

# **PRELIMINARY ENGINEERING REPORT**

## **SUBAQUEOUS FORCE MAIN CROSSING**

### **JOE'S CREEK**

#### **WORK ASSIGNMENT #7**

**(PN 002161A)**

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## **EXECUTIVE SUMMARY**

Wastewater from Seminole and unincorporated Pinellas County is collected at Master Pump Station PS-016 and is conveyed to the South Cross Bayou Water Reclamation Facility (SCBWRF) via an existing 20-inch diameter Cast Iron (CI) force main and a parallel 36-inch diameter Ductile Iron (DI) force main. The 36-inch and 20-inch force mains convey wastewater east on Park Boulevard from the Pinellas Park area across Joe’s Creek for treatment by Pinellas County Department of Environment and Infrastructure (DEI) at the SCBWRF. The existing 20-inch and 36-inch force mains are over 50 and 40 years old respectively and pose a significant risk in the event of failure.

Pinellas County DEI has decided to replace the dual 20-inch and 36-inch Joe’s Creek crossing with a single new 36-inch force main. Four alternative routes were considered within this report for the replacement of the Joe’s Creek crossing. Design plans for a 30-inch Boca Ciega force main replacing the existing 20-inch force main from downstream of PS-016 to the point of Crossing Joe’s Creek were made available to URS and were taken into consideration in this report.

For reasons presented herein, the proposed South A alignment route (Figure No. 6) and Horizontal Directional Drill (HDD) method of installation using approximately 650 feet of butt-fused 42-inch diameter DR-13.5 High Density Polyethylene (HDPE), PE4710, are recommended for the replacement of the Joe’s Creek force main crossing. The installation setup can be performed within the existing right-of-way (ROW) on the west side of Joe’s Creek and on the SCBWRF property on the west side. It is recommended that the drill rig be set up in the SCBWRF and the exit pit be within ROW along Westchester Boulevard and Joe’s Creek to minimize disruption to the local traffic on Westchester and area residents. HDPE pipe would be fused and pulled into the drilled hole from Westchester Boulevard on the west side of Joe’s Creek.

The subaqueous alignment is within Waters of the State with the exception of the associated open cut sections on either side of Joe’s Creek that are located in the Westchester Boulevard ROW and the SCBWRF, respectively. The open cut section includes an approximately 600 feet section on the west side of Joe’s Creek and an approximately 235 feet section within the SCBWRF. There are no permanent easements anticipated to be required by the County. The



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easement through the State Submerged Lands within Waters of the State is obtained through the permitting process.

The new force main is anticipated to be located approximately 30 feet below the bottom of the Joe’s Creek channel. Appropriate geotechnical information should be collected to verify depth of installation and subsurface soil conditions as part of the detailed design effort. Limited geotechnical information available as part of the 30-inch Boca Ciega force main design plans was utilized to estimate the approximate depth needed for the subaqueous crossing. Connections to the existing force mains would be made adjacent to Westchester on the west side and within the SCBWRF on the east side of the Joe’s Creek crossing.

Please note that although Ductile Iron Piping (DIP) is discussed and included in the cost estimation for the open cut section of this project, it may be beneficial to utilize PVC. Due to the potential of salt water influence and the high ground water table, PVC would be less susceptible to exterior corrosion and would have a lower initial cost for installation.

The construction schedule for the project is estimated at 300 days. The estimated construction cost is based on historical values for directional drilling under waterways, the approximate equipment required, and similar project experience. The estimated construction cost for the replacement force main is approximately \$1,451,500.

## **1.0 INTRODUCTION**

### **1.1 General Description**

The County owns and operates Pump Station 016 (PS-016), a master pump station that conveys raw wastewater from the Seminole and unincorporated sections of Pinellas County to the South Cross Bayou Water Reclamation Facility (SCBWRF) via two parallel force mains. The two existing force mains include a 20-inch force main and a 36-inch force main that cross under Joe’s Creek to the western boundary of the SCBWRF. The 36-inch force main conveys wastewater from PS-016 located on Park Boulevard near 104<sup>th</sup> Lane in Pinellas Park to the SCBWRF. The 20-inch force main connects to the 36-inch force main downstream of PS-016 and parallels the 36-inch FM alignment to the SCBWRF. The service area is composed of high density residential and commercial. The 20-inch force main is approaching 50 years and according to the County its material of construction is Cast Iron (CI). The 36-inch force main is composed of Ductile Iron (DI) but is also nearly 40 years old. At the location of the St. Joe’s Creek (Joe’s Creek) crossing both force mains have been identified as posing a significant risk of failure. The County would like to replace the parallel Joe’s Creek crossings with a single 36-inch force main, leaving the two existing force mains as redundant backup force mains. A project location map is included as **Figure No. 1**.

