill material (CY) required to raise public ROW's and areas immediately adjacent to the proposed drainage improvements.
- Priority 2 Earthwork – fill material (CY) required to raise public ROW's and privately owned lots currently at elevations lower than 3.5-feet, not adjacent to drainage improvements.
- Priority 3 Earthwork – fill material (CY) required to raise streets and privately owned lots currently at elevations higher than 3.5-feet.

5.1.2 Street and Pedestrian Improvement Priorities

- Priority 1 Streets / Ped – those streets that are required to be improved (full depth or pavement repair) in direct support of the drainage improvements.
- Priority 2 Streets / Ped – those streets located in areas that are prone to tidal flooding but not necessarily required for the installation of the drainage improvements.
- Priority 3 Streets / Ped – those streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach Area.

5.1.3 Park Improvement Priorities

- Priority 1 Parks – those parks that are directly attached to or immediately adjacent to the linear channel or canal improvements, including shared use paths.
- Priority 2 Parks – those parks improvements that are required due to the fill or raising of properties to achieve positive drainage.
- Priority 3 Parks – other community park, quality of place, and North Beach entrance improvements that are consistent with adopted North Beach Redevelopment Initiatives and Area Development Plans.

5.2 Phasing Considerations

Each Project (Option 1, 2, 3A, 3B) should be constructed in Phases. Several factors contribute to this in particular the Harbor Bridge project. LAN has proposed a three phase approach to completing the construction of the projects:

- Phase 1 – Utilities Relocations / Construction
- Phase 2 – Drainage Improvements
- Phase 3- Streets / Site Improvements (Priority 2-3)

5.2.1 Phase 1 – Utilities Relocations / Construction

Utility relocation costs represent on average **16.5%** of Total Project Costs for each Option. For this, utility relocations and reconstructions should be a project to itself, completed ahead of drainage improvements. Phase 1 would be the relocation and reconstruction of water, wastewater, gas, electrical, and fiber optic utilities. Preliminary engineering would include subsurface utilities engineering (SUE) that will identify the exact locations and depths of these utilities.

5.2.2 Phase 2 – Drainage Improvements

Drainage improvement costs represent on average **55%** of the Total Project Costs for each Option. Drainage improvements include channel/canal improvements, stormwater conveyance (pipe/box), bridges, and bulkheads. They also include property acquisition, earthwork, streets, pedestrian, and parks improvements that are Priority 1 that support the overall goal of improving drainage and reducing flooding on North Beach.

5.2.3 Phase 3 – Streets and Site Improvements

Additional Streets and Site improvement costs represent on average **28.5%** of the Total Project Costs for each Option. Additional streets and site improvements include earthwork, streets, pedestrian facilities, and parks improvements, categorized as Priority 2 and 3, in Section 5.1 above.

5.3 Option 1 – Storm Water Conveyance & Ditch Imp's Phasing Plan

Phase 1 - Utility Improvements	
Land / Right-of-Way	$0
Construction	$3,260,750
Design / Survey / Testing (10%)	$326,075
Project / Program Management (5%)	$163,038
Total Opinion of Probable Project Costs	$3,749,863
Phase 2 - Drainage Improvements	
Land / Right-of-Way	$0
Construction	$8,637,739
Design / Survey / Testing (10%)	$863,774
Project / Program Management (5%)	$431,887
Total Opinion of Probable Project Costs	$9,933,400
Phase 3 (Priority 3 Streets / Site Improvements)	
Land / Right-of-Way	$582,832
Construction	$2,436,361
Design / Survey / Testing (10%)	$243,636
Project / Program Management (5%)	$121,818
Total Opinion of Probable Project Costs	$3,384,647
Phased Build-out of Option 1	**$17,067,910**

5.4 Option 2 – Natural Channel / Linear Park Improvements Phasing Plan

Option 2 - Natural Channel / Linear Park Drainage Improvements	
Phase 1 - Utility Improvements	
Land / Right-of-Way	$0
Construction	$4,514,494
Design / Survey / Testing (10%)	$451,449
Project / Program Management (5%)	$225,725
Total Opinion of Probable Project Costs	$5,191,668
Phase 2A - Drainage Improvements (STA 25+00 to 69+10)	
Land / Right-of-Way	$582,832
Construction	$9,491,005
Design / Survey / Testing (10%)	$949,101
Project / Program Management (5%)	$474,550
Total Opinion of Probable Project Costs	$11,497,488
Phase 2B - Drainage Improvements (STA 00+00 to 25+00)	
Land / Right-of-Way	$0
Construction	$2,376,601
Design / Survey / Testing (10%)	$237,660
Project / Program Management (5%)	$118,830
Total Opinion of Probable Project Costs	$2,733,091
Phase 3 (Priority 2 Streets / Site Improvements)	
Land / Right-of-Way	$0
Construction	$3,938,145
Design / Survey / Testing (10%)	$393,815
Project / Program Management (5%)	$196,907
Total Opinion of Probable Project Costs	$4,528,867
Phase 4 (Priority 3 Streets / Site Improvements)	
Land / Right-of-Way	$0
Construction	$7,801,974
Design / Survey / Testing (10%)	$780,197
Project / Program Management (5%)	$390,099
Total Opinion of Probable Project Costs	$8,972,270
Phased Build-out of Option 2	**$32,923,384**

5.5 Option 3A – Navigable Canal – Phasing Plan

Option3A - Navigable Canal - Rincon Outlet (Base Bid)	
Phase 1 - Utility Improvements	
Land / Right-of-Way	$0
Construction	$6,597,786
Design / Survey / Testing (10%)	$659,779
Project / Program Management (5%)	$329,889
Total Opinion of Probable Project Costs	$7,587,454
Phase 2A - Drainage Improvements (STA 25+00 to 77+15)	
Land / Right-of-Way	$1,200,250
Construction	$28,433,622
Design / Survey / Testing (10%)	$2,843,362
Project / Program Management (5%)	$1,421,681
Total Opinion of Probable Project Costs	$33,898,915
Phase 2B - Drainage Improvements (STA 00+00 to 25+00)	
Land / Right-of-Way	$0
Construction	$8,405,890
Design / Survey / Testing (10%)	$840,589
Project / Program Management (5%)	$420,295
Total Opinion of Probable Project Costs	$9,666,774
Phase 3 - Priority 2 Streets / Site Improvements	
Land / Right-of-Way	$0
Construction	$5,803,751
Design / Survey / Testing (10%)	$580,375
Project / Program Management (5%)	$290,188
Total Opinion of Probable Project Costs	$6,674,313
Phase 4 (Priority 3 Streets / Site Improvements)	
Land / Right-of-Way	$0
Construction	$8,663,371
Design / Survey / Testing (10%)	$866,337
Project / Program Management (5%)	$433,169
Total Opinion of Probable Project Costs	$9,962,877
Phased Build-out of Option 3A	**$67,790,332**

5.6 Option 3B – Navigable Canal – Phasing Plan

Option3B - Navigable Canal - Beach Outlet (Base Bid)	
Phase 1 - Utility Improvements	
Land / Right-of-Way	$0
Construction	$6,597,786
Design / Survey / Testing (10%)	$659,779
Project / Program Management (5%)	$329,889
Total Opinion of Probable Project Costs	$7,587,454
Phase 2A - Drainage Improvements (STA 25+00 to 69+00)	
Land / Right-of-Way	$1,200,250
Construction	$30,616,694
Design / Survey / Testing (10%)	$3,061,669
Project / Program Management (5%)	$1,530,835
Total Opinion of Probable Project Costs	$36,409,448
Phase 2B - Drainage Improvements (STA 00+00 to 25+00)	
Land / Right-of-Way	$0
Construction	$8,159,175
Design / Survey / Testing (10%)	$815,918
Project / Program Management (5%)	$407,959
Total Opinion of Probable Project Costs	$9,383,052
Phase 3 - Priority 2 Streets / Site Improvements	
Land / Right-of-Way	$0
Construction	$5,757,195
Design / Survey / Testing (10%)	$575,719
Project / Program Management (5%)	$287,860
Total Opinion of Probable Project Costs	$6,620,774
Phase 4 (Priority 3 Streets / Site Improvements)	
Land / Right-of-Way	$0
Construction	$7,233,912
Design / Survey / Testing (10%)	$723,391
Project / Program Management (5%)	$361,696
Total Opinion of Probable Project Costs	$8,318,998
Phased Build-out of Option 3B	**$68,319,726**

6 Additional Considerations

6.1 Natural Channel Expansion & Option Variations

Options 2 and 3 both provide for long-term drainage improvements and will address issues with flooding from both rainfall and tides. Providing that the City moves forward with preliminary design for Option 2 – the Natural Channel / Linear Park Improvements, it should be noted that there are opportunities to include future accommodations in the design for a navigable portion of this channel. Since LAN's scope of work to provide cost estimates did not include an exhaustive evaluation of design options, it is recognized that there may be several "in-between" options.

6.2 Canal & Culvert Tide Gates

All options provide for a storm water outfalls (RCB's) to the Bay and/or to the wetlands. A sedimentation / siltation study has not been completed on any of the options; LAN assumes that this can be a concern that would result in higher than normal maintenance costs for dredging and cleaning of pipes/outlets.

A solution to this would be the installation of canal and/or culvert tide gates. The gate would be a passive flap gate or Tide Flex gate opened and closed by the tides in the Bay and able to release storm water as design from the channels and underground conveyance systems, as designed. Since this equipment requires some level of preliminary design, costs for these types of gates were not included in this report however they range from $2,500 to $5,000 /each depending on size.

Figure 12 – Example of Tide Flap Gate

Figure 12 – Example of Tide Flex Check Valve

6.3 Raising of Properties Methodologies

To achieve raising of the properties, the City should consider developing and implementing a policy or ordinance that includes considerations for vacant properties, occupied properties that frequently flood, and future land-use and development. The policy should have provisions that ensure that when properties are raised, they do not affect adjacent properties or cause flooding in streets or rights-of-way. The cost for filling private properties should not be entirely burdened on the City of Corpus Christi but should be shared amongst City and private property owners and future developers. The development of this policy is outside the scope of this contract but LAN can develop a comprehensive plan as part of the City's Area Development Plans.

6.4 Future Development & Public/Private Partnerships

In 2018, the City of Corpus Christi, City Council adopted an ordinance for the **North Beach Redevelopment Initiative Specific Plan**, which amended the City's Comprehensive Plan. The initiative directed the City staff to use the specific plan to facilitate future growth and development in the North Beach area. It included several Capital Improvement Projects (CIP) including a Canal, Cove, Jetties, and street improvements. The City of Corpus Christi should consider revisiting this comprehensive plan and develop policies, funding sources, and realistic strategies for the future development of North Beach.

Because of the unique nature of the North Beach area, the comprehensive plan should be take on as a private/public partnership between City, County, TXDOT, local community stakeholders (USS Lexington, Texas State Aquarium, etc.), and private developer participation. This would be done in similar fashion as the Capitol Riverfront Redevelopment in Washington, D.C. or San Antonio's "SA Tomorrow" or San Pedro Creek Redevelopment Plans:

Capitol Riverfront Business Improvement District | Washington DC Riverfront Development

SA Tomorrow Home - Comprehensive Plan, Sustainability Plan, Multimodal Transportation Plan, Regional Center Plans, and Community Area Plans - SA Tomorrow

San Pedro Creek Culture Park - Flowing with Purpose | San Antonio, Texas (spcculturepark.com)

7 Appendices

7.1 Detailed Opinions of Probable Costs

Option 1 - Storm Water Conveyance & Ditch Improvements (Base Bid)	
Part A - GENERAL	$900,000
Part B - Earthwork / Dredging (Priority 1 Fill only)	$509,913
Part C - Stormwater Conveyance	$3,389,536
Part D - Transportation / Streets (Priority 1 Streets only)	$1,523,000
Part E - Pedestrian / ADA (Priority 1 Streets only)	$124,142
Part F - Structural/Bridge	$0
Part G - Park Improvements (Priority 1 Parks only)	$463,600
SUBTOTAL (Parts A-H)	$6,910,191
Project Contingency (25%)	$1,727,548
Project Total (Base Bid)	$8,637,739
Utilities and Additional Priority 2 Improvements	
Part B - Earthwork / Dredging (Priority 2 Fill only)	$0
Part D - Transportation / Streets (Priority 2 Streets only)	$0
Part E - Pedestrian / ADA (Priority 2 Streets only)	$0
Part G - Park Improvements (Priority 2 Parks only)	$0
Part H - Utilities	$3,260,750
SUBTOTAL (Priority 2)	$3,260,750
Additional Priority 3 Improvements	
Part B - Earthwork / Dredging (Priority 3 Fill only)	$0
Part D - Transportation / Streets (Priority 3 Streets only)	$2,139,961
Part E - Pedestrian / ADA (Priority 3 Streets only)	$296,400
Part G - Park Improvements (Priority 3 Parks only)	$0
SUBTOTAL (Priority 3)	$2,436,361
Total Construction Costs (Priorities 1-3)	**$14,334,850**

Ultimate Build-out	
Option 1 - Storm Water Conveyance & Ditch Improvements (Base Bid)	
Land / Right-of-Way	$582,832
Construction	$14,334,850
Design / Survey / Testing (10%)	$1,433,485
Project / Program Management (5%)	$716,743
Total Opinion of Probable Project Costs	**$17,067,910**

City of Corpus Christi - North Beach Phase 2 - Option 1 Improvements
Preliminary Opinion of Probable Construction Cost

