

# Request for Information

## Written Response and Firm Profile for Integrated Master Planning

Requested Information

**Sewerage and Water Board of New Orleans**  
Special Projects







# GreenPoint

ENGINEERING

February 18, 2020

Ms. Patti Wallace  
Purchasing Director  
Sewerage and Water Board of New Orleans  
625 St. Joseph Street, Room 131  
New Orleans, LA 70165

**BY EMAIL**

Subject: Request for Information  
Integrated Master Planning

Dear Ms. Wallace:

Transmitted herewith is GreenPoint Engineering's response to the Sewerage and Water Board's request for information. As a New Orleans-based firm specializing in water infrastructure, we enthusiastically support the Board's efforts to initiate a long-term, integrated master planning effort and are interested in participating in the process as it moves forward.

I am GreenPoint's Principal and will serve as the Board's primary contact:

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On behalf of my colleagues, thank you for the opportunity to collaborate with the Sewerage and Water Board, and to serve New Orleans.

Sincerely,

Amer Tufail, PE, BCEE  
Principal  
GreenPoint Engineering

enclosure



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# 1 Stormwater and Drainage System Planning

Our geography poses challenges that are compounded by the age of our infrastructure, its size and complexity, and the division of ownership of the system. A better understanding of how the various drainage components functions as an integrated system will yield better confidence in the level of service the Board can achieve, and the solutions and costs required to meet the needs.

## 1.1 Subsidence and Sea Level Rise

The consolidation of the ground is inevitable given the nature of our soils. This natural condition is amplified by the fact that the levee system, constructed to protect the City from annual river flooding, deprives the soil of the sediments that once counteracted subsidence. Subsidence is further exacerbated by sea level rise, and the combination is a moving target that we can only estimate as we plan and invest for the future. As a result, any infrastructure strategy must concede that subsidence is a design condition and must be a factor in planning long-term investment. Further, we must engage with our federal partners to not only ensure that storm protection accommodates sea level rise, but that policies and practices that mitigate the man-made causes of sea level rise are promoted and implemented.

## 1.2 Aging Infrastructure

The infrastructure serving the City was constructed over the course of the last century, and in some cases even before the founding of the Sewerage and Water Board. The challenge goes beyond the commitment of funding required to repair and replace infrastructure components that have exceeded their useful life. The solution must also include an on-going maintenance and reinvestment plan to ensure the system delivers the level of service necessary to promote a resilient community.

## 1.3 System Storage

The forced drainage system necessary given our geography and topography puts great emphasis on the reliability of the pumping and outfall system, and requires that stormwater is removed quickly. Yet given the City's density and land use, the opportunities for any significant storage that would complement forced drainage are very limited. Therefore, implementing the strategies that promote the diversion of stormwater from the outfall system and land use that better manages and co-exists with water will be critical over the coming decades.

## 1.4 Isolation of Street-Level Drainage from Outfall System

Responsibility for the drainage system is shared between the City of New Orleans and the Board. Given this separation, it is difficult to evaluate the condition, performance and needs of the system as a whole. The outfall and street-level components must be better understood as an integrated system so that the Board can validate the true demand of the large canals and pumping stations that serve the City.

Our understanding of the system suggests that the development of a reliable, calibrated street-level model that integrates with the Board's outfall system model will be a valuable first step toward revealing the true performance and shortcomings of the system. We have seen firsthand that drainage design for street improvement projects currently cannot consider the performance of the outfall system, and ignores the pump stations' capacities, the water surface elevation in the canals and the condition and performance of the board's large subsurface drainage components.

Using the outfall system's performance as the boundary condition, a calibrated street-level model can reveal the true capacity of the system, and reveal bottlenecks and deficiencies that the Board and the City can target more effectively. Doing so will provide the Board the true range of flow rates into the outfall system. We would also be able to see how the system performs in reaction to real, documented storm events rather than its reaction to a standard Soil Conservation Service (SCS) storm. Such an approach will also reveal where storage can play a role in expanding the performance and reliability of the system, as well as the potential impact of integrating green infrastructure components at the neighborhood level.

In fact, to help the City evaluate the potential of such an integration, GreenPoint is currently modeling a defined drainage network in the Navarre neighborhood as part of our overall streetscape improvements design project for the added purpose of evaluating the specific needs, limitations and possibilities of integration with the Board's model. Also, GreenPoint is leading the citywide CDBG-funded Drainage Improvements Project for the City of New Orleans with the intention of addressing acute street drainage deficiencies through conventional as well as green infrastructure improvements.