An existing set of drawings, Boca Ciega Sanitary Force Main Improvements, dated July 2001 by Parsons Engineering Science, Inc., showing the proposed replacement of the 20-inch force main from Park Boulevard (just east of PS-016) to the point of the creek crossing with a 30-inch force main will be taken into consideration during the study. This Preliminary Engineering Report (PER) will evaluate four potential routes considered viable for the proposed 36-inch force main to replace the two existing force mains across Joe’s Creek. This PER will also evaluate five potential installation methods for the subaqueous portion of the Joe’s Creek crossing. **Figure No. 1** provides an aerial photograph of the project layout including the SCBWRF.

It should be noted that the proposed 30-inch Boca Ciega force main design from the County indicates that the existing force mains are 36-inch and 20-inch diameter DI pipes. Portions of the 20-inch CI main may have been replaced with DI piping, but URS does not have records of where the specific projects may have occurred.







## **1.2 Purpose**

The purpose of this report is to evaluate the available routes for the replacement of the Joe’s Creek crossing of the existing 36-inch and 20-inch force mains while taking into consideration existing plans for the replacement of the 20-inch force main from near the PS-016 to the Joe’s Creek crossing point. The report will compare the construction techniques of the subaqueous crossing from a cost, benefit, and constructability perspective, considering future operations and maintenance that may be required for the main. One route will be considered utilizing a piping bridge or aerial crossing to allow a cost comparison that is dependent on more than just the route chosen. Based on the selected construction technique for crossing Joe’s Creek, an analysis will be performed comparing the various routes, including:

1. Potential Constructability Issues
2. Potential Existing Utility Conflicts
3. Impact to the Public
4. Permitting
5. Operations and Maintenance
6. Land Acquisition Requirements
7. Opinion of Probable Construction Cost

Finally, a matrix will be developed ranking the four proposed routes using the seven categories above with each category having a defined weight. Based on the results of the matrix, the route with the best scoring will be recommended as the optimal route. This PER includes a discussion on the background of the project, existing force main, proposed improvements, discussion of installation techniques, available alignments, permitting requirements, a preliminary schedule and an estimated construction cost estimate. The most recent publicly available parcel boundary data from the Pinellas County Property Appraiser’s Office and available as-built drawings were also taken into consideration. An independent survey, a geotechnical exploration, and Subsurface Utility Exploration were not conducted as part of this report. Available survey data and Standard Penetration Test (SPT) results made available as part of the 30-inch Boca Ciega force main design were utilized as much as possible.

## **2.0 EXISTING FORCE MAINS AND REPLACEMENT DESIGN**

The following section discusses the existing 20-inch and 36-inch force mains and the proposed 30-inch Boca Ciega force main that will replace the existing 20-inch force main.

### **2.1 Existing 20-inch and 36-inch Diameter Sanitary Sewage Force Mains**

The 36-inch DI and 20-inch CI existing force mains serve parts of Seminole and unincorporated sections of Pinellas County, Florida and have been in service for over 40 years and 50 years respectively. They convey raw municipal wastewater collected from the area in PS-016 to the SCBWRF facility crossing Joe’s Creek, adjacent to the westerly boundary of the treatment facility. The force mains cross 62<sup>nd</sup> Ave North at approximately the 7800 block traveling north/south to an easement between residential homes. The force mains continues south along the easement in parallel for approximately 1,200 feet and turn east towards the treatment facility along another easement also between residential homes between Gibraltar Court North (Gibraltar) and Fareham Court North (Fareham) for approximately 400 feet to Westchester Blvd North (Westchester). The force mains continue east crossing under Westchester and Joe’s Creek for approximately 325 feet to the SCBWRF facility where they eventually discharge for treatment. **Figure 2** illustrates the existing force mains.

Upon entering the County property at the SCBWRF, the 36-inch and 20-inch force mains are routed south around the perimeter to the opposite side of the facility, then to the east and north to the east side of the facility where they discharge into the Headworks. In addition the 36-inch force main manifolds with the Madeira Beach 24-inch force main just south of the reclaimed water tanks. The North and South routes will take into consideration the location of the connection with the Madeira Beach 24-inch force main and replace the force mains upstream of that connection to maintain appropriate flow in that final section of pipe prior to discharging in the Headworks. The force mains appear to have been installed via open cut or direct bury. The As-built Joe’s Creek Canal (Alternate B) crossing, dated January 12, 1976 by Anderson, Johnson, Henry and Parish, Architects/Engineers, Inc., illustrates the replacement of the original 20-inch aerial crossing of Joe’s Creek with a direct bury crossing and the installation of the parallel 36-inch force main via direct bury across Joe’s Creek with a minimum of 2-feet of cover.