Item Description	QTY	Unit	Unit Cost	Work Item Subtotals	Total
Part A - GENERAL					**$900,000**
Mobilization (Max 5%)	1	LS	$500,000	**$500,000**	
Bonds and Insurance (Max 2%)	1	AL	$200,000	**$200,000**	
Traffic Control	1	LS	$100,000	**$100,000**	
Storm Water Pollution Protection Plan	1	LS	$100,000	**$100,000**	
Part B - Earthwork / Dredging					**$509,913**
Excavation - Ditches	15,000	CY	$9	**$135,000**	
Priority 1 Fill - Public ROW and areas immediately adjacent to the drainage improvements					
Street - Fill	10,926	CY	$11	**$120,186**	
Priority 2 Fill - Public ROW and privately owned lots at elevations lower than 3.5-feet, not adjacent to drainage					
Street - Fill	7,053	CY	$11	**$77,583**	
Priority 3 Fill - Streets and privately owned lots at elevations higher than 3.5-feet					
Street - Fill	16,104	CY	$11	**$177,144**	
Part C - Stormwater Conveyance					**$3,389,536**
6' x 6' boxes	3,525	LF	$480	**$1,692,000**	
24" RCP	2,074	LF	$92	**$190,808**	
18" RCP	5,167	LF	$65	**$335,855**	
12" RCP	2,717	LF	$138	**$374,946**	
Inlet	70	EA	$7,000	**$490,000**	
Excavation and Backfill for Structures	18,523	CY	$9	**$166,707**	
Trench Excavation Protection (Item 402)	9,675	LF	$10	**$96,750**	
Wingwalls	2	EA	$20,435	**$40,870**	
Rip-Rap Headwalls (at Channel)	4	CY	$400	**$1,600**	
Part D - Transportation / Streets					**$3,662,961**
Priority 1 - streets that are required to be improved for the drainage improvements					**$1,523,000**
Pavement Structure - Roadway Reconstruction C&G	8,000	SY	$60	**$480,000**	
Type II C&G	2,000	LF	$42	**$84,000**	
Pavement Structure - Roadway Repair	1,500	SY	$224	**$336,000**	
Pavement- Roadway Overlay	10,000	SY	$13.23	**$132,300**	
Driveway	3,876	SY	$75	**$290,700**	
Signing & Pavement Markings	1	LS	$200,000	**$200,000**	
Priority 2 - Those streets located in areas that are prone to flooding					**$0**
Pavement Structure - Roadway Reconstruction C&G	0	SY	$60	**$0**	
Type II C&G	0	LF	$42	**$0**	
Pavement Structure - Roadway Repair	0	SY	$224	**$0**	
Pavement- Roadway Overlay	0	SY	$13.23	**$0**	
Driveway	0	SY	$75	**$0**	
Signing & Pavement Markings	0	LS	$420,000	**$0**	

City of Corpus Christi - North Beach Phase 2 - Option 1 Improvements
Preliminary Opinion of Probable Construction Cost

Item Description	QTY	Unit	Unit Cost	Work Item Subtotals	Total
Priority 3 - streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach area					**$2,139,961**
Pavement Structure - Roadway Reconstruction C&G	8,500	SY	$60	**$510,000**	
Type II C&G	4,191	LF	$42	**$176,022**	
Pavement Structure - Roadway Repair	2,306	SY	$224	**$516,544**	
Pavement- Roadway Overlay	21,723	SY	$13.23	**$287,395**	
Driveway	6,000	SY	$75	**$450,000**	
Signing & Pavement Markings	1	LS	$200,000	**$200,000**	
Part E - Pedestrian/ADA					**$420,542**
Priority 1 - sidewalks on streets that are required to be improved for the drainage improvements					**$124,142**
Sidewalks	1,193	SY	$94	**$112,142**	
ADA Ramp	10	EA	$1,200	**$12,000**	
Priority 2 - Those streets located in areas that are prone to tidal flooding					**$0**
Sidewalks	0	SY	$94	**$0**	
ADA Ramp	0	EA	$1,200	**$0**	
Priority 3 - streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach area					**$296,400**
Sidewalks	3,000	SY	$94	**$282,000**	
ADA Ramp	12	EA	$1,200	**$14,400**	
Part F - Structural/Bridge					**$0**
Not applicable				**$0**	
Part G - Park					**$463,600**
Priority 1 - park improvements that are directly attached to or adjacent to the stormwater improvements					
Shared Use Path	1,159	CY	$400	**$463,600**	
Part H - Utilities					**$3,260,750**
WATER MAIN PIPE (PVC) (6 IN) (C-900)	2,790	LF	$42	**$117,180**	
WATER MAIN PIPE (PVC) (8 IN) (C-900)	4,888	LF	$45	**$219,960**	
WATER MAIN PIPE (PVC) (12 IN) (C-900)	611	LF	$75	**$45,825**	
WATER MAIN PIPE (PVC) (16 IN) (C-905)	2,689	LF	$140	**$376,460**	
CASING STEEL (20IN)	1,500	LF	$120	**$180,000**	
JCK TUN BOR OR AUG WTR MAIN (STL) (20IN)	1,500	LF	$90	**$135,000**	
2" PLASTIC PIPE AND TRACER WIRE	8,225	LF	$125	**$1,028,125**	
4" PLASTIC PIPE AND TRACER WIRE	1,158	LF	$150	**$173,700**	
8" PLASTIC PIPE AND TRACER WIRE	3,028	LF	$200	**$605,600**	
SANITARY SEWER (8 IN) (PVC) (SDR 26)	3,789	LF	$100	**$378,900**	
SUBTOTAL (Parts A thru H)					**$12,607,302**

Notes:
1. The OPPC provided herein is made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as an experienced and qualified professional engineer generally familiar with the construction industry. However, since the Engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions, the Engineer cannot and does not guarantee that proposals, bids or actual Construction Costs will not vary from the opinions of probable Construction Cost or Project Cost prepared by the Engineer. If the Owner wishes greater assurance as to probable Construction Cost or Project Cost, the Owner shall employ an independent cost estimator.

Option 2 - Natural Channel / Linear Park Drainage Improvements	
Part A - GENERAL	$1,980,000
Part B - Earthwork / Dredging (Priority 1 Fill only)	$2,000,391
Part C - Stormwater Conveyance	$3,009,114
Part D - Transportation / Streets (Priority 1 Streets only)	$1,395,897
Part E - Pedestrian / ADA (Priority 1 Streets only)	$124,142
Part F - Structural/Bridge	$0
Part G - Park Improvements (Priority 1 Parks only)	$984,541
SUBTOTAL (Parts A-G)	$9,494,085
Project Contingency (25%)	$2,373,521
Drainage Improvements Total (Base Bid)	$11,867,606
Utilities and Additional Priority 2 Improvements	
Part B - Earthwork / Dredging (Priority 2 Fill only)	$2,405,667
Part D - Transportation / Streets (Priority 2 Streets only)	$1,210,178
Part E - Pedestrian / ADA (Priority 2 Streets only)	$322,300
Part G - Park Improvements (Priority 2 Parks only)	$0
Part H - Utilities	$4,514,494
SUBTOTAL (Priority 2)	$8,452,639
Additional Priority 3 Improvements	
Part B - Earthwork / Dredging (Priority 3 Fill only)	$823,955
Part D - Transportation / Streets (Priority 3 Streets only)	$4,143,323
Part E - Pedestrian / ADA (Priority 3 Streets only)	$1,431,496
Part G - Park Improvements (Priority 3 Parks only)	$1,403,200
SUBTOTAL (Priority 3)	$7,801,974
Total Construction Costs (Priorities 1-3)	**$28,122,219**

Ultimate Build-out	
Option 2 - Natural Channel / Linear Park Improvements (Base Bid)	
Land / Right-of-Way	$582,832
Construction	$28,122,219
Design / Survey / Testing (10%)	$2,812,222
Project / Program Management (5%)	$1,406,111
Total Opinion of Probable Project Costs	**$32,923,384**

City of Corpus Christi - North Beach Phase 2 - Option 2 Improvements
Preliminary Opinion of Probable Construction Cost

Item Description	QTY	Unit	Unit Cost	Work Item Subtotals	Total
Part A - GENERAL					**$1,980,000**
Mobilization (Max 5%)	1	LS	$1,200,000	**$1,200,000**	
Bonds and Insurance (Max 2%)	1	AL	$480,000	**$480,000**	
Traffic Control	1	LS	$150,000	**$150,000**	
Storm Water Pollution Protection Plan	1	LS	$150,000	**$150,000**	
Part B - Earthwork / Dredging					**$5,230,013**
Natural Channel - Cut	44,667	CY	$15	**$670,005**	
New Drainage Ditch (Dolphin Park) - Cut	10,570	CY	$9	**$95,130**	
Coastal Berm - Fill	59,800	CY	$11	**$657,800**	
Priority 1 Fill - Public ROW and areas immediately adjacent to the drainage improvements					
Street - Fill	40,459	CY	$11	**$445,049**	
Property - Fill	12,037	CY	$11	**$132,407**	
Priority 2 Fill - Public ROW and privately owned lots at elevations lower than 3.5-feet, not adjacent to drainage					
Street - Fill	13,072	CY	$11	**$143,792**	
Property - Fill	205,625	CY	$11	**$2,261,875**	
Priority 3 Fill - Streets and privately owned lots at elevations higher than 3.5-feet					
Street - Fill	20,281	CY	$11	**$223,091**	
Property - Fill	54,624	CY	$11	**$600,864**	
Part C - Stormwater Conveyance					**$3,009,114**
Concrete-Lined Channel	2,700	CY	$125	**$337,500**	
6' x 6' boxes	1,718	LF	$480	**$824,640**	
24" RCP (Item 464)	6,084	LF	$92	**$559,728**	
18" RCP (Item 464)	7,046	LF	$65	**$457,990**	
Inlets (Item 465)	68	EA	$7,000	**$476,000**	
Excavation and Backfill for Structures (Item 400)	18,034	CY	$9	**$162,306**	
Trench Excavation Protection (Item 402)	14,848	LF	$10	**$148,480**	
Wingwalls	2	EA	$20,435	**$40,870**	
Rip-Rap Headwalls (at Channel)	4	CY	$400	**$1,600**	
Part D - Transportation / Streets					**$6,749,398**
Priority 1 - streets that are required to be improved for the drainage improvements					**$1,395,897**
Pavement Structure - Roadway Reconstruction	8,000	SY	$60	**$480,000**	
Pavement Structure - Pavement Overlay	1,500	SY	$13	**$19,845**	
Type II C&G	1,500	LF	$42	**$63,000**	
Pavement Structure - Roadway Repair	1,573	SY	$224	**$352,352**	
Driveways	3,876	SY	$75	**$290,700**	
Signing & Pavement Markings (1%)	1	LS	$100,000	**$100,000**	
Illumination	1,500	LF	$60	**$90,000**	
Priority 2 - Those streets located in areas that are prone to flooding					**$1,210,178**
Pavement Structure - Roadway Reconstruction	7,450	SY	$60	**$447,000**	
Pavement Structure - Pavement Overlay	506	SY	$13	**$6,694**	
Type II C&G	3,077	LF	$42	**$129,234**	
Beach Parking Areas - Gravel	8,160	SY	$25	**$204,000**	
Driveways	1,910	SY	$75	**$143,250**	
Signing & Pavement Markings (1%)	1	LS	$100,000	**$100,000**	
Illumination	3,000	LF	$60	**$180,000**	
Priority 3 - streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach area					**$4,143,323**
Pavement Structure - Roadway Reconstruction	33,450	SY	$60	**$2,007,000**	
Pavement Structure - Pavement Overlay	2,534	SY	$13	**$33,525**	
Type II C&G	15,404	LF	$42	**$646,968**	
Driveways	9,550	SY	$75	**$716,250**	
Signing & Pavement Markings (1%)	1	LS	$200,000	**$200,000**	
Illumination	8,993	LF	$60	**$539,580**	

City of Corpus Christi - North Beach Phase 2 - Option 2 Improvements
Preliminary Opinion of Probable Construction Cost

