SECTION V:
PRESENT PROPOSED DESIGN APPROACH FOR THIS PROJECT

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A. Describe proposed design philosophy.

Design Philosophy

The Cape Haze Water Quality Improvement Project is fundamentally like our past CCU septic to sewer projects. However, this community is exclusive and many of the homes are on the Intercoastal Waterway. Septic to sewer projects like this are expensive, disruptive, and unpopular with residents. For this reason, we think a ***flexible design philosophy*** should be considered.

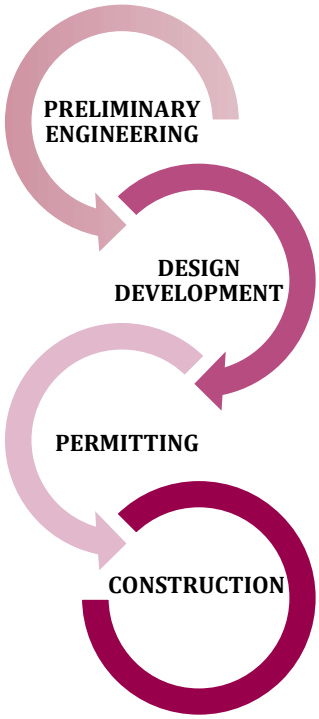
We believe that a good design is determined with the stakeholders in mind. CCU, who will build, own, and maintain the project must be worked closely with to ensure that the delivered product will meet the needs of the County in both the short and long term. This includes considering all aspects of a project design from the start until many years after the project is built including the cost to construct facilities, the costs associated with operating and maintaining facilities long term, providing the ability to keep systems operational during power outages, working closely with utility operations staff to understand their needs and concerns relative to utility operations, ease of maintenance and access, and much more. We prioritize providing the best results for the County.

Additionally, we understand the concerns of residents within the project area. From many years of experience in septic to sewer projects, we have handled countless customer concerns of various natures. Some of the primary worries are typically related to potential odors, noises, and concerns of tree removal, restoration/construction impacts, questions about the sewer system technology, the location of connections, and other inquiries. GWE is aware of the customers' concerns relative to a large construction project happening in their neighborhood and this is precisely why we design the project with also the residents in mind. GWE believes it is essential to deliver a final product that will benefit the residents by providing a system with high operational reliability and dependability, with protocols in place to eliminate any noise or odor problems, a design that minimizes or eliminates impacts to the unique neighborhood features which are valued by the residents (i.e. mature trees), utility buildings that blend into the neighborhood with appropriate landscape buffers, and a project that is delivered on time and within budget. We provide a Construction Hotline to address resident questions or concerns quickly and effectively during the design and construction process. Ultimately, the project is intended to serve the residents of Cape Haze and we have their best interest in mind throughout the entire project life.

This philosophy focuses on designing the sewer system that *minimizes* impact on the environment while providing the best service to the CCU staff and customers. For Cape Haze, this may include additional measures to protect trees or designing the pump station in a Coastal or Mediterranean style, with pastel colors and tile roofs, or taking additional efforts on reducing odor and noise more than we have done in the past. We understand this community is tranquil, secluded, and serene so our approach to the design philosophy should be similar.

Proposed Work Plan

We will focus on team coordination, and calm reasoning throughout the process, and understand that things change during the process.



We start with the Preliminary Engineering Report (PER) that will identify key issues and outline options so that the most appropriate solution for providing central sewer can be made. A cost-benefit analysis of alternative sewer technologies will be performed to aid in the selection process. Although cost is a driving factor in the selection of a sewer system technology, sometimes it makes more sense to spend more money to gain additional non-financial benefits. Conflicts and constraints such as canals, major road crossings, bridges, and storm drain crossings must be identified and considered during the PER phase.

Once the recommendation of the PER is agreed upon by CCU, then the design development can commence. This begins with field surveying that will be used to enhance base design plans for development through the 60-90-100% plan production. At each stage of plan development reviews and discussions will be held with CCU to ensure concurrence.

Sometimes there may be new information revealed during the design process that was never anticipated. In these times, the team must not be rigid and adapt to new information for better outcomes throughout the process.

Our philosophy also ties to our work plan and schedule. To get the project moving, many times we split the areas with the design and permitting to allow for the construction of one area first rather than the entire project.

As we approach the final design, we provide quantity take-offs, obtain FDEP permits (and other permits as necessary), and prepare final documents so that CCU will have “shovel-ready” plans ready to bid.

Some of the ***key elements*** of our work plan are further elaborated as follows:

Kick-Off Meeting

The initial communication protocol and review with the design team and CCU as to the overall goals will be reviewed and the completion dates will be established.

One of the first things to be identified is the critical items that require a long lead time. Identification of those elements and providing the necessary input early is key so that those items can be secured as we work on the balance of the project. For example, the pump station site must be selected and while perhaps not actually purchased, it should be secured so that the design can progress. Without a pump station site, we are not sure where the sewer collection line network will terminate; hence, we cannot proceed far with the design.

Data Collection

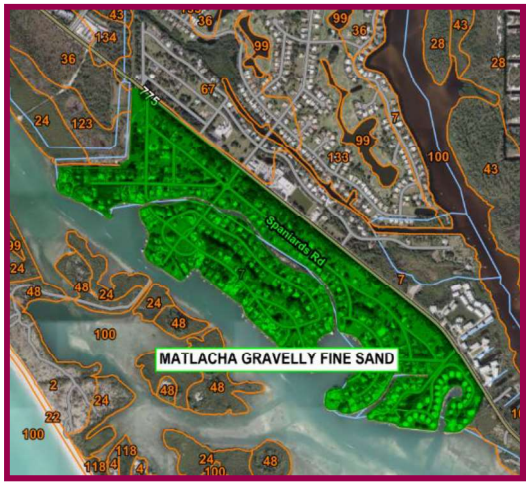
During the first several weeks of the project, the existing plans, existing surveys, and GIS data will be reviewed. If additional information is required or new information needs to be collected, it can be accomplished early in the design process. We will release our sub-consultants as early as possible to obtain the required data and allow time to review the findings before detailed design ensues.

Survey

We will kick off the survey task immediately as this task can be time-consuming and we want to prevent any possible delays as this task is *critical* to the project design schedule.

Geotechnical

Once the PER is finalized, we have conceptual layouts of the station sites and even possibly the collection areas, our geotechnical sub-consultants will begin the subsurface exploratory investigations to obtain information on the physical properties of soil earthworks, rock, and foundations for proposed structures. Subsurface exploration usually involves soil sampling and laboratory tests of the soil samples retrieved via SPTs or hand augers.