## Force Mains

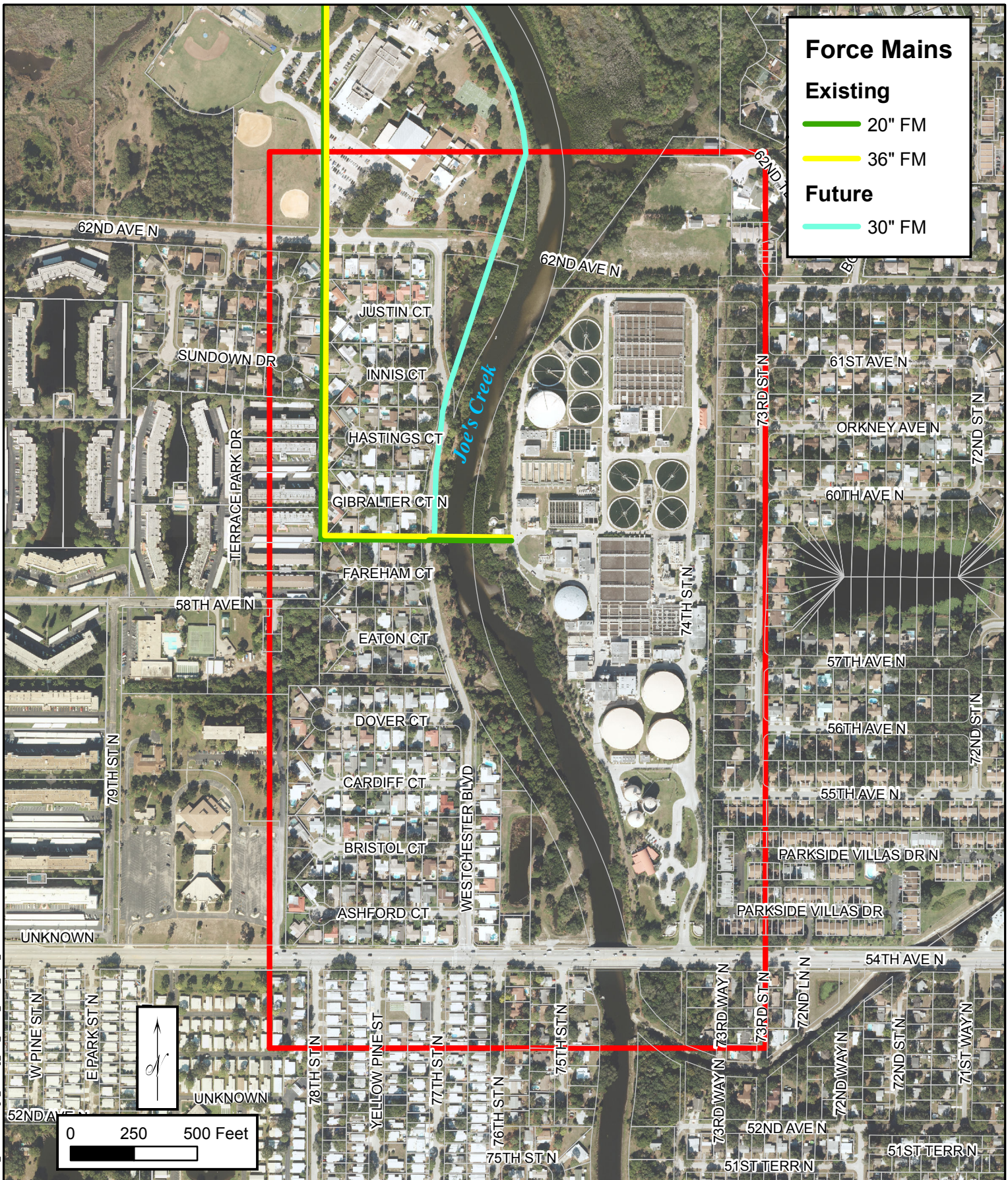
### Existing

20" FM

36" FM

### Future

30" FM



## Existing Force Mains and Future 30" Force Main

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Subaqueous Crossing  
Joe's Creek

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FIGURE NO.  
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## **2.2 Replacement 30-inch Boca Ciega Force Main Design**

A design for the replacement of the 20-inch force mains between PS-016 and the SCBWRF was completed by Parsons Engineering Science, Inc. in 2001. The project is titled Boca Ciega Sanitary Force Main Improvements, and it defines a replacement 30-inch force main from approximately the intersection of Park Boulevard and Garden Drive. The proposed 30-inch force main generally follows the median in Park Boulevard to the east to the intersection of Park and 78<sup>th</sup> Street North and is proposed to be constructed with a series of four horizontal directional drills (HDD) connected at entry/exit pits.

At the intersection with 78<sup>th</sup> Street, the force main turns south and is proposed to be installed via direct bury under the 78<sup>th</sup> Street roadway with interconnection of the existing 36-inch force main for enhanced hydraulic connectivity. As the proposed 30-inch force main approaches Joe’s Creek Canal for the first time, it is proposed to be installed via HDD under the creek. For a short distance, approximately 800 feet, the 30-inch main is proposed to be installed along the west side of Joe’s Creek Canal bank. Finally, the main is proposed to be installed via HDD under and somewhat parallel with Westchester Boulevard. The design terminates at the two existing Joe’s Creek Canal crossings that are between Gibraltar and Fareham, tying into the existing 36-inch force main that crosses Joe’s Creek and enters the SCBWRF. The Boca Ciega force main design appears to indicate the existing 20-inch force main will be grout filled and abandoned in place at the completion of the 30-inch force main construction. **Figure No. 2** illustrates the existing force mains along with the Future 30-inch Boca Ciega force main.