Item Description	QTY	Unit	Unit Cost	Work Item Subtotals	Total
Part E - PEDESTRIAN / ADA					**$1,877,938**
Priority 1 - sidewalks on streets that are required to be improved for the drainage improvements					**$124,142**
Sidewalks	1,193	SY	$94	**$112,142**	
ADA Ramp	10	EA	$1,200	**$12,000**	
Priority 2 - Those streets located in areas that are prone to tidal flooding					**$322,300**
Sidewalks	3,250	SY	$94	**$305,500**	
ADA Ramp	14	EA	$1,200	**$16,800**	
Priority 3 - streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach area					**$1,431,496**
Sidewalks	14,884	SY	$94	**$1,399,096**	
ADA Ramp	27	EA	$1,200	**$32,400**	
Part F - STRUCTURAL / BRIDGE - NOT APPLICABLE					**$0**
				$0	
Part G - Park					**$2,387,741**
Priority 1 - park improvements that are directly attached to or adjacent to the stormwater improvements					**$984,541**
Shared Use Path	1,159	CY	$400	**$463,600**	
Natural Channel Riprap / Wall / Erosion Control	21,467	SY	$23	**$493,741**	
Earthwork - Fill	0	CY	$11	**$0**	
Topsoil	13,600	SY	$1	**$12,240**	
Seeding	13,600	SY	$1	**$14,960**	
Priority 2 - Those parks improvements that are required due to the fill or raising of properties to affect positive drainage					**$0**
Shared Use Path	0	CY	$400	**$0**	
Earthwork - Fill	0	CY	$11	**$0**	
Topsoil	0	SY	$1	**$0**	
Seeding	0	SY	$1	**$0**	
Priority 3 - Community park, quality of life, and North Beach entrance improvements that are consistent with adopted North Beach Redevelopment Initiatives and Area Development Plans.					**$1,403,200**
Shared Use Path	1,706	CY	$400	**$682,400**	
Earthwork - Fill	49,600	CY	$11	**$520,800**	
Topsoil	100,000	SY	$1	**$90,000**	
Seeding	100,000	SY	$1	**$110,000**	
Part H - UTILITIES					**$4,514,494**
WATER MAIN PIPE (PVC) (6 IN) (C-900)	3,892	LF	$ 42.00	**$163,464**	
WATER MAIN PIPE (PVC) (8 IN) (C-900)	5,134	LF	$ 45.00	**$231,030**	
WATER MAIN PIPE (PVC) (12 IN) (C-900)	611	LF	$ 75.00	**$45,825**	
WATER MAIN PIPE (PVC) (16 IN) (C-905)	5,880	LF	$ 140.00	**$823,200**	
CASING STEEL (20IN)	1,500	LF	$ 120.00	**$180,000**	
JCK TUN BOR OR AUG WTR MAIN (STL) (20IN)	1,500	LF	$ 90.00	**$135,000**	
SANITARY SEWER (8 IN) (PVC) (SDR 26)	6,205	LF	$ 100.00	**$620,500**	
SANITARY SEWER (10 IN) (PVC) (SDR 26)	1,362	LF	$ 125.00	**$170,250**	
SANITARY SEWER (15 IN) (PVC) (SDR 26)	399	LF	$ 200.00	**$79,800**	
2" PLASTIC PIPE AND TRACER WIRE	9,351	LF	$ 125.00	**$1,168,875**	
4" PLASTIC PIPE AND TRACER WIRE	1,158	LF	$ 150.00	**$173,700**	
6" PLASTIC PIPE AND TRACER WIRE	670	LF	$ 175.00	**$117,250**	
8" PLASTIC PIPE AND TRACER WIRE	3,028	LF	$ 200.00	**$605,600**	
SUBTOTAL (Parts A - G)					**$25,748,698**

Notes:
1. The OPPC provided herein is made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as an experienced and qualified professional engineer generally familiar with the construction industry. However, since the Engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions, the Engineer cannot and does not guarantee that proposals, bids or actual Construction Costs will not vary from the opinions of probable Construction Cost or Project Cost prepared by the Engineer. If the Owner wishes greater assurance as to probable Construction Cost or Project Cost, the Owner shall employ an independent cost estimator.

Option3A - Navigable Canal - Rincon Outlet (Base Bid)	
Part A - GENERAL	$3,278,000
Part B - Earthwork / Dredging (Priority 1 Fill only)	$4,662,995
Part C - Stormwater Conveyance	$2,799,037
Part D - Transportation / Streets (Priority 1 Streets only)	$1,520,016
Part E - Pedestrian / ADA (Priority 1 Streets only)	$124,142
Part F - Structural/Bridge/Jetties	$16,596,620
Part G - Park Improvements (Priority 1 Parks only)	$490,800
SUBTOTAL (Parts A-H)	$29,471,610
Project Contingency (25%)	$7,367,902
Project Total (Base Bid)	$36,839,512
Utilities and Additional Priority 2 Improvements	
Part B - Earthwork / Dredging (Priority 2 Fill only)	$4,064,623
Part D - Transportation / Streets (Priority 2 Streets only)	$1,416,828
Part E - Pedestrian / ADA (Priority 2 Streets only)	$322,300
Part G - Park Improvements (Priority 2 Parks only)	$0
Part H - Utilities	$6,597,786
SUBTOTAL (Priority 2)	$12,401,537
Additional Priority 3 Improvements	
Part B - Earthwork / Dredging (Priority 3 Fill only)	$1,151,261
Part D - Transportation / Streets (Priority 3 Streets only)	$4,677,414
Part E - Pedestrian / ADA (Priority 3 Streets only)	$1,431,496
Part G - Park Improvements (Priority 3 Parks only)	$1,403,200
SUBTOTAL (Priority 3)	$8,663,371
Total Construction Costs (Priorities 1-3)	**$57,904,419**
	$69,991,051

Ultimate Build-out	
Option3A - Navigable Canal - Rincon Outlet (Base Bid)	
Land / Right-of-Way	$1,200,250
Construction	$57,904,419
Design / Survey / Testing (10%)	$5,790,442
Project / Program Management (5%)	$2,895,221
Total Opinion of Probable Project Costs	**$67,790,332**

North Beach – Phase 2 Cost Estimating

City of Corpus Christi - North Beach Phase 2 - Option 3A Improvements
Preliminary Opinion of Probable Construction Cost

Item Description	QTY	Unit	Unit Cost	Work Item Subtotals	Total
Part A - GENERAL					**$3,278,000**
Mobilization (Max 5%)	1	LS	$2,020,000	**$2,020,000**	
Bonds and Insurance (Max 2%)	1	AL	$808,000	**$808,000**	
Traffic Control	1	LS	$250,000	**$250,000**	
Storm Water Pollution Protection Plan	1	LS	$200,000	**$200,000**	
Part B - Earthwork / Dredging					**$9,878,878**
Dredging (below MSL)	126,250	CY	$20	**$2,525,000**	
Navigable Canal - Cut (above MSL)	100,973	CY	$9	**$908,757**	
Coastal Berm - Fill	59,800	CY	$11	**$657,800**	
Priority 1 Fill - Public ROW and areas immediately adjacent to the drainage improvements					
Street - Fill	40,459	CY	$11	**$445,049**	
Property - Fill	12,037	CY	$11	**$126,389**	
Priority 2 Fill - Public ROW and privately owned lots at elevations lower than 3.5-feet, not adjacent to drainage					
Street - Fill	93,112	CY	$11	**$1,024,232**	
Property - Fill	289,561	CY	$11	**$3,040,391**	
Priority 3 Fill - Streets and privately owned lots at elevations higher than 3.5-feet					
Street - Fill	52,519	CY	$11	**$577,709**	
Property - Fill	54,624	CY	$11	**$573,552**	
Part C - Stormwater Conveyance					**$2,799,037**
6' x 6' boxes	1,201	LF	$480	**$576,480**	
24" RCP	5,784	LF	$92	**$532,128**	
18" RCP	6,188	LF	$65	**$402,220**	
12" RCP	2,953	LF	$138	**$407,514**	
Inlet	80	EA	$7,000	**$560,000**	
Excavation and Backfill for Structures	17,715	CY	$9	**$159,435**	
Trench Excavation Protection	16,126	LF	$10	**$161,260**	
Part D - Transportation / Streets					**$7,614,258**
Priority 1 - streets that are required to be improved for the drainage improvements					**$1,520,016**
Pavement Structure - Roadway Reconstruction C&G, Open Ditch	9,233	SY	$60	**$553,980**	
Type II C&G	1,500	LF	$42	**$63,000**	
Pavement Structure - Roadway Repair	1,573	SY	$224	**$352,352**	
Driveway	3,876	SY	$75	**$290,700**	
Signing & Pavement Markings	1	LS	$150,000	**$150,000**	
Safety	1	LS	$19,984	**$19,984**	
Illumination	1,500	LF	$60	**$90,000**	
Priority 2 - Those streets located in areas that are prone to tidal flooding					**$1,416,828**
Pavement Structure - Roadway Reconstruction C&G, Open Ditch	7,450	SY	$60	**$447,000**	
Type II C&G	3,077	LF	$42	**$129,234**	
Pavement Structure - Roadway Repair	506	SY	$224	**$113,344**	
Driveway	1,910	SY	$75	**$143,250**	
Beach Parking Areas - Gravel	8,160	SY	$25	**$204,000**	
Signing & Pavement Markings	1	LS	$200,000	**$200,000**	
Illumination	3,000	LF	$60	**$180,000**	
Priority 3 - streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach area					**$4,677,414**
Pavement Structure - Roadway Reconstruction C&G, Open Ditch	33,450	SY	$60	**$2,007,000**	
Pavement Structure - Roadway Repair	2,534	SY	$224	**$567,616**	
Type II C&G	15,404	LF	$42	**$646,968**	
Driveway	9,550	SY	$75	**$716,250**	
Signing & Pavement Markings	1	LS	$200,000	**$200,000**	
Illumination	8,993	LF	$60	**$539,580**	

City of Corpus Christi - North Beach Phase 2 - Option 3A Improvements
Preliminary Opinion of Probable Construction Cost

Item Description	QTY	Unit	Unit Cost	Work Item Subtotals	Total
Part E - Pedestrian/ADA					**$1,877,938**
Priority 1 - sidewalks on streets that are required to be improved for the drainage improvements					**$124,142**
Sidewalks	1,193	SY	$94	**$112,142**	
ADA Ramp	10	EA	$1,200	**$12,000**	
Priority 2 - Those streets located in areas that are prone to tidal flooding					**$322,300**
Sidewalks	3,250	SY	$94	**$305,500**	
ADA Ramp	14	EA	$1,200	**$16,800**	
Priority 3 - streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach area					**$1,431,496**
Sidewalks	14,884	SY	$94	**$1,399,096**	
ADA Ramp	27	EA	$1,200	**$32,400**	
Part F-1 - Bridge (Canal Crossings)					**$3,602,000**
Bridge	42,000	SF	$85	**$3,570,000**	
Bridge embankment	1,600	CY	$20	**$32,000**	
Part F-2 - Bulkhead / Retaining Wall					**$9,437,250**
3 Alternatives					
- Steel Sheet Pile	12,583	LF	$1,000	**$12,583,000**	
- Concrete Sheet Pile	12,583	LF	$750	**$9,437,250**	
- Corrugated Vinyl Sheet Piling	12,583	LF	$500	**$6,291,500**	
Part F-3 - Rock RipRap Jetties					**$3,557,370**
Furnish and Place New Imported Rip Rap	18,723	TON	$190	**$3,557,370**	
Part G - Park					**$1,894,000**
Priority 1 - park improvements that are directly attached to or adjacent to the stormwater improvements					**$490,800**
Shared Use Path	1,159	CY	$400	**$463,600**	
Earthwork - Fill	0	CY	$11	**$0**	
Topsoil	13,600	SY	$1	**$12,240**	
Seeding	13,600	SY	$1.10	**$14,960**	
Priority 2 - Those parks improvements that are required due to the fill or raising of properties to affect positive drainage					**$0**
Shared Use Path	0	CY	$400	**$0**	
Earthwork - Fill	0	CY	$11	**$0**	
Topsoil	0	SY	$1	**$0**	
Seeding	0	SY	$1.10	**$0**	
Priority 3 - Community park, quality of life, and North Beach entrance improvements that are consistent with adopted North Beach Redevelopment Initiatives and Area Development Plans.					**$1,403,200**
Shared Use Path	1,706	CY	$400	**$682,400**	
Earthwork - Fill	49,600	CY	$11	**$520,800**	
Topsoil	100,000	SY	$1	**$90,000**	
Seeding	100,000	SY	$1.10	**$110,000**	
Part H - Utilities					**$6,597,786**
WATER MAIN PIPE (PVC) (4 IN) (C-900)	14,608	LF	$ 42.00	**$613,536**	
WATER MAIN PIPE (PVC) (8 IN) (C-900)	8,065	LF	$ 45.00	**$362,925**	
WATER MAIN PIPE (PVC) (12 IN) (C-900)	611	LF	$ 75.00	**$45,825**	
WATER MAIN PIPE (PVC) (16 IN) (C-905)	5,880	LF	$ 140.00	**$823,200**	
CASING STEEL (20IN)	1,500	LF	$ 120.00	**$180,000**	
JCK TUN BOR OR AUG WTR MAIN (STL) (20IN)	1,500	LF	$ 90.00	**$135,000**	
SANITARY SEWER (8 IN) (PVC) (SDR 26)	6,205	LF	$ 100.00	**$620,500**	
SANITARY SEWER (10 IN) (PVC) (SDR 26)	1,362	LF	$ 125.00	**$170,250**	
SANITARY SEWER (15 IN) (PVC) (SDR 26)	399	LF	$ 200.00	**$79,800**	
2" PLASTIC PIPE AND TRACER WIRE	15,292	LF	$ 125.00	**$1,911,500**	
4" PLASTIC PIPE AND TRACER WIRE	3,160	LF	$ 150.00	**$474,000**	
6" PLASTIC PIPE AND TRACER WIRE	3,086	LF	$ 175.00	**$540,050**	
8" PLASTIC PIPE AND TRACER WIRE	3,206	LF	$ 200.00	**$641,200**	
SUBTOTAL (Part A Through H)					**$50,536,517**

Option3B - Navigable Canal - Beach Outlet (Base Bid)	
Part A - GENERAL	$4,930,000
Part B - Earthwork / Dredging (Priority 1 Fill only)	$4,219,658
Part C - Stormwater Conveyance	$4,196,080
Part D - Transportation / Streets (Priority 1 Streets only)	$1,520,016
Part E - Pedestrian / ADA (Priority 1 Streets only)	$124,142
Part F - Structural/Bridge/Jetties	$15,540,000
Part G - Park Improvements (Priority 1 Parks only)	$490,800
SUBTOTAL (Parts A-H)	$31,020,696
Project Contingency (25%)	$7,755,174
Project Total (Base Bid)	$38,775,870
Additional Priority 2 Improvements	
Part B - Earthwork / Dredging (Priority 2 Fill only)	$4,018,067
Part D - Transportation / Streets (Priority 2 Streets only)	$1,416,828
Part E - Pedestrian / ADA (Priority 2 Streets only)	$322,300
Part G - Park Improvements (Priority 2 Parks only)	$0
Part H - Utilities	$6,597,786
SUBTOTAL (Priority 2)	$12,354,981
Additional Priority 3 Improvements	
Part B - Earthwork / Dredging (Priority 3 Fill only)	$1,125,002
Part D - Transportation / Streets (Priority 3 Streets only)	$4,677,414
Part E - Pedestrian / ADA (Priority 3 Streets only)	$1,431,496
Part G - Park Improvements (Priority 3 Parks only)	$0
SUBTOTAL (Priority 3)	$7,233,912
Total Construction Costs (Priorities 1-3)	**$58,364,762**
	$74,183,613