We looked at soils in the area using the National Resources Conservation Service (NRCS) soil data. We found that the area is primarily Matlacha gravelly fine sand. This soil is comprised of gravelly fine sand and fine sand, has a relatively flat slope, a high groundwater table, and no restrictive features such as rock or marl. The soil data available does not raise any considerable concerns for utility installation.

Environmental

Conducting appropriate environmental investigations in this area will be essential to identify any protected species or unanticipated environmental concerns. This task will be done during the preliminary engineering phase such that any findings are considered early to eliminate unfortunate surprises once the detailed design is already underway.

Subsurface Utility Engineering

Subsurface investigations help to identify substandard pipes which require replacement or improvements. It is also useful in verifying the location of pipes which can increase the accuracy of design plans and prevent costly field conflicts.

Archaeological/Historical/Cultural

During the preliminary engineering phase, we will begin the investigation of archaeological/historical/cultural resources to ensure there are no problems encountered during construction.

Preliminary Engineering & Design

In the preliminary engineering phase, we will investigate alternative sewer technologies and make a recommendation in the PER on which technology, or perhaps a combination of technologies, will best serve the Cape Haze area. With CCU agreement on the recommended sewer system type, GWE is prepared to design the sewer system whether it be vacuum, low-pressure, gravity, or any combination of technologies.

Existing Septic System Locations

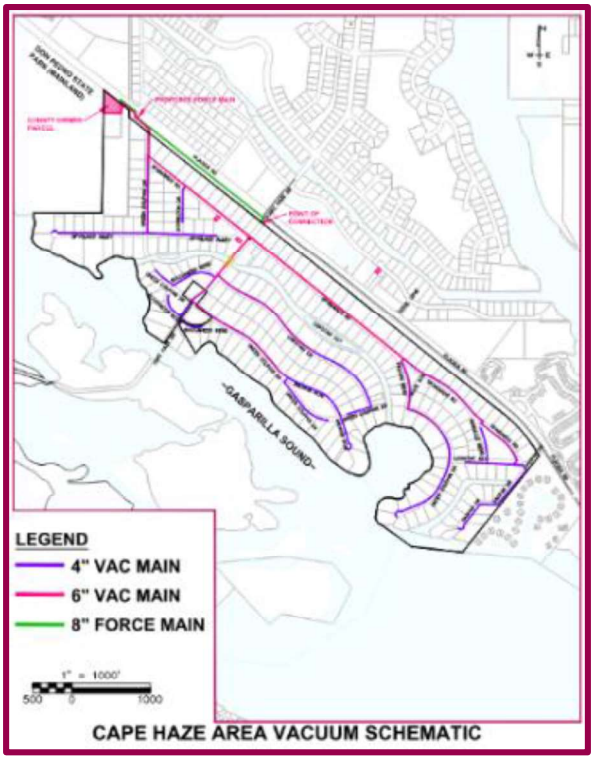
Regardless of the sewer collection system, to prepare the best plans, the location of all existing septic systems must be determined. We understand that most of the existing homes are served by septic tanks which will need to be located and shown on the plans. To allow customers to easily connect to the sewer system once it is installed, the location of their septic system needs to be considered when designing the collection system.

GWE has devised and implemented a process to more efficiently determine septic system locations, as compared to field locating each tank, which is explained in greater detail in Part D of this Section.

Vacuum System Design

A vacuum system and/or a hybrid vacuum system will likely be assessed during the development of the preliminary engineering report. If a vacuum system is selected as the optimal sewer technology to serve the area, there is no more experienced firm to design the vacuum system than GWE. We have already prepared a preliminary layout and performed preliminary hydraulic calculations as an initial "check" to verify the feasibility of a vacuum sewer system in this area. We believe the Cape Haze area is a good candidate for this sewer technology.

There are four (4) major items to consider when laying out a vacuum system once a site has been secured: multiple service zones, minimizing pipe sizes, minimizing vacuum losses, and valve pit or connection spacing. The GWE team is seasoned in the "Do's and Don'ts" of vacuum systems which has been earned through decades of project experience, studies, and observations.



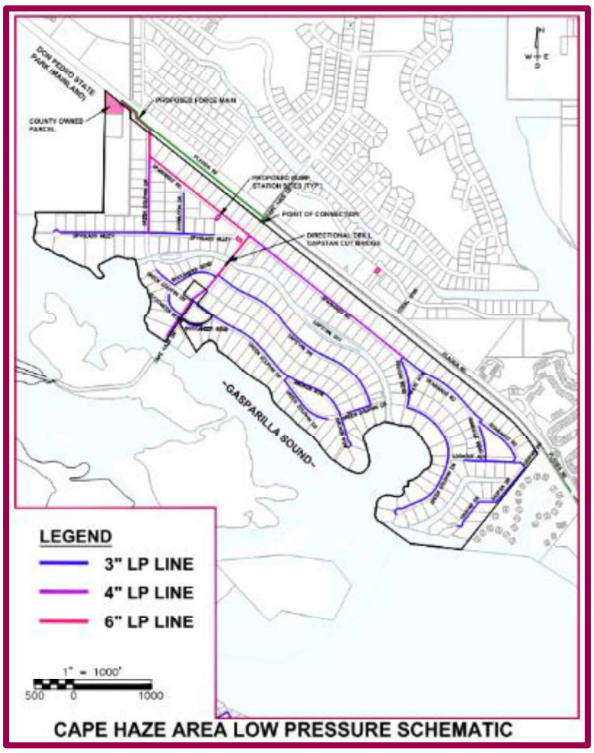
CAPE HAZE AREA VACUUM SCHEMATIC

Low Pressure Sewer Design

During the preparation of the preliminary engineering report, we may analyze the possibility of using low pressure sewer as an alternative option to serve the area.

If a low pressure system is selected for the Cape Haze area, our designers will analyze the existing sewer infrastructure with assistance from the County and make recommendations on the best method for connecting to the system.

A conceptual layout of a low pressure sewer system to serve the area is shown.



CAPE HAZE AREA LOW PRESSURE SCHEMATIC

Gravity Sewer Design

To satisfy the requirements of the SRF preliminary engineering report, a traditional gravity sewer system may be analyzed as a possible sewer technology to serve the project area. We suspect that with the adjacent tidal waters, gravity may be problematic due to the dewatering issues.