Based on the information contained in the 30-inch Boca Ciega Force Main Design plans, the existing force mains where installed via open cut have approximately 4 to 6 feet of cover and the open cut sections for force main along the Boca Ciega route near Joe’s Creek are designed to be approximately 5 feet in depth to Top of Pipe (TOP), with a TOP elevation varying between 1.5 feet and 3.5 feet 1929 National Geodetic Vertical Datum (NGVD29). The seasonal high water level in Joe’s Creek is indicated as approximately 1.2 feet NGVD29, which will lead to significant dewatering requirements when constructing portions of the Boca Ciega and the Joe’s Creek projects. Other considerations from the Boca Ciega project that will be integrated into the Joe’s Creek designs are the locations of the open cut/direct bury sections. One potential route onto the SCBWRF may eliminate a 30-inch HDD section that is proposed to be constructed as part of the Boca Ciega project in the future.

### **3.0 JOE’S CREEK CROSSING ALTERNATIVES**

Four alternate alignment routes have been evaluated in this report for the replacement of the Joe’s Creek crossing. They are identified as the North, In-Place, South A, and South B alignment routes. The South and In-Place alignments upstream connection would connect to the existing force mains on Westchester Boulevard at the point before the crossing of Joe’s Creek while the North route would connect to the existing force main at approximately the 7800 block of 62<sup>nd</sup> Ave North where the existing force mains cross 62<sup>nd</sup> Ave North. The downstream connection of the North and South alignment routes would replace the existing force mains to a point just south of the reclaimed water storage tanks before the manifold with the Madeira Beach 24-inch force main. Each of the three alignments under consideration are further discussed below. Finally, if the North Route is chosen, a future connection would be provided for the future 30-inch force main in the area where it is proposed to be installed via direct bury/open cut eliminating the need for one HDD of the 30-inch piping. **Figure No. 3** illustrates the proposed alignments under consideration. While it is assumed in the sections below that the open cut sections will utilize Ductile Iron Pipe (DIP), it may be more cost effective to utilize PVC. Additionally, some areas of the project have a high ground water table and may be under the influence of salt water due to the proximity to Joe’s Creek. These areas may benefit from the use of PVC due to corrosion resistance properties.