## 2 Wastewater and Sewerage Challenges

The residents of the City have benefited greatly from the Board's investments in the wastewater system. The collection system in particular is performing at a much higher level as a result of the Sanitary Sewer Evaluation and Rehabilitation Program (SSERP) over the last 20 years. The Board has also received national recognition for compliance at its treatment plants, and has taken valuable steps to improve safety and resilience. However, the Board must take steps to improve efficiency and reliability as the system ages and the City steadily grows to recover the population lost following Hurricane Katrina.

GreenPoint's insight to wastewater treatment challenges and opportunities draws primarily from our 2015 Initial Condition Assessment which established the initial condition of the treatment system assets as Veolia initiated a new contract for the operation, maintenance and management of the treatment plants. Our assessment prioritized needs with respect to deficiencies, supporting the development of a 10-year capital improvement program. Further, our design work over the last two years in support of the treatment system improvements at the East Bank facility provides a higher resolution of specific challenges and opportunities.

### 2.1 Reliability

The West Bank Wastewater Treatment Plant is the smaller of the Board's two treatment facilities, and at the time of our Initial Condition Assessment did not require immediate, large scale improvements. In fact, in 2016 the National Association of Clean Water Agencies awarded the facility its Platinum Peak Performance Award in recognition of its five-year compliance record.

The East Bank Wastewater Treatment Plant is a much larger facility, and despite the devastating damage suffered in the Lower Ninth Ward following Hurricane Katrina, has served the residents of the city well. Our work has still revealed vulnerabilities at the East Bank plant, that though largely managed to date will become greater risks as the system ages and the City's growth imparts greater demand. The Board must therefore plan for continued and targeted investment in the system's reliability.

### 2.2 East Bank Effluent Pumping Capacity

GreenPoint's work with the Board reveals that though the treatment plant has a maximum hydraulic capacity of 239-million gallons per day (mgd), the maximum pumping capacity of the Effluent Pump Station (EPS) is approximately 210-mgd, resulting in overflows within the plant site during peak flow events. Further, the review also reveals that the pumping capacity of the EPS with a minimum number of backup pumps in standby is only 169-mgd, a deficit of 70-mgd. As a result, at plant flows at or above 169-mgd (a threshold typically exceeded several times each month), the EPS operates with no redundant standby pumps.

The model we developed for the design of the station's improvements illustrates that the target pumping capacity of 239-mgd can be met through the addition of a third 66-inch effluent force main, and the addition of a third 36-inch pump to provide redundancy in support of the pumps currently in service. To meet the additional 1,000-hp power demand a new 36-inch pump requires, the EPS will require additional transformer capacity as well as modifications to the existing power and controls system. In combination, these recommended measures will not only allow the EPS to meet the hydraulic capacity of the EBWWTP, they will also provide an emergency capacity of 287-mgd with all pumps in service at full speed, and excess future capacity if an expansion of the EBWWTP is required in the future.

Though the board has taken the first step of designing the addition of a new 36-pump and the required transformer capacity, the EPS Improvements project has not yet moved to construction. Once the project moves to construction, the critical next step will be the addition of third 66-inch effluent force main.

### 2.3 Waste Activated Sludge Thickening

Currently, the East Bank plant's Clarifier No. 4 is used as a gravity thickener to increase the solids content of the waste activated sludge (WAS) before it is further processed for disposal. This use of Clarifier No. 4 limits the extent of final settling capacity available at the plant, a concern given the need for redundancy and the anticipated increase in plant demand expected in the coming years. Further, the extent of WAS thickening must be improved through the addition of unit process specifically designed for this purpose.

To restore the total final settling capacity available, increase the WAS concentration for processing and improve redundancy, a new WAS thickening unit process must be constructed at the EB WWTP, and Clarifier No. 4 must be re-habilitated so that it may be used as a final settling tank as originally intended. Though GreenPoint has not yet been authorized moved to the design phase, the current strategy will be to install a new gravity thickener, and to restore Clarifier No. 4 to function as a final settling tank.

### 2.4 Conventional Aeration vs. Bioreactors

The East Bank plant employs bioreactors to achieve the aerobic biological activity necessary for wastewater treatment, generating pure oxygen from ambient air. Though extremely effective and space-efficient, the pure oxygen feeding the aerobic reactor is critically dependent on the reliability of the oxygen-generating equipment. Further, the process is extremely energy intensive, yielding a high cost of ownership over the long term.