If a gravity system is selected for the Cape Haze area, our designers will make recommendations on lift station sites and the best method for connecting to the system.

Force Main Design

Regardless of sewer technology, some force main design will be needed. The hydraulic design of the force main system is critical to ensure that the wastewater can be moved efficiently through the pipeline. This includes determining the flow rate, velocity, and pressure requirements for the system. Elevation changes in the force main system should be minimized to reduce the potential for hydraulic issues such as airlocks, which can cause the system to fail. The design of the force main system should include provisions for easy access and maintenance, in other words, "not too deep".

Potable Water Design

The project includes the installation of new potable water mains to serve the area. The exact condition of the existing mains is unknown, and they will be assessed to investigate the possibility of converting the existing water mains to reclaimed water distribution mains. This will be investigated in the preliminary engineering phase and recommendations will be made.

We expect that the new water mains will be installed on the opposite side of the road from the existing water mains. In highly developed areas the goal is to avoid service interruptions and minimize the likelihood of construction conflicts. Our designers will look closely at the sequencing of the water main replacement and verify the connections to existing mains to avoid disruptions and less than ideal connection scenarios.

Reclaimed Water Investigation & Design

During the preliminary engineering phase, GWE will assess the possibility of converting the existing potable water mains to reclaimed water distribution mains. The PER will make recommendations based on known information. Pipe improvements or perhaps replacement if the condition warrants replacement or if the pipes are asbestos cement will be proposed as part of the project if it is recommended in the PER.

Pump Station Considerations

Several key elements should be considered during pump station design to ensure that the finished product will satisfy the needs of the County and the residents. GWE is well-versed in identifying these considerations and addressing each concern that some firms may overlook or deem unimportant.

Pump Station Site Selection

The pump station and system design start with the site selection. The pump station site is ***key***. Two fundamental criteria are vital when locating a proposed station: system hydraulics, or the ability of the selected site to serve the entire collection area(s), and "non-hydraulic" issues such as compatibility with the neighborhood. From a hydraulic standpoint, the site or sites should be located so that the main line distance from the station to the extremities of the collection area, including system losses is within design parameters.

A matrix of potential pump station sites will be finalized based on the preliminary research of available land and will be ranked based on several parameters such as hydraulic favorability, cost, proximity to residents, environmental considerations, zoning compatibility, and any other factors which may affect the site selection process. We provide an overall map to the County that highlights several potential sites which are prioritized so that if one purchase falls through, a backup site can be immediately identified and pursued.

Depending on the sewer technology or technologies selected to serve the area, there will likely be one pump station design needed. The preliminary engineering phase will identify the number and type of pump stations needed for each alternative sewer collection system evaluated. Pump station sites will be identified and ranked in order of recommendation. Depending on the pump station type and location, there may be additional measures above and beyond what is typically required of a pump station to enhance the aesthetics of the station and reduce the potential for unwanted noise and odors. Certain sewer technologies are more prone to these issues and GWE will ensure that all concerns are appropriately addressed.

Zoning "Special Exception", DRC, and Environmental Review

Pump stations are considered "essential services" and are either allowed "by right", but most times especially when located in a residential area, a special exception is required. This was done for Spring Lake and Ackerman and we are very familiar with going through the special exception process for pump stations to develop a workable concept and buffer plans for the selected site. A preliminary and final site plan approval process is necessary

before the contractor applies for a building permit. We did this for El Jobean, Ohara, and many other commercial projects within the County and are familiar with the requirements.

Neighborhood Compatibility

The pump station should be designed to aesthetically blend in with the neighborhood. GWE tailors each of our pump stations to "fit" the specific area. We have designed numerous pump stations with a scalloped metal tile roof with a European flair, some with false window facades, and even "Key West" styles over the years. In some instances, our pump stations look like the "nicest home" in the neighborhood.

Buffering

We typically add fencing, gates, and landscape buffers for our pump stations which not only helps separate the facility from the neighbors but also provides additional security for the facility.

Odor Control

GWE was the first engineer to design a mulch bed odor control system for vacuum stations in this area. It acts as a biofilter for odor control and has worked exceptionally well, and the mulch bed is now the standard for all vacuum stations.

We have also designed "air scrubber" odor control systems which are suitable for a variety of pump station applications. Air scrubbers are an effective and reliable solution for controlling odors, especially on sites with a smaller footprint.

We anticipate that odor control will be a primary concern for any pump station constructed within this area.

Noise

Typically, neighbors are concerned about the potential noise from a pump station. While there may be some "humming" when the pumps are running, generally it's no louder than a residential air conditioner.

GWE has implemented many techniques for reducing pump station noise, especially in our vacuum stations which can have several pumps running at once. We have used louvers, buffers, and even sound attenuation blankets to limit noises from the pump station. These measures have been effective in previous projects at reducing the noise outside of the pump station building and producing results that are well within the code limits for noise.

Regardless of the pump station type, measures will be taken to reduce any noise coming from the proposed pump station.

Building Heat Dissipation and Cooling

If it is desired to construct a building to house the pump station, consideration must be given to heat dissipation measures. Pumps generate a significant amount of heat which must be addressed to protect the equipment and also provide safe working conditions for operations staff who may need to enter the building from time to time.

If a vacuum station is selected, the vacuum pump exhaust heat is a significant contributor to excess heat in the building. To address this, GWE will design under-slab discharge lines to get that heat outside as soon as possible.

The vacuum pump discharge will be turned down into the concrete to an under-slab manifold that absorbs heat while it directs the air to the odor control bed. GWE has found through experience on past pump station projects that this is a very effective and affordable method for heat dissipation.

To further reduce heat in the building, we incorporate natural cooling elements such as louvers and frame the ceiling with scissor trusses and a cupola to direct the heat up and out of the station. Blowers are used to help circulate and evacuate the warm air from the building.

Air-Conditioned Control Rooms

To keep the controls cool, we design a separate air-conditioned control room in our pump stations.

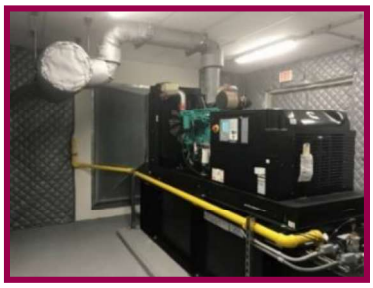
Access and Hoists

Pumps will need to be changed from time to time. GWE has designed overhead doors, loading docks, or removable grates allowing access and replacement of pump station equipment relatively easy.