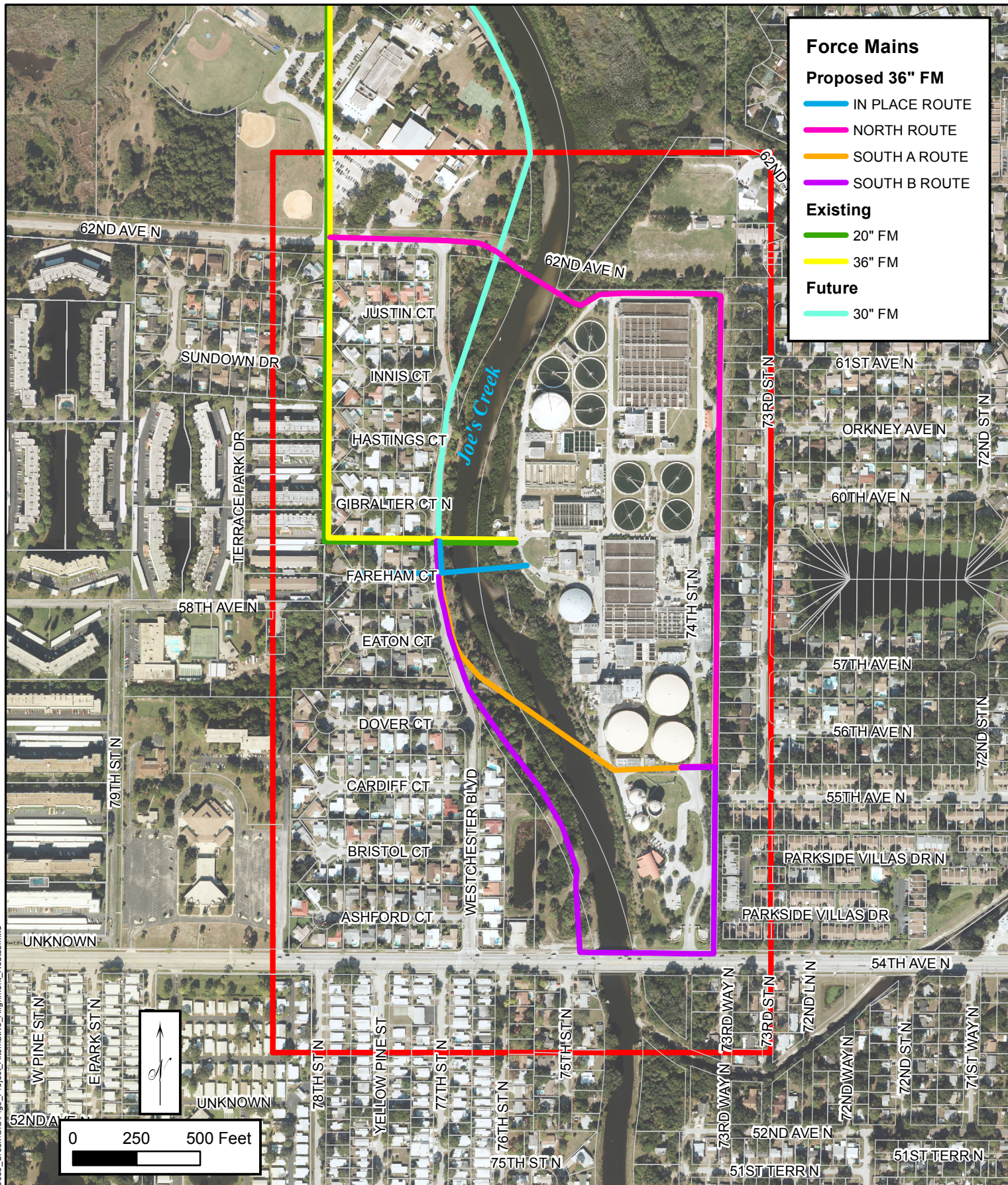
#### **3.1 North Alignment Route**

The North Alignment Route takes into consideration the existing Boca Ciega Force Main plans. The plans propose a future replacement of the 20-inch force main with a 30-inch force main from downstream of PS-016 to the point before the crossing of Joe’s Creek. The proposed Boca Ciega 30-inch force main approaches the crossing from the North and a section of the 30-inch piping could potentially be eliminated if hydraulically possible. The logical connection point for the North route is in the Right-of-Way (ROW) where the existing force mains cross 62<sup>nd</sup> Ave North because the existing force mains travel along easements between private properties north and south of that location and it is now difficult to access the easements.

The proposed North Route for the replacement of the two force mains crossing Joe’s Creek would connect to the existing force mains at the point where they cross 62<sup>nd</sup> Ave North at approximately the 7800 block. The proposed 36-inch replacement force main would then travel



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## Project Alternative Alignment Routes

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Joe's Creek

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FIGURE NO.  
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Figure 3 HERE

east on 62<sup>nd</sup> Ave North past the intersection with Westchester and continue in the ROW across Joe’s Creek to the northwest corner of the facility. Once on County property, the force main would continue to travel east along the north property boundary of the facility and turn south along the edge of the property to the connection point before the manifold with the Madeira Beach 24-inch force main.

There appears to be sufficient available ROW space along the north side of 62<sup>nd</sup> Ave North to install the force main. There is also a large ROW area east of 62<sup>nd</sup> Ave North prior to the Joe’s Creek crossing available for staging construction equipment. The North route would then cross Joe’s Creek to the northwest corner of the facility and travel along the north and east property boundaries to the connection point south of the reclaimed water storage tanks. There are numerous yard piping mains surrounding the property that would have to be taken into consideration within the facility.

The proposed North Route intersects the route of the previously proposed 30-inch force main east of 62<sup>nd</sup> Ave North before crossing Joe’s Creek effectively eliminating approximately 1,050 feet of the previously designed 30-inch force main that was proposed to be installed by HDD. The future 30-inch force main could be installed by open cut to the point where it would intersect the proposed 36-inch force main. **Figure No. 4** shows the proposed North Alignment Route.

### **3.2 In-Place Alignment Route**

The In-Place Alignment Route would replace the existing 36-inch and 20-inch force mains at the crossing of Joe’s Creek from Westchester to the west side of the SCBWRF property replacing only the section of the force mains crossing Joe’s Creek. The In-Place replacement would connect to the existing force mains at the end point of the existing proposed Boca Ciega 30-inch replacement force main. From the connection point the force main would proceed to the existing force mains on the west side of Joe’s Creek, crossing under Joe’s Creek to the proposed connection point to the existing force mains on the facility property.

To consider the constructability, there are numerous utilities along Westchester Boulevard. Sewer, water, reclaimed water, electric, telephone and cable television are present in addition to storm water structures that would have to be taken into consideration. It should be noted a 4-inch PVC water main is installed on the west side of Westchester. The east side of Joe’s Creek is bordered by the SCBWRF facility. As mentioned in the North Alignment, there is limited







space at the facility since there are numerous pipes that compose the yard piping of the plant. To limit the effects of neighboring residents, it is suggested that a trenchless technology be utilized for the In-Place route that will begin at the western end of Fareham. This will limit the affected area to the residents at the west end of the cul-de-sac rather all residents on Fareham. This location is also needed to allow for the setup of the drill rig to be far enough west to allow the drilled pipe to reach the required depth prior to reaching the west bank of Joe’s Creek. The proposed 36-inch force main will have to be interconnected to the existing 36-inch force main at the location where it is close to the existing sub-aqueous crossing.