Given these reliability and energy concerns, the Board should evaluate the costs and benefits of converting the system to conventional aerated treatment, using the oxygen in ambient air to achieve aerobic treatment. Though the energy costs and reliability of the such a system would be greatly improved, the construction cost and space required to implement such a system would be significant, warranting a comprehensive evaluation.

### 3 Drinking Water Challenges

As with the Board's drainage and wastewater systems, the drinking water system suffers from aging components and insufficient re-investment over the years. The system is also unique in that it largely relies on booster pumps rather than elevated tanks to maintain pressure, limiting the degree of system storage and pressure resilience possible. These factors combined with the impacts following Hurricane Katrina, particularly on the distribution system, yield significant challenges.

#### 3.1 Prioritization Protocol

Our work to evaluate the initial condition of the Board's East Bank and West Bank WWTPs yielded surprising and informative information, and helped guide the prioritization of needs. We expect the same approach would be of similar benefit for the Board's water treatment plants, and at the Carrollton Water Treatment Plant in particular. Though the Carrollton facility offers adequate treatment capacity, the plant is aging and would benefit greatly from upgrades and technology enhancements that would improve reliability and efficiency. However, the condition and criticality of the individual unit processes and components may not be sufficiently understood to allow prioritization and budgeting of immediate needs as a long-term capital plan is developed. We therefore propose an approach that evaluates risk in terms of criticality, by evaluating probability of failure and consequence of failure of each process component.

The approach we envision would begin with the collection of data describing each treatment component's condition. This would require performing inspections of the facilities and documenting the assets in a standardized format geared toward assessing condition. The collected data should reflect the physical status of each asset with respect to its structural, mechanical and electrical condition as well as overall degradation. The inspections should also rate each asset with respect to functionality. It will be important that the data collection format limits subjectivity and draws exclusively on field observations.

The condition and functionality data alone do not indicate the criticality of each asset. To arrive at each asset's criticality, we recommend the development of a screening tool similar to the one we developed for the East Bank and West Bank WWTPs. The criticality assessment would be based on two scored factors, the probability of an asset failing and the consequence of a failure, described further below.

##### 3.1.1 Probability of Failure

The likelihood of an asset failure is primarily based on the condition of the asset. Assets of deteriorated condition are not only more likely to incur greater operational cost, the chance of these assets failing is significantly increased. Therefore, the probability of an asset's failure can largely be inferred from the condition rating assigned during the field inspections. Therefore, those assets assessed a condition score of "1" (severely damaged, heavy corrosion or wear, broken) in any of the four condition categories are given the highest probability of failure score.

Redundancy also plays a large role in assessing the probability of failure. Those systems that have redundancy, either in the form of parallel systems or backups, are less likely to be impacted by an asset failure. Therefore, those assets that do not benefit from redundancy are assessed a higher probability of failure score. To incorporate the benefit of redundancy on the probability of an asset's failure, each system must be understood to determine if redundant components are available in the event of an failure.

### 3.1.2 Consequence of Failure

The resulting impact of an asset failure also plays a role in determining criticality. Failures that compromise either safety or compliance are of greatest concern to operations, whereas failures that simply result in added operations cost or complications are of less concern. For the purpose of screening criticality, only two consequence of failure ratings are applied to each asset:

#### **High Consequence of Failure**

- H-1 - Critical (corrective action within 1 year)
- H-2 - Potentially Critical (corrective action within 1 – 3 years)
- H-3 - Not Critical (near-term, within 3 – 5 years)
- H-4 - Recommended (long-term, within 6 – 10 years)

#### **Low Consequence of Failure**

- L-1 – Highest Priority of the Low Consequence of Failure Category
- L-2 – Second Highest Priority
- L-3 - Third Highest Priority
- L-4 – Lowest Priority

Using this prioritization protocol, each individual treatment system asset can be described in terms of deficiency priority, reflecting the asset's condition as well as the consequence of the asset's failure with respect to safety and compliance.

## 4 GreenPoint Profile

GreenPoint Engineering is a New Orleans firm specializing in the planning and design of water resource projects for governmental agencies. From our office on Loyola Avenue we have delivered many successful drainage, wastewater and drinking water projects for agencies across the region. Founded in 2012, we have grown through our staff's combined experience pre-dating the founding of GreenPoint, and an approach to project delivery that emphasizes both quality and collaboration. The result is a solid foundation of successful projects earned through proficiency and client service. Our wide range of clients and the complexity of our projects reflect our capabilities.