If a vacuum station is selected, it is ***even more critical*** to consider how staff will access equipment in the future since there is a lower level "basement." To remove sewage pumps, we design lifting beams and hoists as part of our structural design.

Generator

To continue to provide reliable sewer service, even during a power outage, we propose one large generator at each pump station for emergency use.



For our vacuum stations, we have designed generators both inside the pump station building as well as outside of the building. After Hurricane Ian, the County experienced a long-term power outage. All vacuum stations were able to remain in operation with no service interruption to residents.

GWE is experienced with designing and understands the importance of providing a backup generator at pump stations to maintain service to residents, especially during emergencies.

Structural Design – Concrete Waterproofing & Buoyancy

If vacuum is selected as the proposed sewer technology, special consideration must be given to the vacuum station building, especially the pit or "basement."

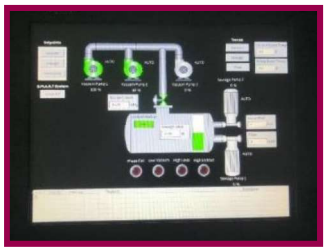
The Cape Haze area has a high groundwater table, and the vacuum station pit must be constructed to withstand long term water exposure. GWE has designed several vacuum stations in areas of high groundwater successfully and is prepared to address this problem. Not only do we plan for this with dense concrete mixes, waterproofing admixes, and exterior pumping systems, but we can also investigate using sheet membranes and cold fluid systems to provide additional assurance. Vacuum station buildings are a significant investment, and they should be protected accordingly.

Similarly, due to the high groundwater table, there are issues with building the vacuum station pit. In addition to gravity loads, buoyancy uplift forces must be calculated to ensure that the building will not float out of the ground during construction. In addition to a heavier reinforcing design, we specify special underdrains, and a foundation pump to keep the water out of the "basement."

Vacuum stations are most susceptible to these issues of waterproofing and buoyancy, but the same principles can apply to a standard pump station that is built in an area with a high groundwater table. It is essential to have designers who are aware of these challenges and prepared to address them as GWE has done numerous times.

SCADA and Controls Operations

We understand the need to interface and the ability to perform a supervisory operation with your equipment. Our pump station designs include monitoring of all the station equipment and control selection tailored to the CCU's standards and desires. Our design includes monitoring equipment and control selection, development of a theory of operation, and internal SCADA connections with connections to the communication infrastructure system.



Communication Infrastructure and Methods

It may make the most sense for the SCADA data to travel over the pre-established Data Flow Systems (DFS) remote telemetry network/Modbus protocol. However, we understand the master plan prepared by McKim and Creed will provide County Wide direct wired fiber optic connection TCP/IP protocol or even cellular.

Either way, our track record has experience delivering SCADA to similar systems for both methods. Our services will consist of providing input and output items in the RTU panel as either analog or digital signals from the station PLC.

Cost Analysis

At the conclusion of key milestones, as well as the final design, a cost analysis will be conducted in-house. Current unit costs based on recent projects will be applied to the quantities to determine an estimated construction cost to ensure the project is within budget guidelines.

Permitting, Technical Specifications, & Bid Documents

Permits with FDEP will be applied for at the 90% level. Technical specifications will be developed as the design process moves forward. At the same time, detailed Bid Documents will be prepared.

Bidding & Review of Bids

Bid packages will be assembled in concert with CCU and a pre-bid meeting will be scheduled. It's quite likely that multiple bid packages may be necessary. For example, we divided East/West Spring Lake into three individual bid packages, one for the Vacuum Station and two separate collection areas. This allowed the County to get a jump start on the station, which not only has a long lead time for construction and obtainment of AIRVAC skid units but of course, must be up and running before any customers can be connected.

Funding Sources

SRF (State Revolving Funding) and other funding will be explored, and the GWE team will provide engineering documentation for fund application which will be an ongoing task. We have routinely done this for other entities including Englewood Water District, Sarasota County, and Martin County.

Cooperative Work Program

Our main office, established in 1992, is located just up the road from the Cape Haze project. No other firm with equivalent *septic to sewer* experience has its main office located any closer to the project than GWE.

Moreover, our office has ample space for utilization by CCU staff.

With our close proximity and available office space, CCU engineering staff is welcome to participate throughout the design and construction process using our facility as a field office to review and offer cooperative input.

Advantages:

- **GWE's main office is located close to the project:** CCU engineering staff can easily drive to the site should questions arise during design (or construction) to review issues directly with our staff.
- **GWE - CCU working relationship:** GWE and CCU have worked together on many *septic to sewer* and other utility projects throughout the decades**.** We understand CCU's needs and have a great relationship with CCU staff, so working together as the plans progress will be a benefit.
- **Cost-effectiveness**: With the CCU engineering staff involved in the review process, there may be less need for formal review meetings, which can help streamline the process.
- **Education and training**: The cooperative work program can also provide an opportunity for CCU staff to learn and get trained on the specific design requirements working with our engineers right here at our GWE office.

Disadvantages:

- **Office location:** Unlike GWE, other firms may not have their office located close to the Cape Haze project. If not, a cooperative effort trying to use an office that is located further from the site may be counterproductive and not worth the additional travel and effort. Having the CCU engineering staff involved in the review process at an office located further from the site could extend the time taken to complete the project.

In summary, our office location, and experienced design staff combined with our office size allows for a good cooperative work program between GWE and CCU, which will benefit the overall project.

Public Outreach

This task will continue with the same key design members and will also last during both the design and construction process. Often, questions arise from the public that are more technical in nature since they are not familiar with the septic to sewer construction concepts. Many times, the residents don't want to hear from what they perceive to be just a "PR Firm" trying to "sell" a project. For this reason, our engineers routinely attend public meetings to offer technical input to public concerns.

Our key staff has also been on the "paying end," because some of us live or own property in the Englewood Water District's vacuum expansion areas, and one of our team members lives within the CCU vacuum expansion areas and have had to pay those fees directly, making us quite empathetic to the public's concern. The GWE team is very experienced and adept at garnering public support for vacuum sewer projects, and this same staff has successfully worked with CCU staff at public meetings for prior projects.

B. What problems do you anticipate and how do you propose to solve them?

Several anticipated problems will need to be investigated and addressed throughout the design process. GWE is prepared to address each problem as described below.