Ultimate Build-out	
Option3B - Navigable Canal - Beach Outlet (Base Bid)	
Land / Right-of-Way	$1,200,250
Construction	$58,364,762
Design / Survey / Testing (10%)	$5,836,476
Project / Program Management (5%)	$2,918,238
Total Opinion of Probable Project Costs	**$68,319,726**

City of Corpus Christi - North Beach Phase 2 - Option 3B Improvements
Preliminary Opinion of Probable Construction Cost

Item Description	QTY	Unit	Unit Cost	Work Item Subtotals	Total
Part A - GENERAL					**$4,930,000**
Mobilization (Max 5%)	1	LS	$3,200,000	**$3,200,000**	
Bonds and Insurance (Max 2%)	1	AL	$1,280,000	**$1,280,000**	
Traffic Control	1	LS	$250,000	**$250,000**	
Storm Water Pollution Protection Plan	1	LS	$200,000	**$200,000**	
Part B - Earthwork / Dredging					**$9,362,726**
Dredging (below MSL)	117,750	CY	$20	**$2,355,000**	
Navigable Canal - Cut	72,850	CY	$9	**$655,650**	
Coastal Berm - Fill	59,800	CY	$11	**$657,800**	
Priority 1 Fill - Public ROW and areas immediately adjacent to the drainage improvements					
Street - Fill	40,459	CY	$11	**$424,820**	
Property - Fill	12,037	CY	$11	**$126,389**	
Priority 2 Fill - Public ROW and privately owned lots at elevations lower than 3.5-feet, not adjacent to drainage					
Street - Fill	93,112	CY	$11	**$977,676**	
Property - Fill	289,561	CY	$11	**$3,040,391**	
Priority 3 Fill - Streets and privately owned lots at elevations higher than 3.5-feet					
Street - Fill	52,519	CY	$11	**$551,450**	
Property - Fill	54,624	CY	$11	**$573,552**	
Part C - Stormwater Conveyance					**$4,196,080**
6' x 6' boxes	1,200	LF	$480	**$576,000**	
10' x 10' box	1,305	LF	$1,402	**$1,829,610**	
24" RCP	4,883	LF	$92	**$449,236**	
18" RCP	7,127	LF	$65	**$463,255**	
12" RCP	1,980	LF	$138	**$273,240**	
Inlet	30	EA	$7,000	**$210,000**	
Excavation and Backfill for Structures	25,532	CY	$9	**$229,789**	
Trench Excavation Protection	16,495	LF	$10	**$164,950**	
Part D - Transportation / Streets					**$7,614,258**
Priority 1 - streets that are required to be improved for the drainage improvements					**$1,520,016**
Pavement Structure - Roadway Reconstruction C&G, Open Ditch	9,233	SY	$60	**$553,980**	
Type II C&G	1,500	LF	$42	**$63,000**	
Pavement Structure - Roadway Repair	1,573	SY	$224	**$352,352**	
Driveway	3,876	SY	$75	**$290,700**	
Signing & Pavement Markings (1%)	1	LS	$150,000	**$150,000**	
Safety	1	LS	$19,984	**$19,984**	
Illumination	1,500	LF	$60	**$90,000**	
Priority 2 - Those streets located in areas that are prone to tidal flooding					**$1,416,828**
Pavement Structure - Roadway Reconstruction C&G, Open Ditch	7,450	SY	$60	**$447,000**	
Type II C&G	3,077	LF	$42	**$129,234**	
Pavement Structure - Roadway Repair	506	SY	$224	**$113,344**	
Driveway	1,910	SY	$75	**$143,250**	
Beach Parking Areas - Gravel	8,160	SY	$25	**$204,000**	
Signing & Pavement Markings (1%)	1	LS	$200,000	**$200,000**	
Illumination	3,000	LF	$60	**$180,000**	
Priority 3 - streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach area					**$4,677,414**
Pavement Structure - Roadway Reconstruction C&G, Open Ditch	33,450	SY	$60	**$2,007,000**	
Pavement Structure - Roadway Repair	2,534	SY	$224	**$567,616**	
Type II C&G	15,404	LF	$42	**$646,968**	
Driveway	9,550	SY	$75	**$716,250**	
Signing & Pavement Markings (1%)	1	LS	$200,000	**$200,000**	
Illumination	8,993	LF	$60	**$539,580**	

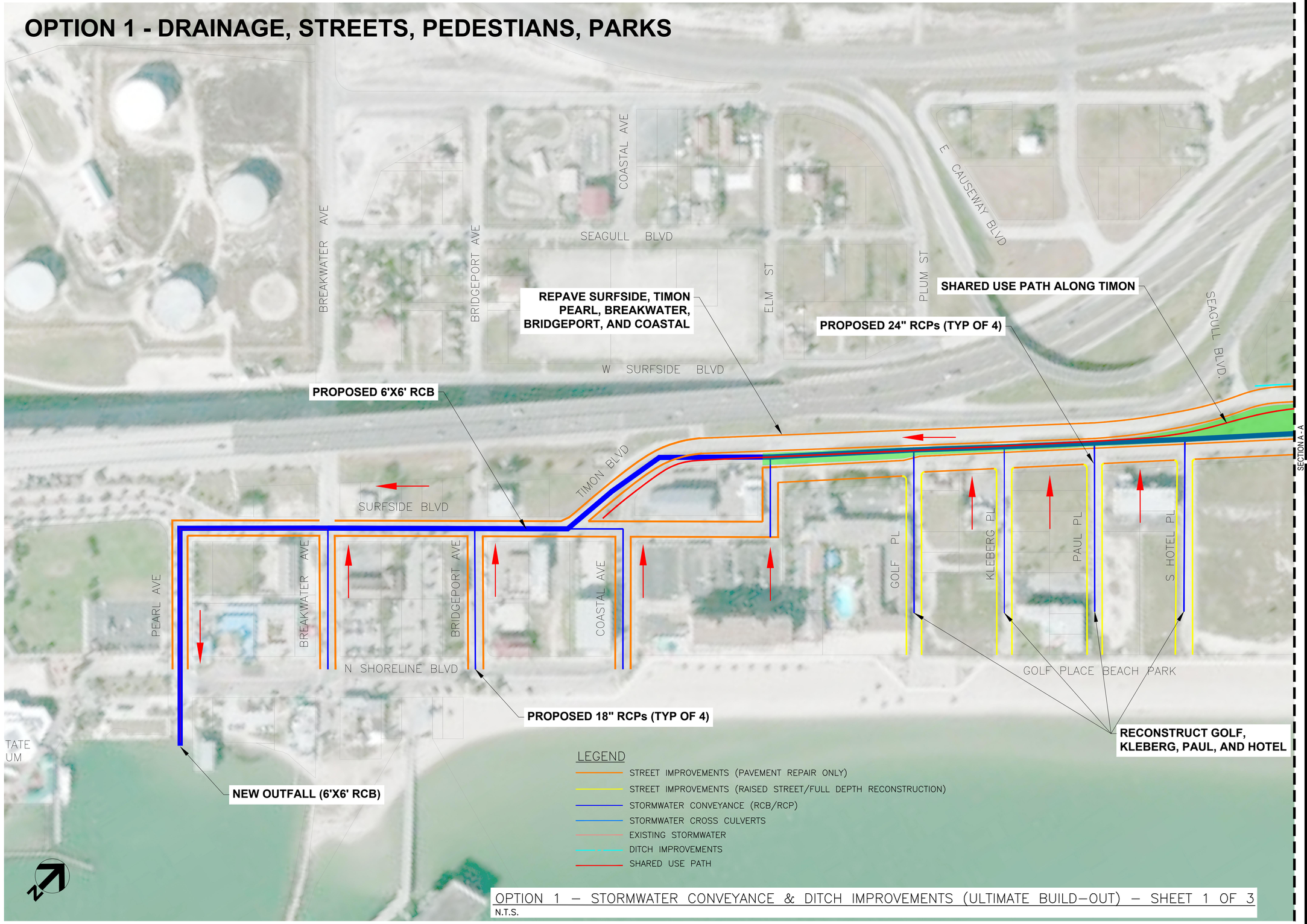
City of Corpus Christi - North Beach Phase 2 - Option 3B Improvements
Preliminary Opinion of Probable Construction Cost

Item Description	QTY	Unit	Unit Cost	Work Item Subtotals	Total
Part E - Pedestrian/ADA					**$1,877,938**
Priority 1 - sidewalks on streets that are required to be improved for the drainage improvements					**$124,142**
Sidewalks	1,193	SY	$94	**$112,142**	
ADA Ramp	10	EA	$1,200	**$12,000**	
Priority 2 - Those streets located in areas that are prone to tidal flooding					**$322,300**
Sidewalks	3,250	SY	$94	**$305,500**	
ADA Ramp	14	EA	$1,200	**$16,800**	
Priority 3 - streets that are required to improve capacity or are in poor condition (PCI<50) in the North Beach area					**$1,431,496**
Sidewalks	14,884	SY	$94	**$1,399,096**	
ADA Ramp	27	EA	$1,200	**$32,400**	
Part F-1 - Bridge (Canal Crossings)					**$3,602,000**
Bridge	42,000	SF	$85	**$3,570,000**	
Bridge embankment	1,600	CY	$20	**$32,000**	
Part F-2 - Bulkhead / Retaining Wall					**$8,812,500**
3 Alternatives					
- Steel Sheet Pile	11,750	LF	$1,000	**$11,750,000**	
- Concrete Sheet Pile	11,750	LF	$750	**$8,812,500**	
- Corrugated Vinyl Sheet Piling	11,750	LF	$500	**$5,875,000**	
Part F-3 - Rock RipRap Jetties					**$3,125,500**
Furnish and Place New Imported Rip Rap	16,450	TON	$190	**$3,125,500**	
Part G - Park					**$1,894,000**
Priority 1 - park improvements that are directly attached to or adjacent to the stormwater improvements					**$490,800**
Shared Use Path	1,159	CY	$400	**$463,600**	
Earthwork - Fill	0	CY	$11	**$0**	
Topsoil	13,600	SY	$1	**$12,240**	
Seeding	13,600	SY	$1.10	**$14,960**	
Priority 2 - Those parks improvements that are required due to the fill or raising of properties to affect positive drainage					**$0**
Shared Use Path	0	CY	$400	**$0**	
Earthwork - Fill	0	CY	$11	**$0**	
Topsoil	0	SY	$1	**$0**	
Seeding	0	SY	$0.27	**$0**	
Priority 3 - Community park, quality of life, and North Beach entrance improvements that are consistent with adopted North Beach Redevelopment Initiatives and Area Development Plans.					**$1,403,200**
Shared Use Path	1,706	CY	$400	**$682,400**	
Earthwork - Fill	49,600	CY	$11	**$520,800**	
Topsoil	100,000	SY	$1	**$90,000**	
Seeding	100,000	SY	$1.10	**$110,000**	
Part H - Utilities					**$6,597,786**
WATER MAIN PIPE (PVC) (4 IN) (C-900)	14,608	LF	$ 42.00	**$613,536**	
WATER MAIN PIPE (PVC) (8 IN) (C-900)	8,065	LF	$ 45.00	**$362,925**	
WATER MAIN PIPE (PVC) (10 IN) (C-900)		LF	$ 60.00	**$0**	
WATER MAIN PIPE (PVC) (12 IN) (C-900)	611	LF	$ 75.00	**$45,825**	
WATER MAIN PIPE (PVC) (16 IN) (C-905)	5,880	LF	$ 140.00	**$823,200**	
CASING STEEL (20IN)	1,500	LF	$ 120.00	**$180,000**	
JCK TUN BOR OR AUG WTR MAIN (STL) (20IN)	1,500	LF	$ 90.00	**$135,000**	
				$0	
SANITARY SEWER (8 IN) (PVC) (SDR 26)	6,205	LF	$ 100.00	**$620,500**	
SANITARY SEWER (10 IN) (PVC) (SDR 26)	1,362	LF	$ 125.00	**$170,250**	
SANITARY SEWER (15 IN) (PVC) (SDR 26)	399	LF	$ 200.00	**$79,800**	
				$0	
2" PLASTIC PIPE AND TRACER WIRE	15,292	LF	$ 125.00	**$1,911,500**	
4" PLASTIC PIPE AND TRACER WIRE	3,160	LF	$ 150.00	**$474,000**	
6" PLASTIC PIPE AND TRACER WIRE	3,086	LF	$ 175.00	**$540,050**	
8" PLASTIC PIPE AND TRACER WIRE	3,206	LF	$ 200.00	**$641,200**	
SUBTOTAL (Part A Through H)					**$52,012,788**

Notes:
1. The OPPC provided herein is made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as an experienced and qualified professional engineer generally familiar with the construction industry. However, since the Engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions, the Engineer cannot and does not guarantee that proposals, bids or actual Construction Costs will not vary from the opinions of probable Construction Cost or Project Cost prepared by the Engineer. If the Owner wishes greater assurance as to probable Construction Cost or Project Cost, the Owner shall employ an independent cost estimator.