Though GreenPoint is a relatively new firm, our senior staff bring to GreenPoint a history of managing and delivering high profile water infrastructure projects beyond our region. It is upon this foundation of proven experience that we build our model of combining recognized expertise with local accountability and service.

### Amer Tufail, PE, BCEE

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Amer Tufail is the principal and founder of GreenPoint Engineering. He is a civil engineer experienced in the planning, design and management of water infrastructure and environmental programs, whose work history spans state government and municipal clients across Louisiana, Mississippi and Alabama. His areas of practice include the planning and design of drinking water and wastewater systems, flood control and protection projects, and the management of interdisciplinary planning, design and construction programs. Mr. Tufail is a diplomate of the American Academy of Environmental Engineers, and serves as the state representative for Louisiana and certification examination chairman for the Academy.

### Robert Heath, PE

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Robert Heath is GreenPoint's engineering practice leader. He is a specialist in drainage system design and accomplished in the development and execution of stormwater models. He has over 20-years of experience in the planning, design and management of a wide variety of complex civil and environmental engineering projects, including large stormwater management, flood control and storm water pumping systems. Over his career, he has also earned a record of success in securing environmental permits from state and federal regulatory agencies.

### Mohammad Tufail, PE

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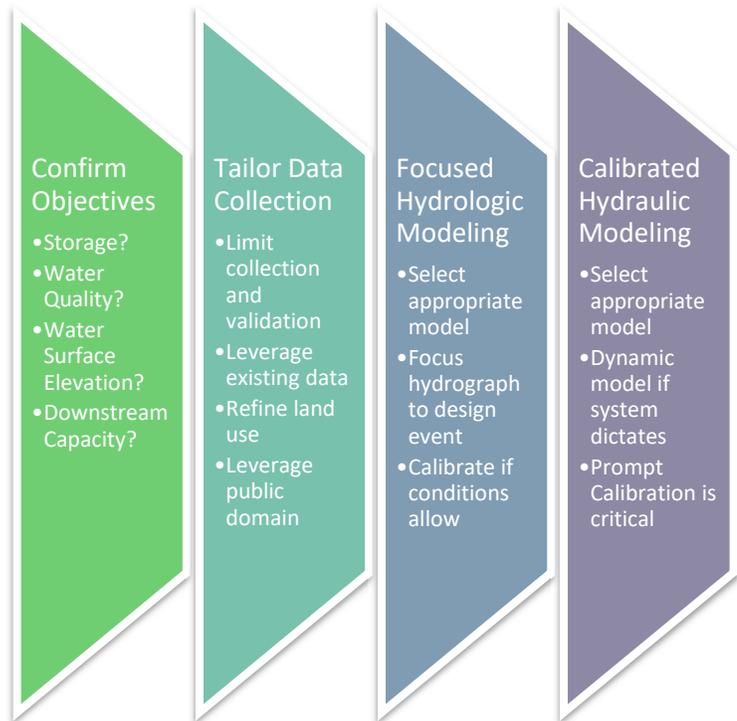
Mohammad Tufail is a program and construction manager experienced in complex and high-profile design and construction programs, and serves as GreenPoint's Quality Manager. He has led large A/E teams in the delivery of water resources, defense and civil infrastructure programs. For the US Army Corps of Engineers' New Orleans District, he led the preparation of Design Memoranda for several civil works, flood control and hurricane protection projects in the New Orleans vicinity. For the US Army, he served as the Technical Affairs Division Chief, Program Manager and Senior Adviser for the design and construction of numerous military facilities in the USACE Middle East Division, where he also served as the overall manager of a \$730-million Foreign Military Sales Construction Program. Before his USACE career, he was a hydraulic design engineer for the Boston, Massachusetts firm Anderson Nichols Engineers, and a Senior Design/Planning Engineer for the Ohio-Kentucky-Indiana Regional Council of Governments in Cincinnati, Ohio.

## 4.1 Our Proven Approach to Hydraulic Modeling and Planning

GreenPoint recognizes that the thoughtful development, calibration and execution of hydraulic and hydrologic (H&H) models are critical steps in achieving reliable results and corresponding designs. Our team has executed numerous H&H modeling efforts throughout the region, and implemented the findings of those models through practical designs. The projects described herein reflect a proficiency that will yield reliable model results on an accelerated timeline.