Selecting a Sewer Technology

Determining the best sewer technology to serve a given area can be a complex process and several factors must be incorporated into the selection process:

- **Conceptual layout**: In the preliminary engineering phase, we develop conceptual layouts for alternative sewer systems to help identify unique challenges or limitations for each sewer technology (i.e. a bridge crossing is not problematic for low-pressure, but is problematic for gravity and vacuum sewer), prepare quantity take-offs and cost estimates, and assess several different options for methods by which to serve the area with central sewer. Sometimes, one or more sewer technology is recommended based on project specific constraints and considerations. GWE will look at all options to provide the most efficient collection system to serve the specific area or sub-areas if appropriate.
- **Cost**: The cost of implementing new sewer technology can be a significant initial cost. To address this issue, it is necessary to conduct a cost-benefit analysis that considers both the short-term and long-term costs and benefits of the technology. It is also crucial to identify potential sources of funding, such as grants or loans, that can help offset the initial costs.
- **Maintenance requirements**: Every sewer technology requires some degree of maintenance to function optimally. The maintenance requirements can vary significantly depending on the technology selected. To address this issue, it is essential to evaluate the maintenance requirements of each technology and determine the resources required to maintain the system over its lifetime.
- **Environmental impact**: The selection of a sewer technology can have a significant impact on the environment. It is important to consider the environmental impact of the sewer system and identify measures to mitigate any adverse effects. For example, if the technology involves extensive open-cut trenches, it may be necessary to design pipelines in the roadways to minimize the impact on the trees. Similarly, some sewer technologies are more susceptible to leaks or main breaks that may be difficult to detect or locate, causing adverse environmental impacts.
- **Public acceptance**: The selection of a new sewer technology can be met with resistance from the public, particularly if it involves changes to established practices or infrastructure. To address this issue, it is essential to engage the public and stakeholders early in the selection process, communicate the benefits of the technology, and address any concerns they may have.

Selecting a sewer technology whether it is gravity, vacuum, low pressure, or a "hybrid" system can be challenging. Through conducting a comprehensive preliminary engineering report that considers the costs and benefits, evaluates the maintenance requirements, addresses the environmental impacts, and engages stakeholders, it is possible to identify the most appropriate technology and ensure its successful adoption.

Pump Station Site Selection & Considerations

The selection of a suitable pump station site or site(s) depending on the sewer technology selected and addressing the "*not in my backyard*" issue is probably the most significant decision that affects the entire project outcome. Not only does the integrity of the system revolve around the pump station site(s), but it can quickly become the focus of adverse publicity due to perceived concerns relative to aesthetics, noise, and odor.

Normally, we recommend using land currently owned by the County, and there is an option for that at 8470 Placida Road. We also researched

the MLS database to locate potential lots that are currently for sale. We located one parcel for sale at 510 Spaniards Road listed for $215k.

The sewer technology selected to serve the area also impacts the ***specific needs of the site***. For example, a vacuum station requires a larger site than a standard lift station site.

We already ran preliminary vacuum hydraulics using the County owned land site as a "worst case scenario" (i.e. not hydraulically favorable) pump station location, coupled with the bridge vacuum main crossing hydraulics, to confirm that vacuum sewer, or perhaps a hybrid system, appears to be a feasible option to serve the area.

PROJECT: Charlotte County - Cape Haze
LINE: EOL GREEN DOLPHIN DR

GWE
Vacuum Sewer System

PROJECT NUMBER: 2023.11
MAX FLOW: 0.39 gpm / ERC
DATE: 3/31/2023

STREET OR OTHER NOTES	MAIN LINE LENGTH	PIPE SIZE	HOMES	Q MEAN	Q ACC'M	HL/ 100'	HEAD LOSS LINE	TOTAL STATIC LIFT	NUMBER LIFTS	STATIC LOSS	SUB TOTAL FRICTION	SUB TOTAL STATIC	PIPE SIZE 3"	4"	6"	8"	10"
EOL GREEN DOLPHIN DR	1,500	4	22	4.3	8.6	0.00	0.07	3	2	2.33	0.07	12.33		1,500			
		4		8.6	8.6	0.02	0.00			0.00	0.07	10.00		0			
CONT. GREEN DOLPHIN DR	520	6	5	9.5	10.5	0.00	0.02	1.5	1	1.00	0.08	10.00			520		
		6		10.5	10.5	0.00	0.00			0.00	0.08	9.00			0		
CONT. PELICAN BEND	680	6	7	11.9	13.2	0.00	0.03	1.5	1	1.00	0.11	9.00			680		
		6		13.2	13.2	0.01	0.00			0.00	0.11	8.00			0		
SPANIARDS RD		6	44	21.8	30.3	0.01	0.00			0.00	0.11	8.00			0		
		6		30.3	30.3	0.03	0.00			0.00	0.11	8.00			0		
CONT. SPANIARDS RD	2,520	6	39	37.9	45.5	0.04	0.96	4.5	3	3.00	1.08	8.00			2,520		
		6		45.5	45.5	0.05	0.00			0.00	1.08	5.00			0		
CONT. SPANIARDS RD	1,650	6	13	48.0	50.8	0.06	0.98	4.5	3	3.00	2.05	5.00			1,650		
		6		50.8	50.8	0.07	0.00			0.00	2.05	2.00			0		
CONT. GREEN DOLPHIN DR	340	6	1	50.8	50.9	0.07	0.22	1.5	1	1.00	2.28	2.00			340		
		6		50.9	50.9	0.07	0.00			0.00	2.28	1.00			0		
CONT. PLACIDA RD	490	6	0	50.9	50.9	0.07	0.32	1.5	1	1.00	2.60	1.00			490		
		6		50.9	50.9	0.07	0.00			0.00	2.60	0.00			0		
TO VPS	100	6	0	50.9	50.9	0.07	0.07			0.00	2.67	0.00			100		
TOTALS -	7,800		131		50.9		2.67	18	12	12.33			0	1,500	6,300	0	0

Pump Station Noise, Odors & Aesthetics

In previous pump station projects, we attenuate noise using louvers, buffers, and even sound attenuation blankets so that there are limited sounds from the pump station. We pioneered the use of mulch beds which are sized to minimize odors and we have designed alternative odor control units such as air scrubbers. Having designed and constructed so many wastewater pump stations on small lots in residential neighborhoods, we have the experience to address odor, noise, and aesthetic issues.

One of the big advantages of retaining a firm that has done so many local pump station projects is that we have been through just about every potential issue with neighbors.