7.2 Drainage Improvement Exhibits

OPTION 1 - DRAINAGE, STREETS, PEDESTIANS, PARKS



OPTION 1 – STORMWATER CONVEYANCE & DITCH IMPROVEMENTS (ULTIMATE BUILD-OUT) – SHEET 1 OF 3

N.T.S.

REVISION NO.	DATE	BY	DESCRIPTION
REVNO1	REVDATE1	REVBY1	REVDESC1
REVNO2	REVDATE2	REVBY2	REVDESC2
REVISION NO.	DATE	BY	DESCRIPTION
REVNO3	REVDATE3	REVBY3	REVDESC3
REVNO4	REVDATE4	REVBY4	REVDESC4

SECTION A - A

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
PLANNING
ENGINEERING
PROGRAM MANAGEMENT
500 N. Shoreline Blvd., Suite 905
Corpus Christi, Texas 78401

CITY of CORPUS CHRISTI
TEXAS
Department of Engineering Services

NORTH BEACH NAVIGABLE CANAL PROJECT (PHASE II)

OPTION 1 – STORMWATER CONVEYANCE & DITCH IMPROVEMENTS PROJECT

SHEET ____ of ____
RECORD DRAWING NO.
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CITY PROJECT # XXXXXX / XXXXXX

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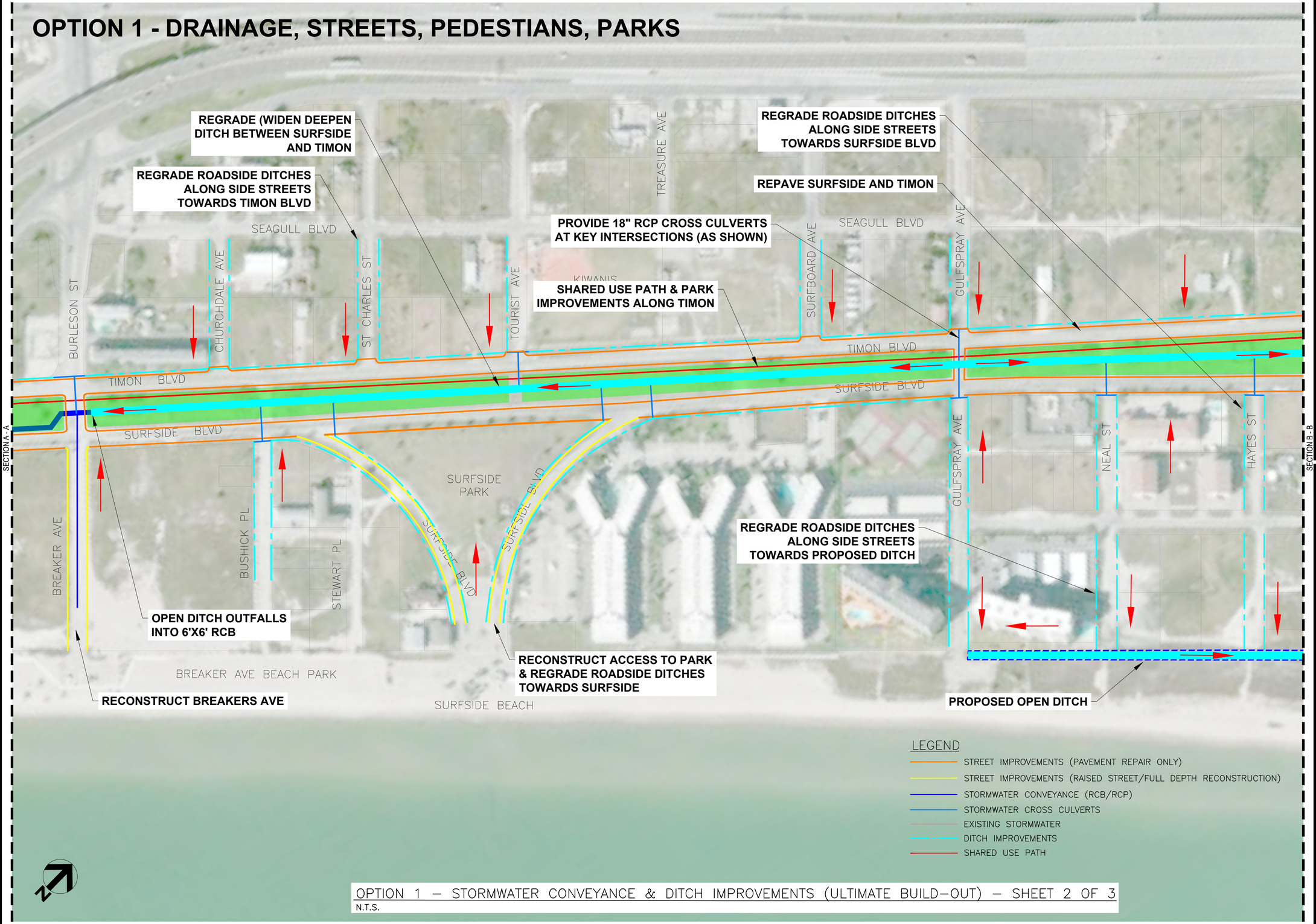
OPTION 1 - DRAINAGE, STREETS, PEDESTIANS, PARKS



OPTION 1 – STORMWATER CONVEYANCE & DITCH IMPROVEMENTS (ULTIMATE BUILD-OUT) – SHEET 2 OF 3

N.T.S.

REVISION NO.	DATE	BY	DESCRIPTION
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REVNO2	REVDATE2	REVBY2	REVDESC2
REVISION NO.	DATE	BY	DESCRIPTION
REVNO3	REVDATE3	REVBY3	REVDESC3
REVNO4	REVDATE4	REVBY4	REVDESC4

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
PLANNING
ENGINEERING
PROGRAM MANAGEMENT
500 N. Shoreline Blvd., Suite 905
Corpus Christi, Texas 78401

CITY of CORPUS CHRISTI
TEXAS
Department of Engineering Services

NORTH BEACH NAVIGABLE CANAL PROJECT (PHASE II)

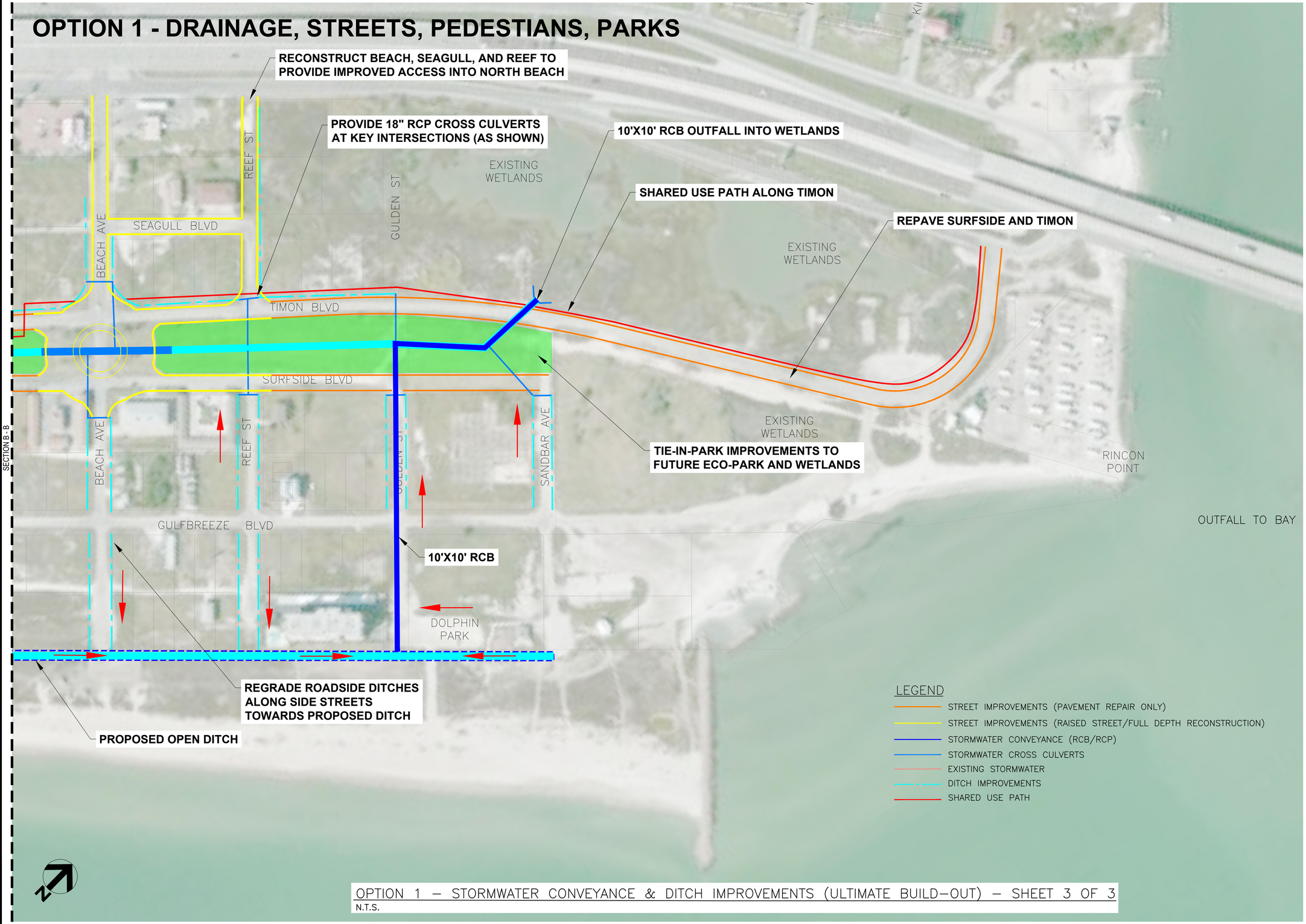
OPTION 1 – STORMWATER CONVEYANCE & DITCH IMPROVEMENTS PROJECT

SHEET ____ of ____
RECORD DRAWING NO.
— —
CITY PROJECT # XXXXXX XXXXXX

SECTION A - A

SECTION B - B

OPTION 1 - DRAINAGE, STREETS, PEDESTIANS, PARKS



OPTION 1 – STORMWATER CONVEYANCE & DITCH IMPROVEMENTS (ULTIMATE BUILD-OUT) – SHEET 3 OF 3

N.T.S.

REVISION NO.	DATE	BY	DESCRIPTION
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REVNO2	REVDATE2	REVBY2	REVDESC2
REVNO3	REVDATE3	REVBY3	REVDESC3
REVNO4	REVDATE4	REVBY4	REVDESC4

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
PLANNING
ENGINEERING
PROGRAM MANAGEMENT
500 N. Shoreline Blvd., Suite 905
Corpus Christi, Texas 78401

CITY of CORPUS CHRISTI
TEXAS
Department of Engineering Services

NORTH BEACH NAVIGABLE CANAL PROJECT (PHASE II)

OPTION 1 – STORMWATER CONVEYANCE & DITCH IMPROVEMENTS PROJECT

SHEET ____ of ____
RECORD DRAWING NO.
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CITY PROJECT # XXXXXX XXXXXX

SECTION B - B

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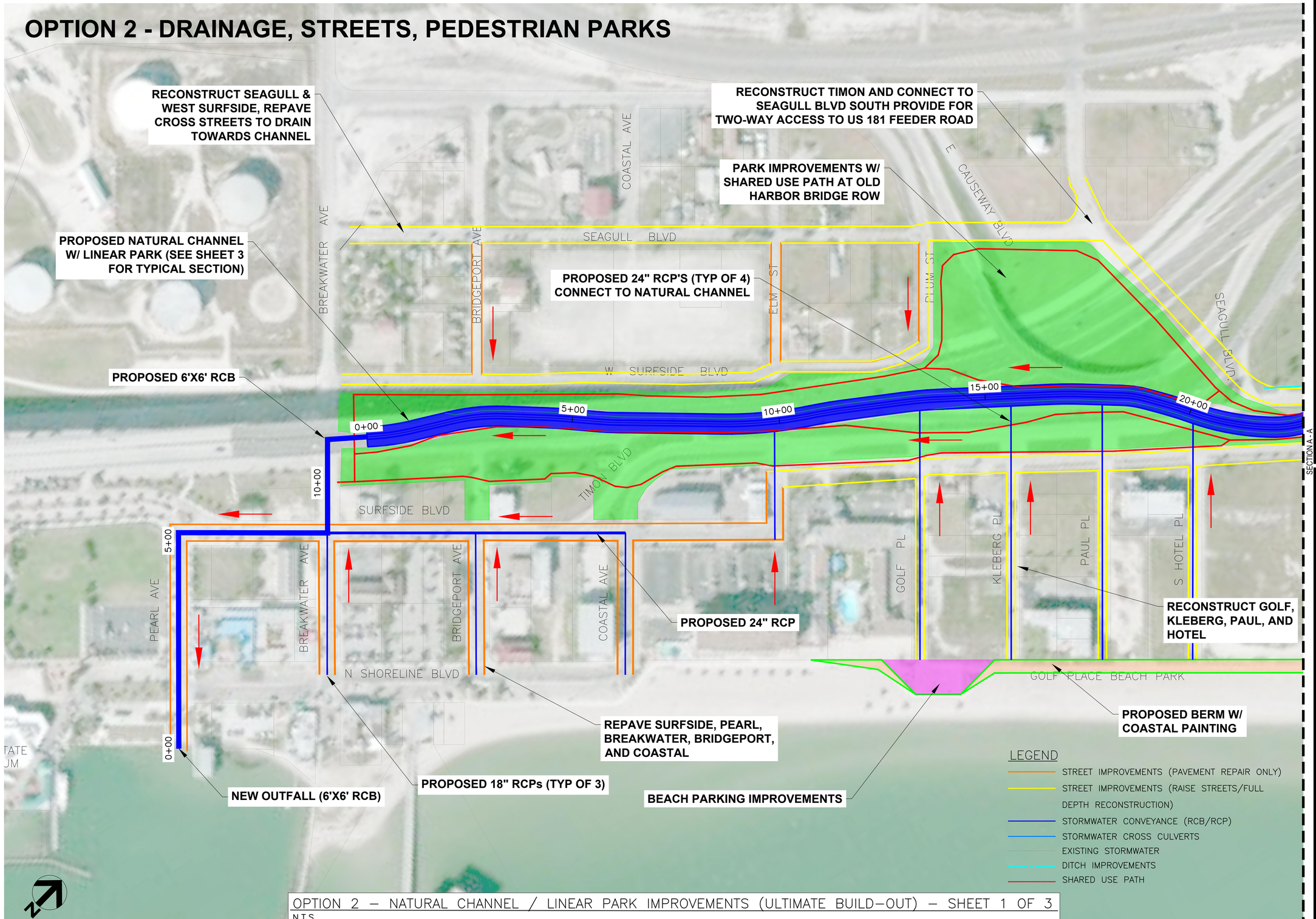
OPTION 2 - DRAINAGE, STREETS, PEDESTRIAN PARKS



OPTION 2 – NATURAL CHANNEL / LINEAR PARK IMPROVEMENTS (ULTIMATE BUILD-OUT) – SHEET 1 OF 3

N.T.S.