Our modeling efforts draw on valuable experience in various stormwater hydrologic and hydraulic modeling platforms, including HEC-HMS, HEC-GeoHMS, HEC-RAS, SWMM, StormCAD, and NRCS WinTR-55. Further, as New Orleans firm we are well-versed in local conditions, and have earned valuable working relationships with the regulatory agencies involved in the review of stormwater and flood control projects.

Our approach to H&H modeling leverages that experience to confidently and quickly deliver meaningful model results, and arrive at practical alternatives for benefit-cost analysis. The steps to a successful modeling program are clear; however, recognizing opportunities to accelerate the process are an added value our team delivers.



### Confirm Objectives

The first step to promptly delivering a completed and reliable model is to confirm the ultimate objectives. By confirming the model's true purpose, whether to maximize storage, address water quality, achieve a target water surface elevation, or to match downstream capacity, GreenPoint can focus the subsequent efforts to maximize efficiency.

### Tailor Data Collection

With the objectives confirmed, the GreenPoint will tailor the data collection and validation effort, a step that can be time consuming if not managed towards the goal. Further, our experience with mining existing data and studies, as well as researching and leveraging data available through other agencies in the public domain has proven valuable in past H&H studies.

### Focused Hydrologic Modeling

Confidence in the hydrologic modeling is critical in determining system hydraulics. With our experience, we are confident that we can accelerate the hydrologic modeling step by optimizing the model selection, and limiting the iterations to the storm events of greatest concern. The hydrologic model should be calibrated to the extent existing conditions and available data allow.

## Calibration

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In order to develop a model that can be quickly and confidently applied towards a final design, it is necessary to promptly calibrate the hydraulic model against a known storm event. GreenPoint has the experience in both modeling and design that will allow manipulation of modeled conditions, storage and retention features and post-project flows to arrive at feasible alternatives.

## 4.2 Our Proven Approach to Design

Our experience in delivering water infrastructure projects in Louisiana has reinforced the importance of the design engineer's role in the mitigation of risk, cost overruns and disruption to local residents and businesses. Our internal design and quality management procedures explicitly address this understanding, as summarized below.

### Thoughtful Design

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The process begins with a design that anticipates construction impacts. This step is critical, and requires a thorough understanding of the conditions typically encountered in local construction projects, the methods typically used by the local contractors, and the impact of the anticipated conditions and methods on risk, cost and the local community. Over the course of many water infrastructure design projects across the region, GreenPoint Engineering has earned the experience to anticipate and mitigate such impacts.

### Clear Plans and Specifications

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Too often plans and specifications are difficult to follow, and are a poor basis for bidding and subsequently for construction. The immediate impact of an unclear bid package is a wide range of bids, followed by conflicts during construction and ultimately change orders. GreenPoint recognizes this risk, and takes great care in validating the constructability of our design projects. This is reflected in the narrow range of our projects' bids and our low change order rates.

### Engaged Construction Management

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We recognize the value of involving the design engineer in the construction phase, and it is therefore our practice to engage the design engineer in the construction phase of the project. This not only promotes continuity in the design vision, it gives the design engineer direct feedback regarding construction constraints and opportunities for improvement.



## 4.3 Relevant Experience

In addition to our Initial Condition Assessment for the Board's East Bank and West Bank WWTPs, our recent design at the East Bank WWTP, our support of the Water Line Replacement Program and our drainage improvement and road repair work for the City of New Orleans, GreenPoint has supported the planning and design of water, sewer and drainage systems across the region. We've selected our two most recent projects to convey our interest and capabilities in the issues of most relevance to the Board.

### 4.3.1 Mid-Barataria Sediment Diversion – Interior Drainage

GreenPoint led the Interior Drainage engineering tasks for the Coastal Protection and Restoration Authority of Louisiana's \$1.3-billion Mid Barataria Sediment Diversion Project. The Mid-Barataria Sediment Diversion will harness the power of the Mississippi River for long-term and sustainable sediment, water, and nutrient delivery to the surrounding wetlands, transporting the sediment from the river to the Barataria Basin. GreenPoint's scope of work covers all aspects of developing the project's drainage solutions:

- Validation and calibration of existing models
- Development of designs for new siphons and new pumping stations
- Design of modifications required at the existing USACE-designed and constructed drainage pumping station

#### Design Considerations

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The Mid-Barataria Sediment Diversion channel will divide the area drained by the existing 1,000-cfs Wilkinson Pumping Station into two distinct basins, separating the northern section from its drainage



outfall at the station. GreenPoint's effort began with the evaluation of two selected methods, inverted siphon and pumping, by which drainage of the separated northern drainage basin can be maintained once the diversion channel is constructed. As the **US Army Corps of Engineers** is considering two candidate alignments for the **New Orleans to Venice Hurricane Protection Levee (NOV Levee)**, each yielding a successively smaller drainage basin, the alternatives analysis considered both an inverted siphon and a new pumping station for each of two candidate NOV Levee alignments. With the State's selection of the inverted siphon approach, GreenPoint proceeded with the sizing of the siphon bank.