It's bad enough to have a large-scale project that costs residents a significant sum; but if you are also introducing a new building that everyone will see, you will want a firm that has proven experience with over two dozen stations with architectural looks that are both practical and aesthetically pleasing.

High Groundwater

Due to the coastal location of the project area and the lower lying ground elevation, a high groundwater table is expected and should be considered during the project design. In areas like this, deep excavation depths should be avoided or minimized and special consideration must be given to the pump station building to ensure the structure will not be adversely impacted by fluctuating groundwater levels.

FEMA Flood Zone

According to the recently updated FEMA flood maps, the project area encompasses several flood zone designations including Coastal A, 10AE, 9AE, 8AE, 11VE, 12VE, and X. The County owned land is located in flood zone 9AE and therefore any building constructed here will need to be elevated.

Narrow Rights of Way

Generally, the average right-of-way width in the area is about 50 feet wide. GWE has plenty of experience in navigating the challenges associated with narrow rights of way in developed neighborhoods such as this one.

Maintenance of traffic will be a key component of the project and identifying all potential conflicts early on in the design process will be essential to prepare quality design plans to avoid conflicts and minimize disruption.

Restoration

The Cape Haze project area is a unique neighborhood that will require specific attention and care to navigate the project specific conditions. GWE performed a preliminary walkthrough of the area and noted several large banyan trees that are still standing after the recent Hurricane Ian, large amounts of well-tended landscaping, and decorative driveways. It is important to be aware of these features and to explore all options to avoid or minimize impacts to these elements which will increase project cost, cause environmental impacts, and may upset the neighbors/residents in the area.

Bridge Crossing

There is one canal and bridge that subdivides the area. One of the disadvantages of vacuum versus low pressure is that bridge crossings can be difficult because specific slopes must be maintained and there can be significant hydraulic losses incurred by multiple lifts needed.

The Capstan Cut Waterway Bridge was built in 1993 and has an existing water main mounted to the northwest side of the bridge. Since the bridge is relatively old, a bracket connection for utilities on the side of the bridge will require structural analysis; or a separate pile-supported aerial crossing structure dedicated just for utilities may be needed. Various options depending on the sewer technology selected will be investigated for feasibility and cost effectiveness. Fortunately, the bridge is relatively flat and we suspect that it can be crossed with vacuum mains without exceeding the recommended hydraulic loss limits.

Reusing Existing Mains for Reclaim Water Distribution

The decision to reuse existing potable water mains as reclaimed water distribution mains will need to be thoroughly investigated. This suggestion can be tricky because a choice will have to be made for which side of the road to locate the new sewer and water on.

One solution is to install new water mains on the opposite side of the road. This does three things: First, it eliminates any problems with water/sewer separation issues. Secondly, it allows customers to be switched over to the newly installed water system without interruption. Third, while the sewer is being installed next to the existing water mains (future reclaimed water mains) conflicts with the sewer can be adjusted and repairs to damaged pipes or the replacement of pipes can be done.

Public Acceptance & Resident Concerns

One major advantage of retaining a firm that has successfully completed numerous septic to sewer projects in and around Charlotte County is that we have extensive experience with resolving complaints and concerns with the public. It is normal to have concerned residents when introducing a large scale utility project of this nature.

GWE maintains a “hotline” number (1-866-556-2200) during both the design and construction processes. This is a “toll free” number for residents to call to discuss the status of the design or their specific needs during construction. All design and construction issues are logged into a GWE database and forwarded to the appropriate personnel for resolution and follow-up. The “name of the game” is to be able to address the concern keeping complaints from “going up the ladder” and keeping customers informed as to the resolution of their issue.

Easement Acquisition

The acquisitions of easements are a time consuming process, particularly if you don’t have a willing seller. The time and money it takes to secure easements can delay a project. Securing easements requires parcel sketches, legal input, and the associated County acquisition process.

First off, GWE acts diligently to reduce the number of required easements in the project area by realigning the main lines of the system whenever possible. This will be accomplished by analyzing alternative pipe corridors and designing around potentially expensive easements. Yet sometimes easements, despite our best efforts, are necessary for an efficient design.

When easements are unavoidable, GWE segregates the needed easements into two categories--namely "critical" easements, and "secondary" easements. Critical easements are those that are necessary to build the "main line." They are identified early on and forwarded to the utility to maximize the acquisition time.

Existing Utilities

Unknown, existing utilities are classic magnets for delay and cost claims by contractors in many large infrastructure projects. Like most firms, GWE provides the design plans to all the known utilities and plots the best available information on the plans. After the known utility information is plotted, we go back into the field and conduct further subsurface utility locations using our ground penetrating radar in specific areas of concern. We pinpoint conflicts and plot additional existing utility information right on the plans, as we did for the East/West Spring Lake project.

The goal of subsurface utility exploration (SUE) is to mitigate costs associated with project redesign and construction delays and to avoid the risk and liability that can result from damaged underground utilities. Non-destructive methods are used to determine the presence of subsurface utilities and to mark their horizontal position on the ground surface. A conflict matrix is also created to evaluate and compare collected utility information with project plans, identify conflicts and propose solutions.

Drainage Infrastructure Replacement

As part of any utility project, a decision will need to be made regarding the extent to which drainage gets replaced. The intent to improve all the drainage within the project rights of way could be very costly. Ideally, this means any existing metal drainage or deteriorated pipes would be replaced and upgraded to an equivalent concrete pipe.

Although initially more expensive than what is necessary for installing just the CCU utility mains, this concept of "doing it all now" is in the long run less expensive and certainly less disruptive since the area would only have to be disturbed once for both the new drainage and utilities. We understand that this involves both CCU and Public Works and money is the main issue. We believe we have a good rapport with staff in both departments and will look at various options so an informed decision can be made upfront that benefits Charlotte County.

We have worked with Charlotte County Public Works providing stormwater designs, stormwater system assessments, and water quality modeling in the past. While an involved drainage scope is likely not necessary, we will need to look at drainage swale restoration, driveway pipes, and improvements to the drainage conveyance system as it relates to utility installation impacts. We have extensive experience integrating drainage improvements into wastewater projects.

Maintenance of Traffic

Due to the presence of narrow rights of way and the anticipation that there may be instances in which we have to align mains to go around conflicts (such as mature trees), maintenance of traffic will be a key issue. The project takes place in a residential neighborhood with many dead ends/cul de sacs. Access must be maintained for pedestrian and vehicular traffic to pass, which may be challenging in some areas

We drove through this neighborhood and witnessed several people walking their dogs and riding bikes, so we understand this is an active neighborhood. Maintenance of traffic so that construction can progress while allowing residents to uphold their normal routines while keeping all parties safe will be a key project component.