SECTION A - A

REVISION NO.	DATE	BY	DESCRIPTION
REVNO4	REVDATE4	REVBY4	REVDESC4
REVNO3	REVDATE3	REVBY3	REVDESC3

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
PLANNING
ENGINEERING
PROGRAM MANAGEMENT
500 N. Shoreline Blvd., Suite 905
Corpus Christi, Texas 78401

CITY of CORPUS CHRISTI
TEXAS
Department of Engineering Services

NORTH BEACH NAVIGABLE CANAL PROJECT (PHASE II)

OPTION 2 - NATURAL CHANNEL / LINEAR PARK IMPROVEMENTS PROJECT

SHEET ____ of ____
RECORD DRAWING NO.
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CITY PROJECT # XXXXXX XXXXXX

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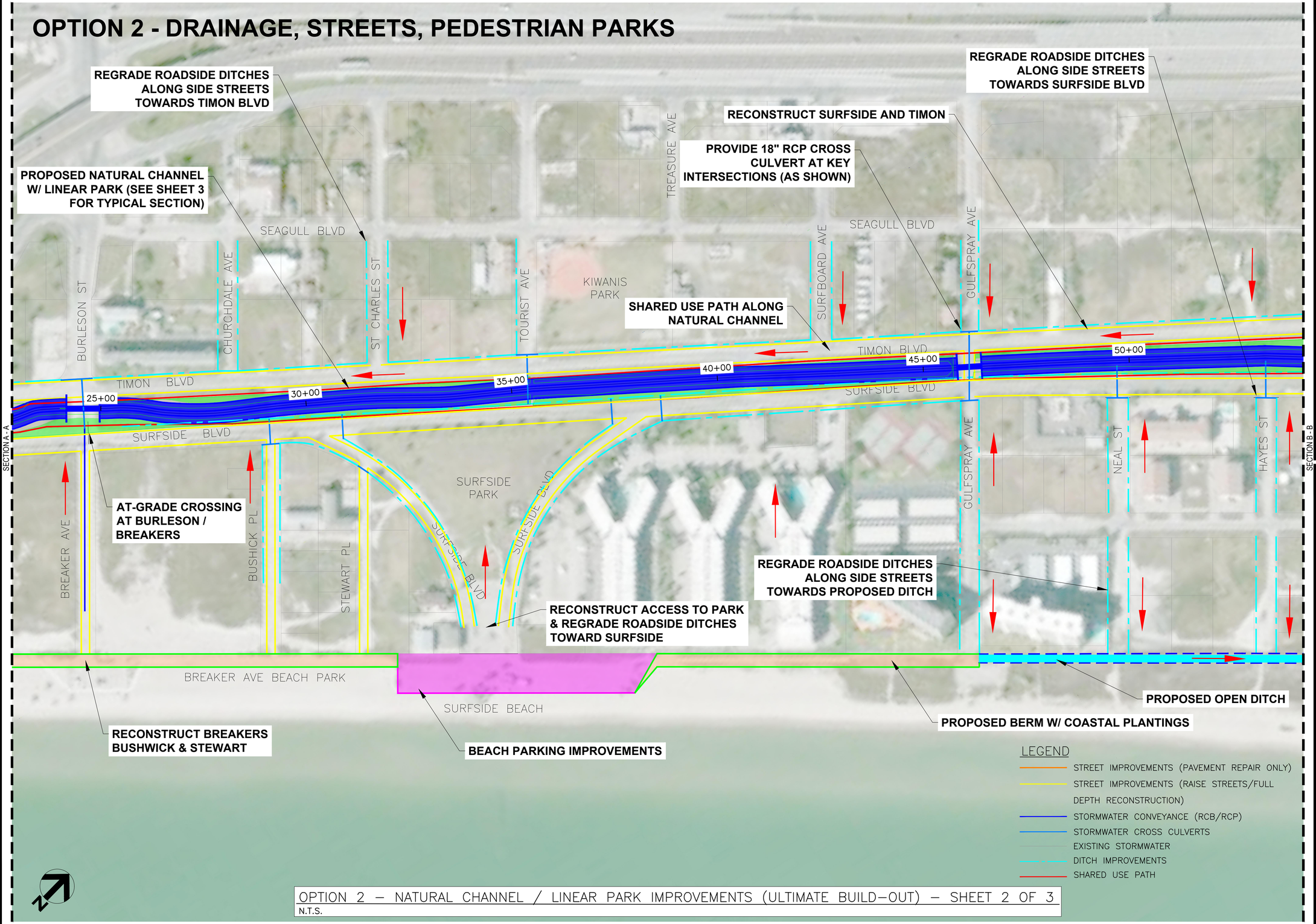
OPTION 2 - DRAINAGE, STREETS, PEDESTRIAN PARKS



OPTION 2 – NATURAL CHANNEL / LINEAR PARK IMPROVEMENTS (ULTIMATE BUILD-OUT) – SHEET 2 OF 3

N.T.S.

SECTION A - A

SECTION B - B

REVISION NO.	DATE	BY	DESCRIPTION
REVNO3	REVDATE3	REVBY3	REVDESC3
REVNO4	REVDATE4	REVBY4	REVDESC4

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
PLANNING
ENGINEERING
PROGRAM MANAGEMENT
500 N. Shoreline Blvd., Suite 905
Corpus Christi, Texas 78401

CITY of CORPUS CHRISTI
TEXAS
Department of Engineering Services

NORTH BEACH NAVIGABLE CANAL PROJECT (PHASE II)

OPTION 2 - NATURAL CHANNEL / LINEAR PARK IMPROVEMENTS PROJECT

SHEET ____ of ____

RECORD DRAWING NO.

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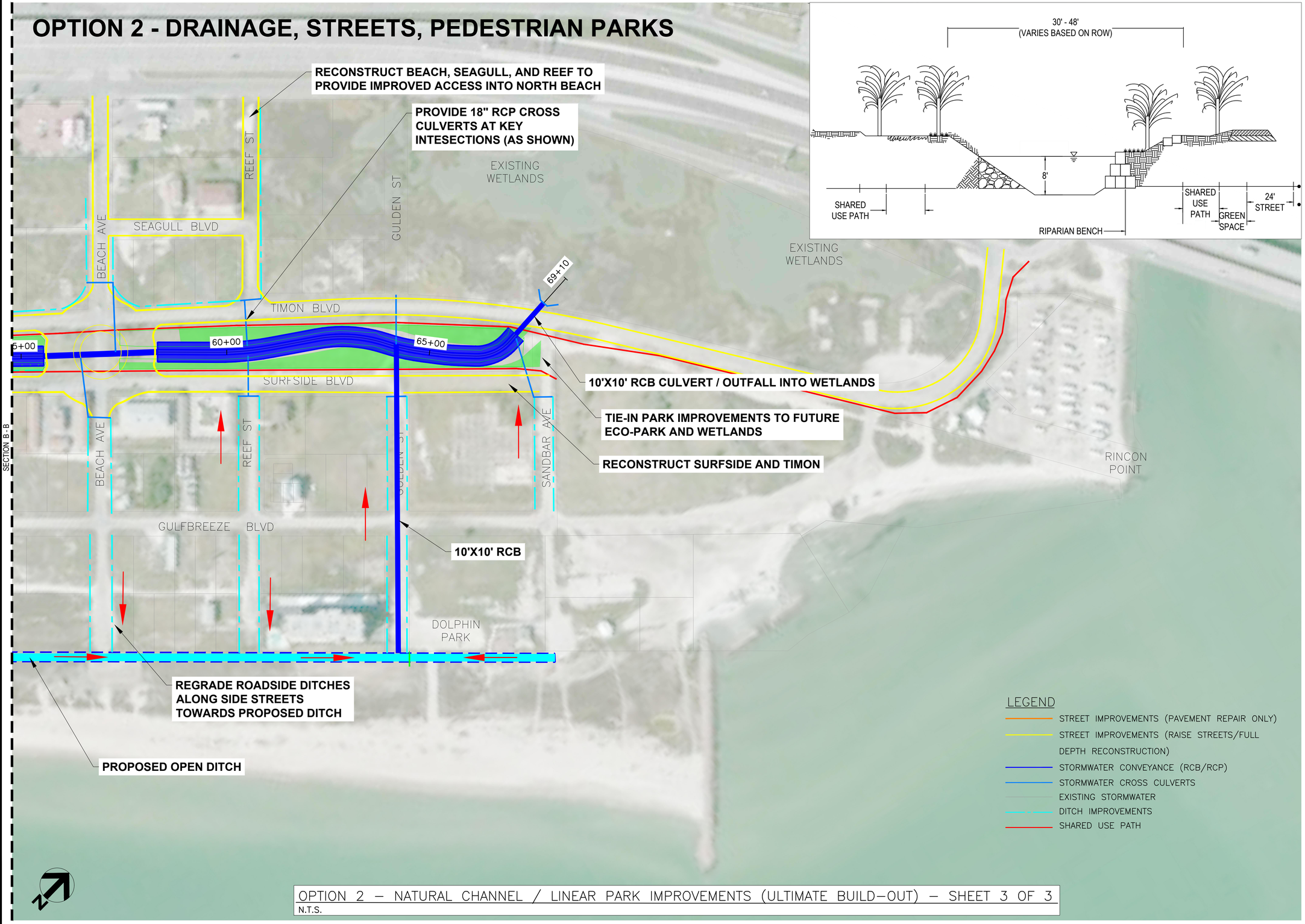
CITY PROJECT # XXXXXX XXXXXX

OPTION 2 - DRAINAGE, STREETS, PEDESTRIAN PARKS



OPTION 2 – NATURAL CHANNEL / LINEAR PARK IMPROVEMENTS (ULTIMATE BUILD-OUT) – SHEET 3 OF 3

N.T.S.

SECTION B - B

REVISION NO.	DATE	BY	DESCRIPTION
REVNO4	REVDATE4	REVBY4	REVDESC4
REVNO3	REVDATE3	REVBY3	REVDESC3

REVISION NO.	DATE	BY	DESCRIPTION

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

Lockwood, Andrews & Newnam, Inc.
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PROGRAM MANAGEMENT
500 N. Shoreline Blvd., Suite 905
Corpus Christi, Texas 78401