The 36-inch force main can be connected to the existing force main by installing a new force main, via open cut, along Fareham from the point the HDD begins, going east, to the east ROW of Westchester. There the main will route north to the existing 36-inch force main near the Joe’s Creek crossing.

The In-Place route does not provide for the replacement of any portion of the proposed Boca Ciega Force Main but provides for the replacement of the Joe’s Creek crossing in place of the existing crossing without adding any additional length of force main except for that required to achieve the depth for the crossing method selected and the connection force main along Fareham. The In-Place Alignment Route is illustrated on **Figure No. 5**.

### **3.3 South Route A and South Route B**

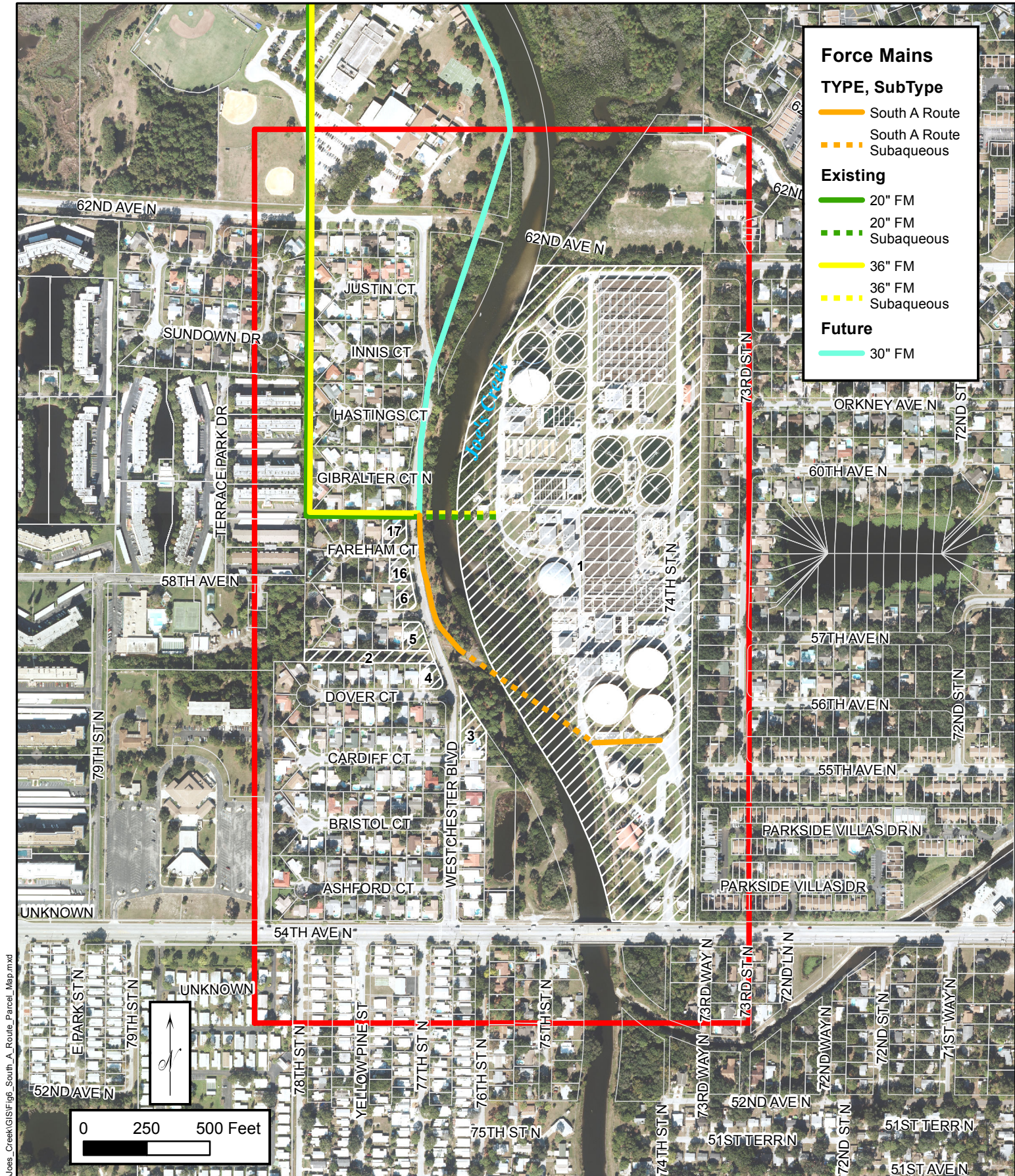
There are two possible alignment routes for the South alternative. Both South alignment routes would travel south from the point of connection on Westchester near Gibraltar and Fareham. The main will cross Joe’s Creek and replace the existing crossing at a location south of the existing crossing and would connect to the existing force main at the plant site before the manifolded connection with the 24-inch Madeira Beach force main. Both of the proposed alternatives for the South alignment are discussed below.