These considerations will have to be deliberated during the preliminary engineering and throughout the design process. This may impact the sewer technology recommendation, the construction sequencing, proposed methods of construction, and many other facets which will have to be worked out during design.

Large Areas of Disruption during Construction

We have learned through the last 20 years of designing and providing CEI services specifically for septic to sewer projects that despite a contractor's best intentions, there is no question that large areas can be disturbed for several months aggravating the residents, if not properly controlled.

For this reason, we typically provide a construction phasing plan where the contractor is limited to a certain area and cannot move into another area until the prior area is cleaned up. In addition to the "Phasing Plan," we also develop specific language that we put in our specifications which is exactly what we did for the East/West Spring Lake and Ackerman Wastewater Expansion projects.

C. Describe probable energy savings applications.

Coordination with Other Entities

Construction projects are expensive and consume considerable energy, just to install. For this reason, we only want to "tear up" the neighborhood once, if possible. Hence, we coordinate with other utilities and Public Works to see if we can integrate their planned drainage improvements into our sewer projects.

A recent example is where a local internet provider has been upgrading its systems by directional drilling fiber optic cables in areas where our vacuum mains were already planned. We were able to coordinate and avoid a conflict. Knowledge of these improvements and correspondence documenting this helped to alleviate significant energy costs and disruption. We also coordinate with future paving programs, requesting a delay in planned overlay projects until after all our utility construction is installed, which also saves energy expenditures.

We have followed this energy cost savings process on many utility projects. For example, we included additional water main installations, we delayed both Charlotte County and Sarasota County paving projects until after our EWD sewer lines were installed, and we coordinated with other utility and road projects, all of which saves energy and therefore money for the citizens.

Operational Energy Savings

Because vacuum stations serve many customers, the pumping systems use relatively large motors and generate significant heat. GWE has developed many styles of vacuum stations using energy saving techniques for cooling, baffling for noise, controlling odor, and energy efficient pumps. For example, our newer stations use a "cupola" like the barns of yesteryear to take advantage of the natural convection airflow for cooling the station. We also use special baffles on our cooling louvers and sometimes (such as our Red Rock Park vacuum station in Sarasota), we tuck our stations among existing trees so that we get some natural shading on the station, all of which saves operational energy in the long run. Regardless of which type of pump station is required for the project, we will incorporate these types of energy saving practices into the design.

Underground utility construction projects are difficult. Problems will inevitability come up during construction. Many times, it is not so much what problems arise; but rather, *how timely the problem can be resolved*. We pride ourselves on handling field issues with a "sense of urgency", minimizing delays which equate to energy savings.

Energy Conservation

One of the recent energy conservation items we have put into practice for vacuum stations is the use of rotary claw style vacuum pumps (aka Mink pumps) which are efficient (air delivered versus electrical energy usage) in the operating range of 16-20-in. Hg.) and require less maintenance.

They do come with a higher initial cost; however, the rotary claw operation principle of Mink claw vacuum pumps reduces their energy consumption considerably in comparison with conventional vacuum pumps, so energy costs are reduced. Compared to conventional vacuum pumps, Mink claw vacuum pumps can save up to 60% on energy and operating costs. Due to their near maintenance-free operation, a decrease in operating costs adds to the savings. In addition, to reduce back-pressure on the vacuum pumps, each vacuum pump exhaust is manifolded which conserves energy.

Considering the typical vacuum station houses 4-6 vacuum pumps, the opportunity for significant energy conservation versus upfront investment costs is an advantage. We have used solar panels to help run monitoring systems in Port St Lucie and normally incorporate drought tolerant type landscaping to reduce watering needs.

New Energy Resources

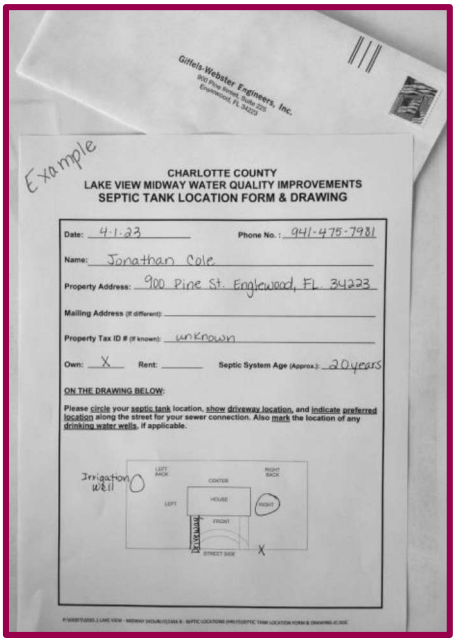
GWE provided a more efficient "new energy resource" for transporting sewage from an existing lift station by converting it to a vacuum buffer tank.

For example, the nursing home on Drury Lane in Englewood previously had an onsite treatment plant with duplex pumps in an existing lift station discharging to a perc pond. GWE was able to remove all the electrical components and convert the existing lift station into a "buffer tank" system with vacuum valves that pulled the sewage from their existing system into the Area V-2 vacuum station.

This source of energy, the vacuum, reduced the need for two power drops and the cost and maintenance of duplex lift stations. It also eliminated the need for long-term maintenance of the treatment system and the perc ponds, as all sewage was shunted to the vacuum station and treated at the regional plant, which is far more efficient. This buffer tank conversion system designed by GWE has been in operation for many years with no reported trouble. We have done this exact thing--that is, using buffer tanks for high volume flows instead of duplex stations on many of our subsequent vacuum projects.

Recently GWE designed the very first vacuum system to use only buffer tanks designed to remove multiple old lift stations for the City of Port St Lucie. One central station now replaces a dozen former pump stations eliminating multiple power sources with a single source.

D. Describe innovative approaches in production and design.


Giffels-Webster Engineers, Inc.

Example

CHARLOTTE COUNTY
LAKE VIEW MIDWAY WATER QUALITY IMPROVEMENTS
SEPTIC TANK LOCATION FORM & DRAWING

Date: 4-1-23 Phone No.: 941-475-7981

Name: Jonathan Cole

Property Address: 900 Pine St. Englewood, FL. 34223

Mailing Address (if different):

Property Tax ID # (if known): unknown

Own: X Rent: Septic System Age (Approx.): 20 years

ON THE DRAWING BELOW:

Please circle your septic tank location, show driveway location, and indicate preferred location along the street for your sewer connection. Also mark the location of any drinking water wells, if applicable.