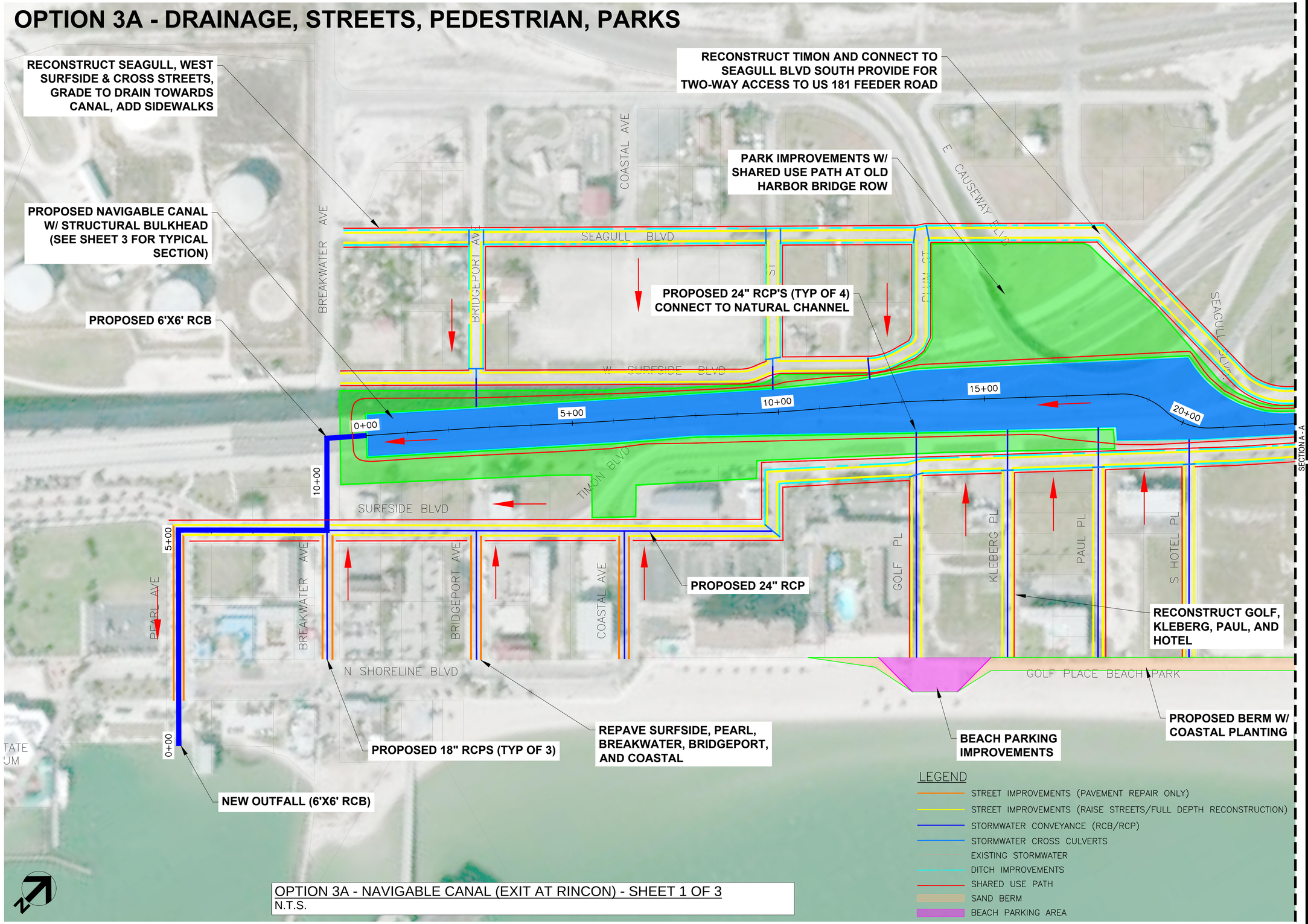
CITY of CORPUS CHRISTI
TEXAS
Department of Engineering Services

NORTH BEACH NAVIGABLE CANAL PROJECT (PHASE II)

OPTION 2 - NATURAL CHANNEL / LINEAR PARK IMPROVEMENTS PROJECT

SHEET ____ of ____
RECORD DRAWING NO.
— —
CITY PROJECT # XXXXXX XXXXXX

OPTION 3A - DRAINAGE, STREETS, PEDESTRIAN, PARKS



OPTION 3A - NAVIGABLE CANAL (EXIT AT RINCON) - SHEET 1 OF 3
N.T.S.

REVISION NO.	DATE	BY	DESCRIPTION
REVNO1	REVDATE1	REVBY1	REVDESC1
REVNO2	REVDATE2	REVBY2	REVDESC2
REVNO3	REVDATE3	REVBY3	REVDESC3
REVNO4	REVDATE4	REVBY4	REVDESC4

SECTION A - A

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

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Department of Engineering Services

NORTH BEACH NAVIGABLE CANAL
PROJECT (PHASE II)

OPTION 3A - NAVIGABLE CANAL
(EXIT AT RINCON)

SHEET ____ of ____
RECORD DRAWING NO.
— —
CITY PROJECT # XXXXXX / XXXXXX

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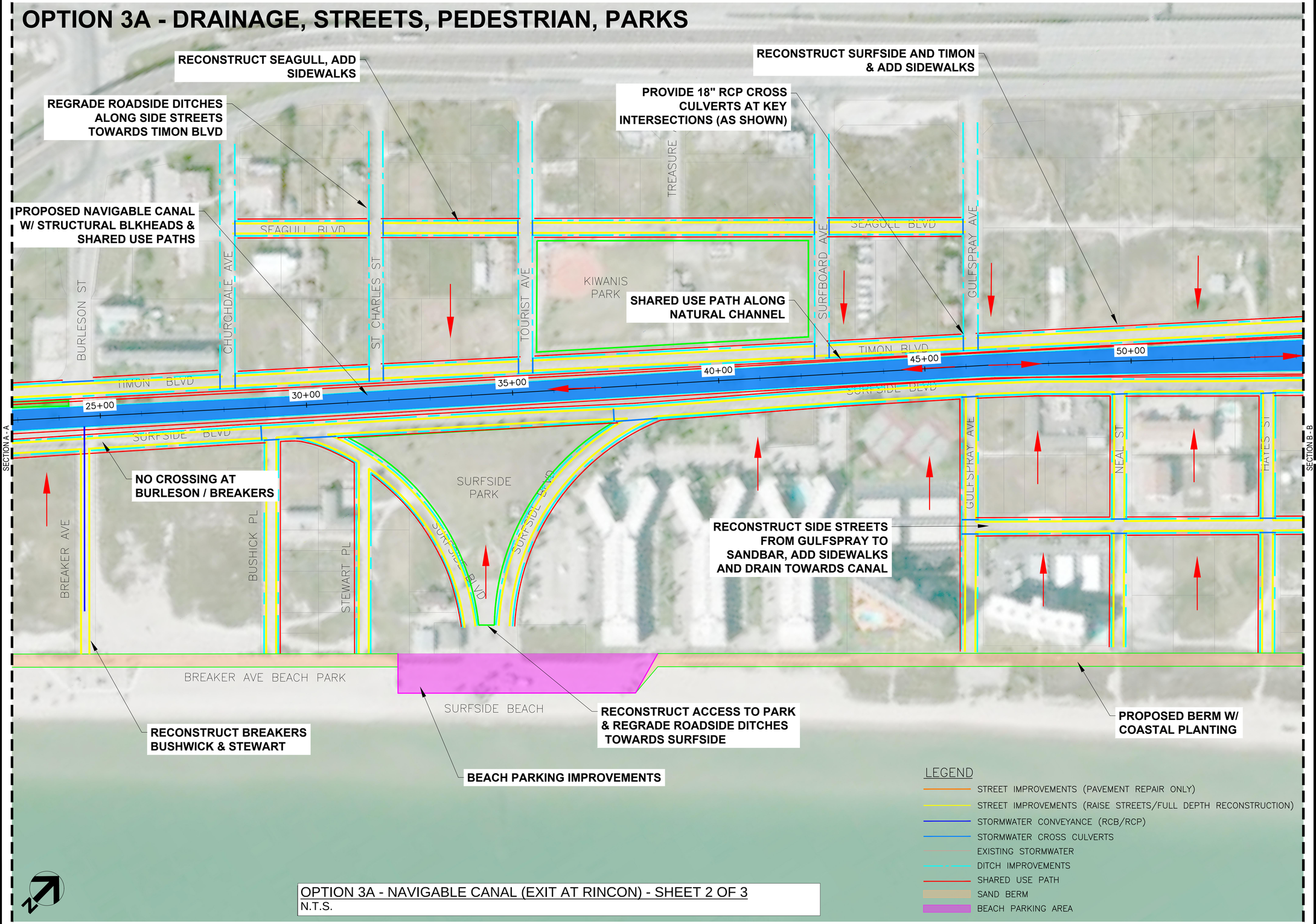
OPTION 3A - DRAINAGE, STREETS, PEDESTRIAN, PARKS



OPTION 3A - NAVIGABLE CANAL (EXIT AT RINCON) - SHEET 2 OF 3
N.T.S.

REVISION NO.	DATE	BY	DESCRIPTION
REVNO1	REVDATE1	REVBY1	REVDESC1
REVNO2	REVDATE2	REVBY2	REVDESC2
REVNO3	REVDATE3	REVBY3	REVDESC3
REVNO4	REVDATE4	REVBY4	REVDESC4

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

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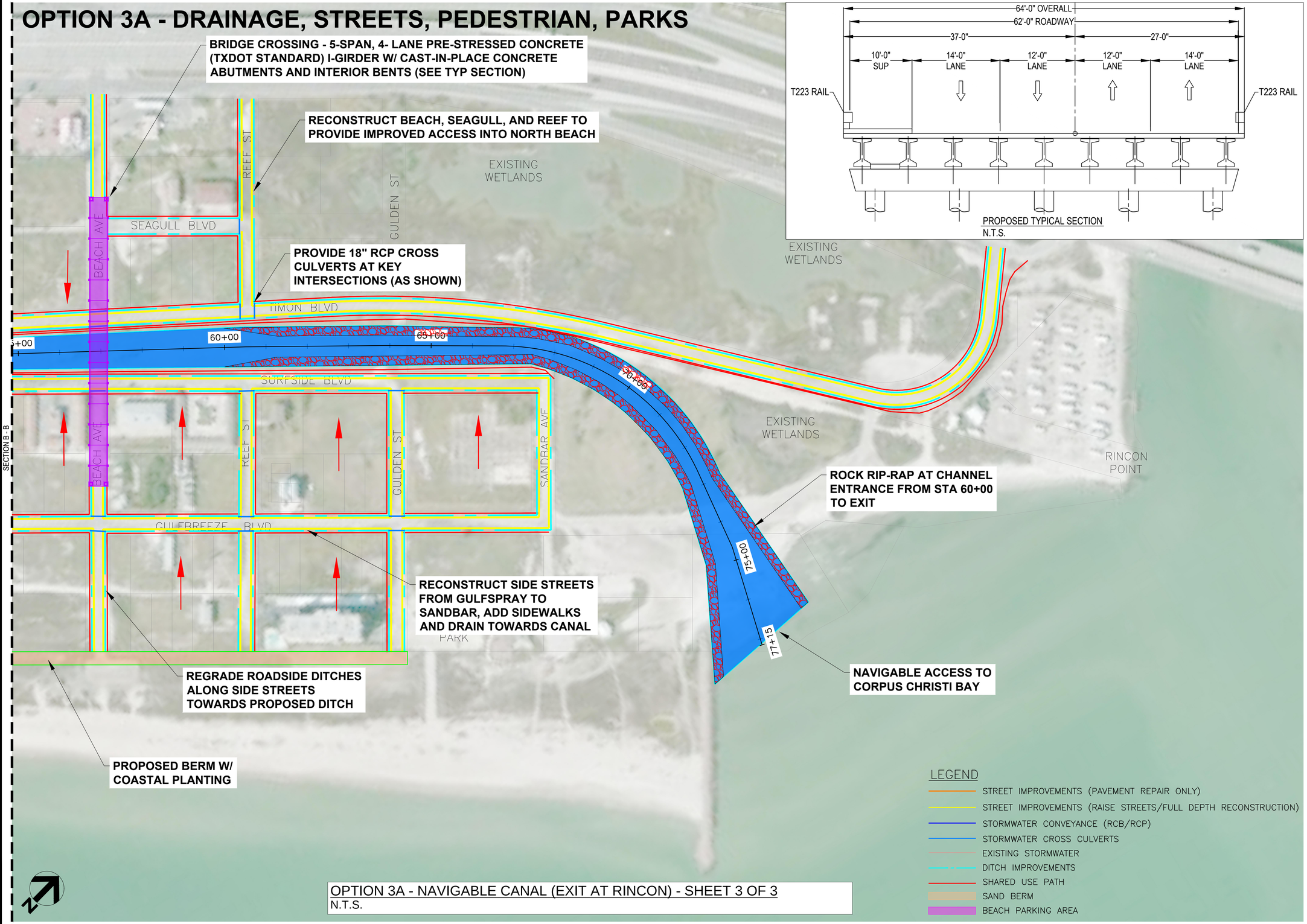
Department of Engineering Services

NORTH BEACH NAVIGABLE CANAL PROJECT (PHASE II)

OPTION 3A - NAVIGABLE CANAL (EXIT AT RINCON)

SHEET ____ of ____
RECORD DRAWING NO.
— —
CITY PROJECT # XXXXXX / XXXXXX

OPTION 3A - DRAINAGE, STREETS, PEDESTRIAN, PARKS



OPTION 3A - NAVIGABLE CANAL (EXIT AT RINCON) - SHEET 3 OF 3
N.T.S.