**South A:** The South A alignment route proposes a connection to the existing 36-inch and 20-inch force mains at the point before the mains cross Joe’s Creek on the east side of Westchester and travel south along Westchester to approximately between Eaton Court North and Dover Court North. The force main would subsequently cross Joe’s Creek via HDD subaqueous crossing to the facility and travel east to the connection point before the 36-inch force main manifolds with the 24-inch force main just south of the reclaimed water storage tanks. Alternative A for the South alignment is shown on **Figure No. 6**.









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## South A Route Parcel Map

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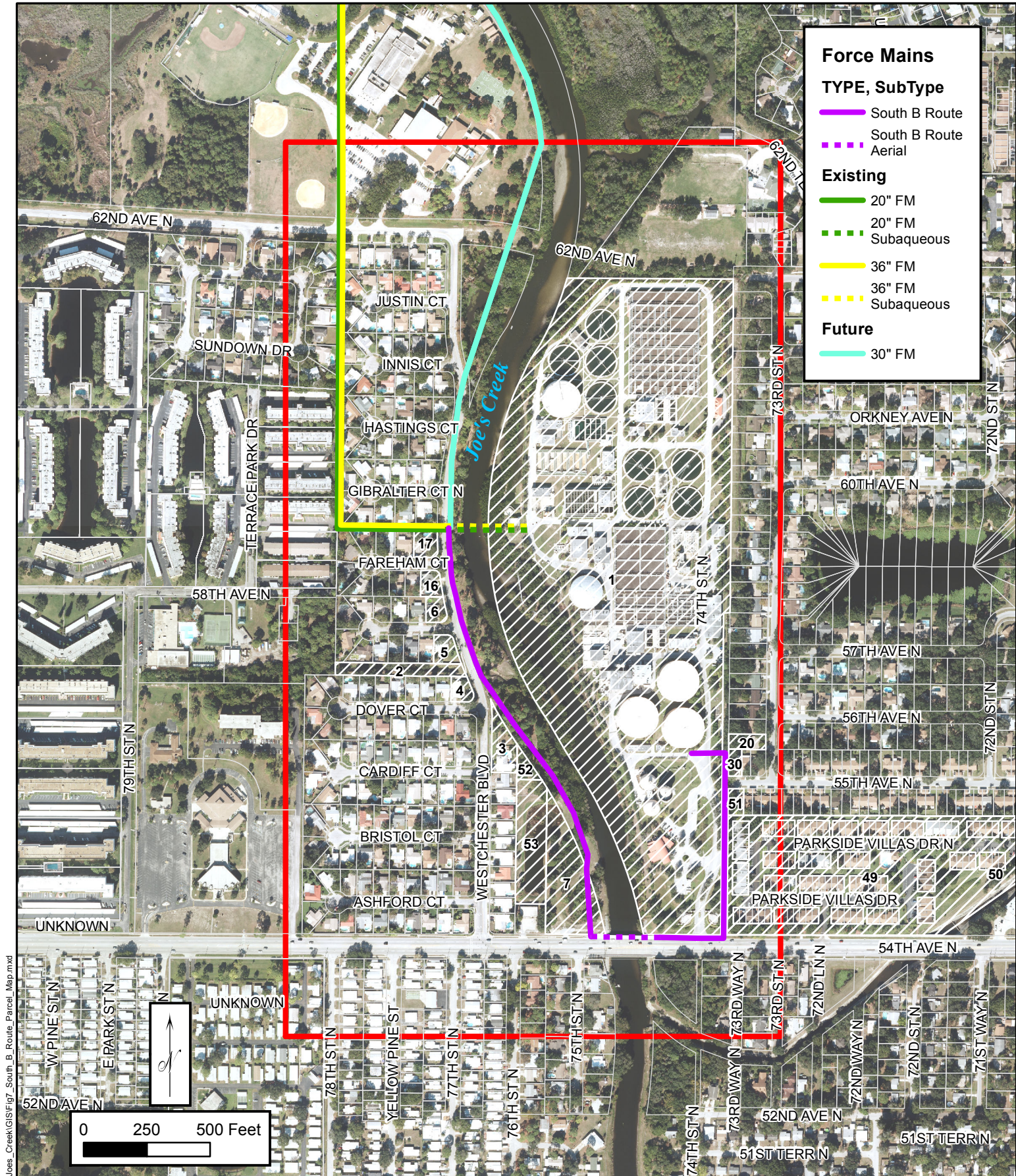
FIGURE NO.  
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**South B:** The South B alignment proposes the 36-inch force main route to continue south along Westchester Blvd veering to the east off of the road just south of Dover Court North. The main would be installed via HDD parallel with Joe’s Creek within Joe’s Creek ROW and parcels owned by the County. This route would avoid conflicts and increased maintenance of traffic issues with the residents along the east side of Westchester Boulevard North. Upon approaching 54<sup>th</sup> Ave North, the force main would be installed with an aerial crossing of Joe’s Creek along the existing bridge proceeding to 74<sup>th</sup> Street North, the entrance to the SCBWRF facility. Once on 74<sup>th</sup> Street North, the force main would continue north within the facility property to the point of connection to the 36-inch force main before the manifold with the 24-inch Madeira Beach force main. South B alignment is shown on **Figure No. 7**.