#### Modeling and Calibration

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Using current topographic surveys of the area's drainage features, GreenPoint updated the existing conditions model to reflect the current conditions and features of the existing drainage area, and also converted the existing models to **HEC-GeoRAS** and **HEC-GeoHMS**. GreenPoint then calibrated the updated existing conditions model by monitoring channel depth and pump operation at the Wilkinson Pump Station after several significant rainfall events. The

calibrated model was the basis for the development of the future conditions models describing the drainage system performance each of the two alternative NOV Levee alignments yields.

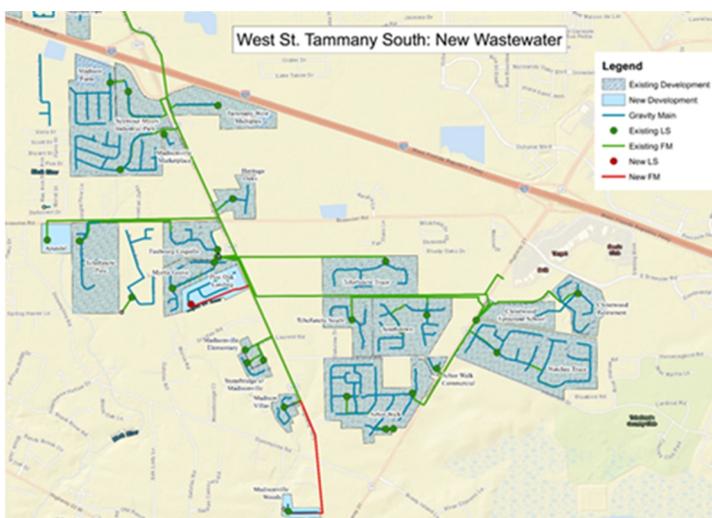
### Hydraulic Design

The evaluation of hydraulic conditions and the subsequent design of hydraulic features to maintain interior drainage upon construction of the diversion channel is based on a level of service consistent with a **25-year, 24-hour storm event**, yielding six 96-inch siphon tubes spanning the 800-foot width of the diversion channel. GreenPoint also evaluated the inverted siphon with respect to **life-cycle costs** anticipated over the 50-year useful life of the system.

#### 4.3.2 West St. Tammany Water and Sewer Consolidation Conceptual Design Report

St. Tammany Parish has enjoyed a long history of growth, and its growth continues along the LA-1077 corridor, from I-12 north to Goodbee and beyond, where private developers are investing in new residential communities. In addition to planning for and addressing this growth, the Parish recognizes the opportunity these new developments offer to begin a new phase of consolidation of water and wastewater systems. To initiate consolidation, the Parish directed GreenPoint Engineering to prepare a Conceptual Design Report to guide the design and construction of immediate water and wastewater priorities.

The objective of GreenPoint's Conceptual Design was to establish the sequence, method and budget for consolidating conveyance and treatment of the various water and wastewater service areas in the West St. Tammany Planning Region. The first step was to document the Parish's planning objectives, including regulatory compliance, target level of service, and potential private and intergovernmental partnerships. GreenPoint also established the existing conditions by creating a GIS inventory of existing infrastructure and delineating existing service areas.



To establish the growth needs, GreenPoint incorporated the planned new developments into the inventory to project future population growth and resulting drinking water and wastewater demand. With these projected future conditions, GreenPoint developed a wastewater collection and pumping system model to determine the location and pumping capacity of the new lift stations required, and to determine the most cost-efficient and scalable force main network required to convey flows to the two regional treatment facilities as demand grows. Using these criteria, GreenPoint prepared the conceptual design of the new wastewater pumping stations and force mains, and the new drinking water well, storage and distribution system improvements necessary to meet the demand.

The final product is a Conceptual Design Report that guides the Parish in the consolidation of water and wastewater services. The Conceptual Design identifies and scopes the specific capital projects the Parish must implement to meet the new demand, the necessary project sequence and the estimated costs so that the Parish can initiate land acquisition, surveys, detailed design and financing.