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SECTION B - B

REVNO4	REVDATE4	REVBY4	REVDESC4
REVNO3	REVDATE3	REVBY3	REVDESC3
REVISION NO.	DATE	BY	DESCRIPTION

REVNO2	REVDATE2	REVBY2	REVDESC2
REVNO1	REVDATE1	REVBY1	REVDESC1
REVISION NO.	DATE	BY	DESCRIPTION

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

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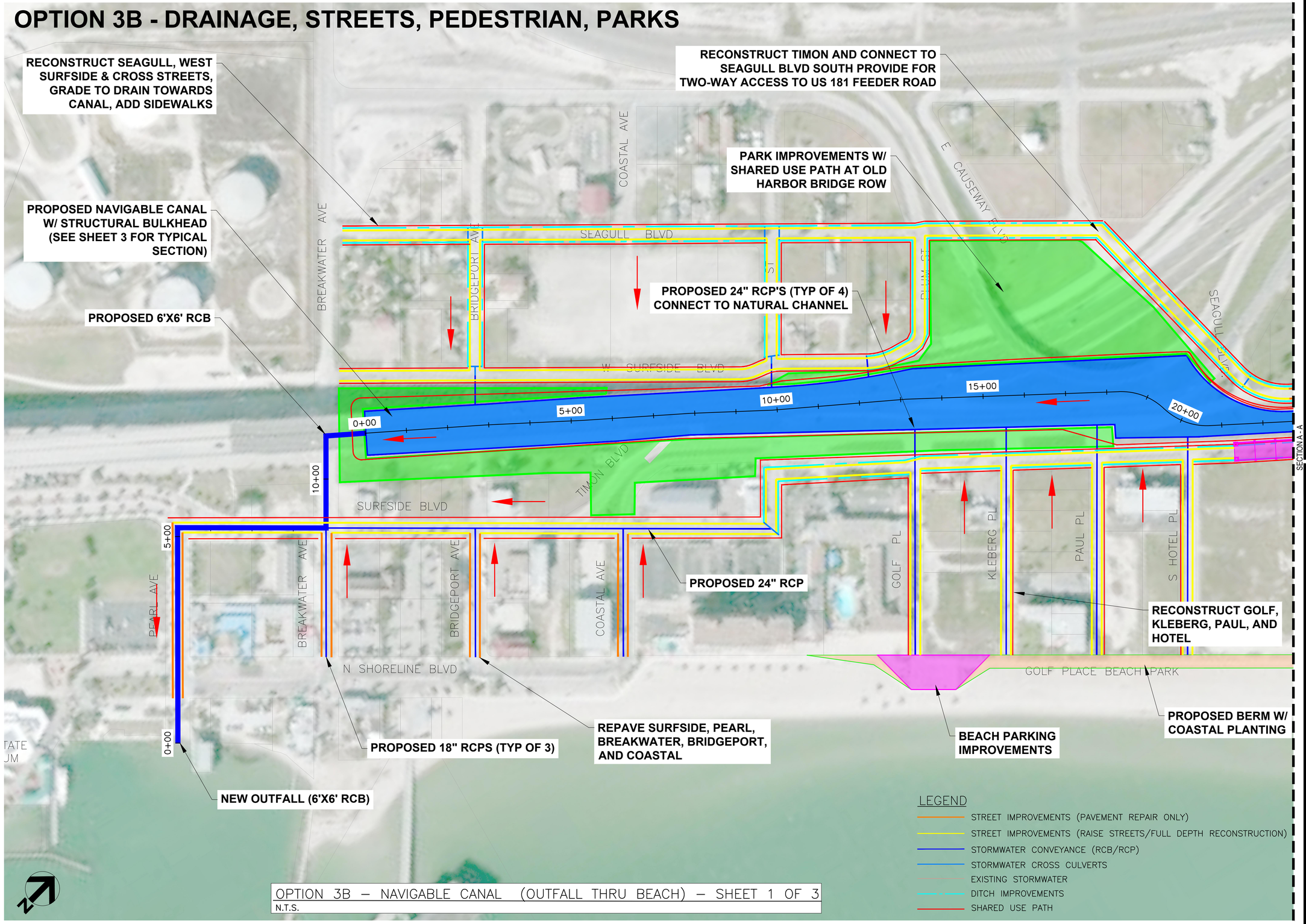
NORTH BEACH NAVIGABLE CANAL
PROJECT (PHASE II)

OPTION 3A - NAVIGABLE CANAL
(EXIT AT RINCON)

SHEET ____ of ____
RECORD DRAWING NO.
— —
CITY PROJECT # XXXXXX / XXXXXX

OPTION 3B - DRAINAGE, STREETS, PEDESTRIAN, PARKS



OPTION 3B – NAVIGABLE CANAL (OUTFALL THRU BEACH) – SHEET 1 OF 3

N.T.S.

REVNO4	REVDATE4	REVBY4	REVDESC4
REVNO3	REVDATE3	REVBY3	REVDESC3
REVISION NO.	DATE	BY	DESCRIPTION

REVNO2	REVDATE2	REVBY2	REVDESC2
REVNO1	REVDATE1	REVBY1	REVDESC1
REVISION NO.	DATE	BY	DESCRIPTION

SECTION A - A

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

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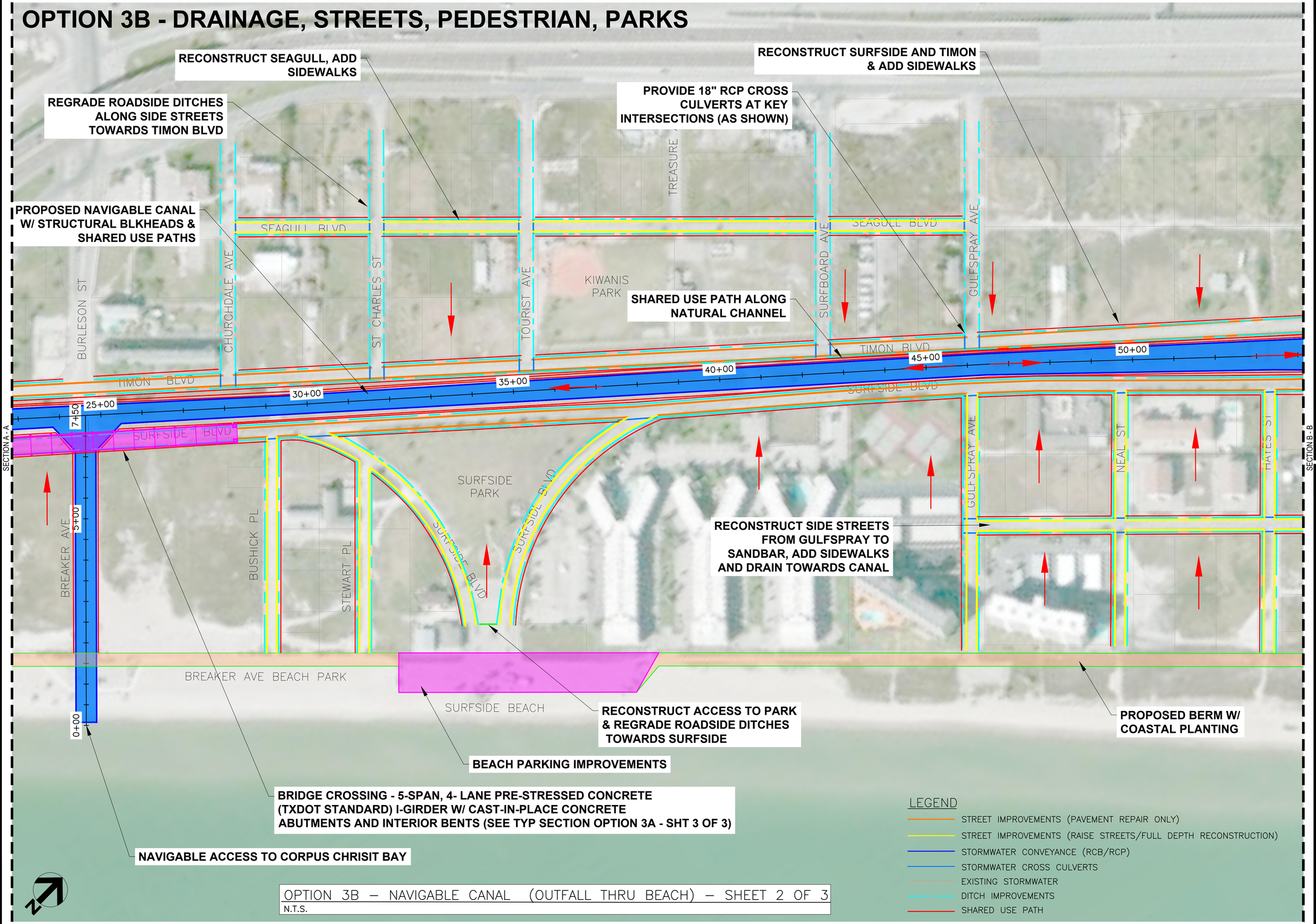
NORTH BEACH NAVIGABLE CANAL PROJECT (PHASE II)

OPTION 3B – NAVIGABLE CANAL (OUTFALL THRU BEACH)

SHEET ____ of ____
RECORD DRAWING NO.
— —
CITY PROJECT # XXXXXX XXXXXX

OPTION 3B - DRAINAGE, STREETS, PEDESTRIAN, PARKS



OPTION 3B – NAVIGABLE CANAL (OUTFALL THRU BEACH) – SHEET 2 OF 3

N.T.S.

REVNO4	REVDATE4	REVBY4	REVDESC4
REVNO3	REVDATE3	REVBY3	REVDESC3
REVISION NO.	DATE	BY	DESCRIPTION

REVNO2	REVDATE2	REVBY2	REVDESC2
REVNO1	REVDATE1	REVBY1	REVDESC1
REVISION NO.	DATE	BY	DESCRIPTION

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

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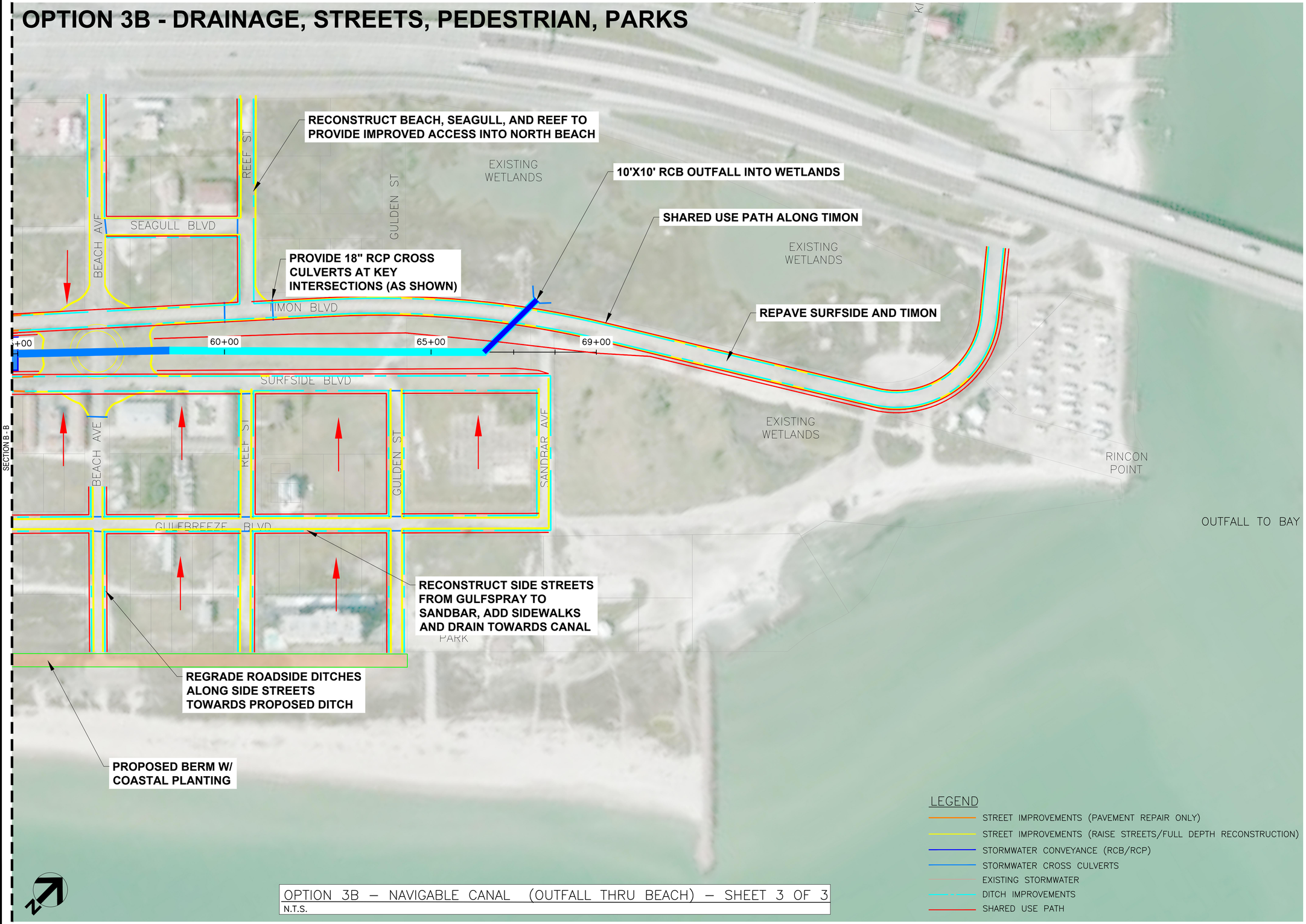
NORTH BEACH NAVIGABLE CANAL
PROJECT (PHASE II)

OPTION 3B – NAVIGABLE CANAL
(OUTFALL THRU BEACH)

SHEET ____ of ____
RECORD DRAWING NO.
— —
CITY PROJECT # XXXXXX XXXXXX

OPTION 3B - DRAINAGE, STREETS, PEDESTRIAN, PARKS



OPTION 3B – NAVIGABLE CANAL (OUTFALL THRU BEACH) – SHEET 3 OF 3

N.T.S.

REVNO4	REVDATE4	REVBY4	REVDESC4
REVNO3	REVDATE3	REVBY3	REVDESC3
REVISION NO.	DATE	BY	DESCRIPTION

REVNO2	REVDATE2	REVBY2	REVDESC2
REVNO1	REVDATE1	REVBY1	REVDESC1
REVISION NO.	DATE	BY	DESCRIPTION

CONSULTANT'S PROJECT NO.
XXX–XXXXX–XXX

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NORTH BEACH NAVIGABLE CANAL
PROJECT (PHASE II)

OPTION 3B – NAVIGABLE CANAL
(OUTFALL THRU BEACH)

SHEET ____ of ____
RECORD DRAWING NO.
— —
CITY PROJECT # XXXXXX XXXXXX

File:P:\130\130-10937-002\4-0-Production-Working\4-1-BIM-CAD\Civil\CXXX OPT3B-SITE PLAN - NTS - FINAL.dwg Plotted:6/3/2021 8:55 AM By:Gatica, Gilbert
SECTION B - B

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