Irrigation well

LEFT BACK CENTER RIGHT BACK LEFT HOUSE RIGHT FRONT DRIVEWAY STREET SIDE X

Septic Tank Location Forms

GWE has developed an innovative cost-saving technique for locating existing septic tanks via a septic tank location form which we mail directly to the residents within the project area that are on septic systems. The homeowner has the option to provide the location of their septic tank and input as to where the most convenient connection point would be. Since valve pits serve multiple homes, the pit cannot always be placed in a location that makes everyone happy. However, using these forms as a guideline helps in the design process.

By allowing the homeowner to suggest the actual placement of the lateral, CCU will get "buy in" avoiding homeowner arguments as to where the lateral was placed, minimizing disagreements when construction begins.

To encourage homeowner participation and simplify the return response, we provide the homeowner with a pre-addressed and stamped return envelope to create a convenient way to mail the completed form back to our office for processing.

The homeowner can offer as much or as little information as they please. We have implemented this process on several recent projects, including Lake View/Midway, and have had an overwhelmingly positive response from the public.

In large septic to sewer projects, this process is far simpler and saves a vast amount of time and resources compared to field locating each septic tank. The responses received from the septic locate mailers are marked on the plans and then the remaining septic tanks are field located by our staff to determine the best connection point.

Project Phasing

Splitting projects into smaller phases is another innovative approach. We did this for the Area V-9 Project (EWD) in Englewood. The primary vacuum station was constructed first. The Area V-9 collection area was split into three phases over the years due to EWD funding issues. We provided enough room for all pumps at build-out but phased the vacuum/sewage pump installation so that as the collection areas came online, additional pumps were installed, and the costs were allocated to the appropriate areas.

We have also split up the primary elements of the projects. A good example is in our Martin County projects where we recommended separating the construction of the vacuum stations from the collection systems. This allowed a blend of underground utility contractors to be more competitive in fields in that they were more experienced and general contractors specializing in vertical construction were not intimidated by underground utility line construction.

Value Engineering

GWE provided Construction Engineering & Inspection for several utility projects in Sarasota County, including Area "K" and Area "C" that were initially designed by other firms. During the construction of these projects, GWE was able to value engineer and field adjust, saving the County well over one million ($1M) dollars.

In addition to the direct field adjustments, GWE re-designed two of the vacuum stations (initially designed by other engineers), shaving over a quarter of a million dollars from the initial bid price.

Overall, the innovative techniques spearheaded by GWE have saved utilities several million dollars, allowing them to add service areas utilizing the savings generated by our firm. This experience allows us to produce streamlined, efficient design layouts which help produce accurate cost estimates and close bids.

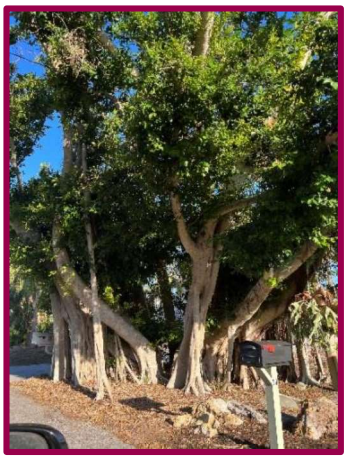
E. Address the waterway crossing and mature tree impact.

Waterway Crossing

The waterway crossing divides the "sewer shed" between W3 and W4. One of the drawbacks of vacuum versus low pressure is that bridge crossings can be difficult because the vacuum main approaching the bridge will need a series of lifts to raise the vacuum main up and over the bridge. Moreover, it must be no lower than deck level so as not to impede boat clearance. The bridge crossing elevation is approximately 4ft. While we don't know all the details yet, we believe adding a carrier pipe is feasible allowing both areas to be served with one vacuum station. We will provide a detailed conceptual layout to verify this solution as part of the PER.

Mature Trees

GWE has witnessed the sheer size and magnitude of the existing trees in the project area. Several large banyan trees are located close to the road within the right of way. We understand that these trees are likely very special to the residents who drive by them every day and we intend to protect the trees to the best of our ability. One option is to design the pipes around the trees which will likely increase road restoration costs associated with this option but ensures the protection of the trees.



Alternatively, some utility mains can be directionally drilled under the trees if realigning the main is not feasible. These options will have to be considered and compared in the preliminary engineering phase. It is easy to directional drill water mains or low pressure mains, but deep directional drills under trees are harder to access for maintenance. Also, vacuum mains, if selected as the sewer system technology, can be directionally drilled but is usually not recommended due to the strict tolerances and design constraints that must be adhered to.

F. Address access issues during construction.

When addressing access issues during construction in a developed residential neighborhood, it is essential to take extra precautions to minimize disruption and ensure the safety of the residents and the Contractor. Here is how we would address access issues during construction:

- **Inform residents in advance**: Notices/signs should be posted in visible locations, and information should be provided on how to contact the project manager or construction team for any questions or concerns.
- **Develop a traffic management plan**: A traffic management plan should be developed specifically for the residential neighborhood. The plan should consider the layout of the neighborhood, the availability of alternate routes, and any potential impacts on pedestrians and cyclists. It should also include signage, temporary barriers, and other measures to guide residents safely around the construction site.
- **Coordinate with local authorities**: It is essential to coordinate with local authorities to ensure that any road closures, diversions, or other traffic management measures comply with local regulations and requirements. This will help to minimize any potential conflicts with residents.
- **Schedule work to minimize disruption**: Construction work should be scheduled to minimize disruption to residents as much as possible. This may involve working outside of peak traffic hours, scheduling noisy work for times when it will cause the least disruption, and implementing measures to mitigate noise and other disturbances.
- **Provide safe access for residents**: Safe access to homes and properties should be provided throughout the construction period. This may involve providing safe walkways, temporary pedestrian crossings, or other measures to ensure that residents can access their homes safely.
- **Provide access for essential services**: Access to properties for mail and garbage services should be provided and coordinated throughout the construction period. This may involve providing temporary mailboxes or garbage pickup locations.
- **Address concerns promptly**: Any concerns raised by residents should be addressed promptly and effectively. This will help to maintain a positive relationship between the construction team and the local community.

By addressing access issues during construction in a residential neighborhood, project managers can help to minimize disruption, ensure the safety of residents, and maintain a positive relationship with the local community.