The South B alignment route offer the least advantages on length since it does not replace any portion of the future Boca Ciega Force Main project but adds an approximate additional length of 2,750 feet to the Joe’s Creek crossing force main replacement installation when compared to the In-Place replacement. However, this location is the preferential location for the installation of an aerial crossing. The aerial crossing is not simple in that it will require the addition of a support system for the piping. URS has looked at the pier spacing and it is beyond the length typically allowable for long-span aerial crossing (45 feet). This can be accomplished with piping bridge fabricated with beams to support the load of the proposed piping.





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## South B Route Parcel Map

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Subaqueous Crossing  
Joe's Creek

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FIGURE NO.  
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#### **4.0 METHOD OF CONSTRUCTION FOR CROSSING**

URS evaluated the trenchless technology construction methods currently available in the marketplace for installation of the proposed 36-inch force main under Joe’s Creek. The minimum crossing is approximately 345 to 650 feet in length, depending on the chosen alignment, beneath Joe’s Creek to the SCBWRF but the length may be longer depending on other factors. The following five (5) trenchless techniques have been considered as potential alternatives where appropriate.

- Horizontal Directional Drilling (HDD)
- Conventional Tunneling,
- Horizontal Auger Boring or Jacking and Boring,
- Micro Tunneling, and
- Pipe Bridge/Aerial Crossing.

In evaluating any of the subsurface installation techniques, consideration must be given to geotechnical conditions, entry location, exit location, and environmental considerations. Geotechnical concerns require the installation of the piping or casing within a subsurface zone that is not loose or have high levels of sandy materials. All of the subsurface techniques, with the exception of pipe jacking, require horizontal drilling. If the crossing is proposed in loose or sandy material the contractor may lose mud circulation while performing the drill operation causing them to abandon the project. If the crossing is proposed in very loose or karst materials, some installation methods could cause a collapse.

Potential entry and exit locations are influenced by the construction method chosen. While the entry pit and exit pit to a HDD is relatively small, the product pipe staging area and the drill rig including other machinery required for the installation are greater than the other considered techniques.

Finally, potential environmental impact where the crossing is being installed must be considered. The crossing of Joe’s Creek will be require dewatering for any subsurface method chosen where machines are required to be setup below the surface. The amount of dewatering will vary with the method chosen, adding to project expense. Tunneling, horizontal auger boring/jack and

boring, and micro tunneling all utilize subsurface machinery and would require significant dewatering. As opposed to HDD which will require limited dewatering.

#### **4.1 Horizontal Directional Drilling (HDD)**

The HDD method comprises a three-stage process including drilling a pilot hole, the reaming process and pulling back the product pipe through the hole thereby accomplishing the installation. The first stage consists of drilling a small diameter pilot hole along the desired alignment. The pilot hole is excavated using a drill head with a rod stringing for the entire length of the proposed crossing. The pilot hole is then enlarged (reamed) to a larger diameter by attaching a reamer to the drilling rod until the required proposed borehole diameter is obtained. This reaming process can be completed in one step or several steps depending upon the proposed diameter. For this project multiple steps will be required throughout the reaming process, the hole is kept open (or kept from collapsing) by the use of thick drilling mud to fill the annulus space. The drilling mud is usually a bentonite-based compound.

The final borehole diameter is typically 50% larger than the proposed product pipe diameter at smaller diameters, but can be decreased slightly on larger diameter drill sizes. It should be noted that due to the wall thickness of HDPE, a 36-inch DR-11 HDPE pipe inside diameter is approximately 31 inches. To maintain a minimum inside diameter of 36 inches, a 42-inch DR-13.5 HDPE pipe would have to be used. The inside diameter of 42-inch DR-13.5 HDPE is approximately 37.5 inches. 42-inch HDPE is not fabricated in DR-11 or lower, but if the newer PE 4710 is utilized the pressure rating of DR-13.5 piping is 161 psi versus 160 psi for traditionally utilized PE3608/3408 DR-11 piping. Please note that not all manufacturers of HDPE have DR-13.5 available in 42-inch Ductile Iron Pipe Size (DIPS) PE 4710, but it is available according to ISCO’s latest catalog. Consulting with our internal experts, we believe drilling of the proposed 42-inch HDPE piping will require a drilling diameter of approximately 60 inches. Upon completion of the last reaming step the product pipe is then pulled through hole. The HDD technique can be used in a variety of soil and rock materials, though it is preferential to find a lens of clay material in which to drill.

The HDD technique requires a relatively large staging area on both the entry and exit points of the drilling operation. The entry area must be significantly larger than other subsurface techniques due to the size of the equipment required for the drilling. Preferably, a long section

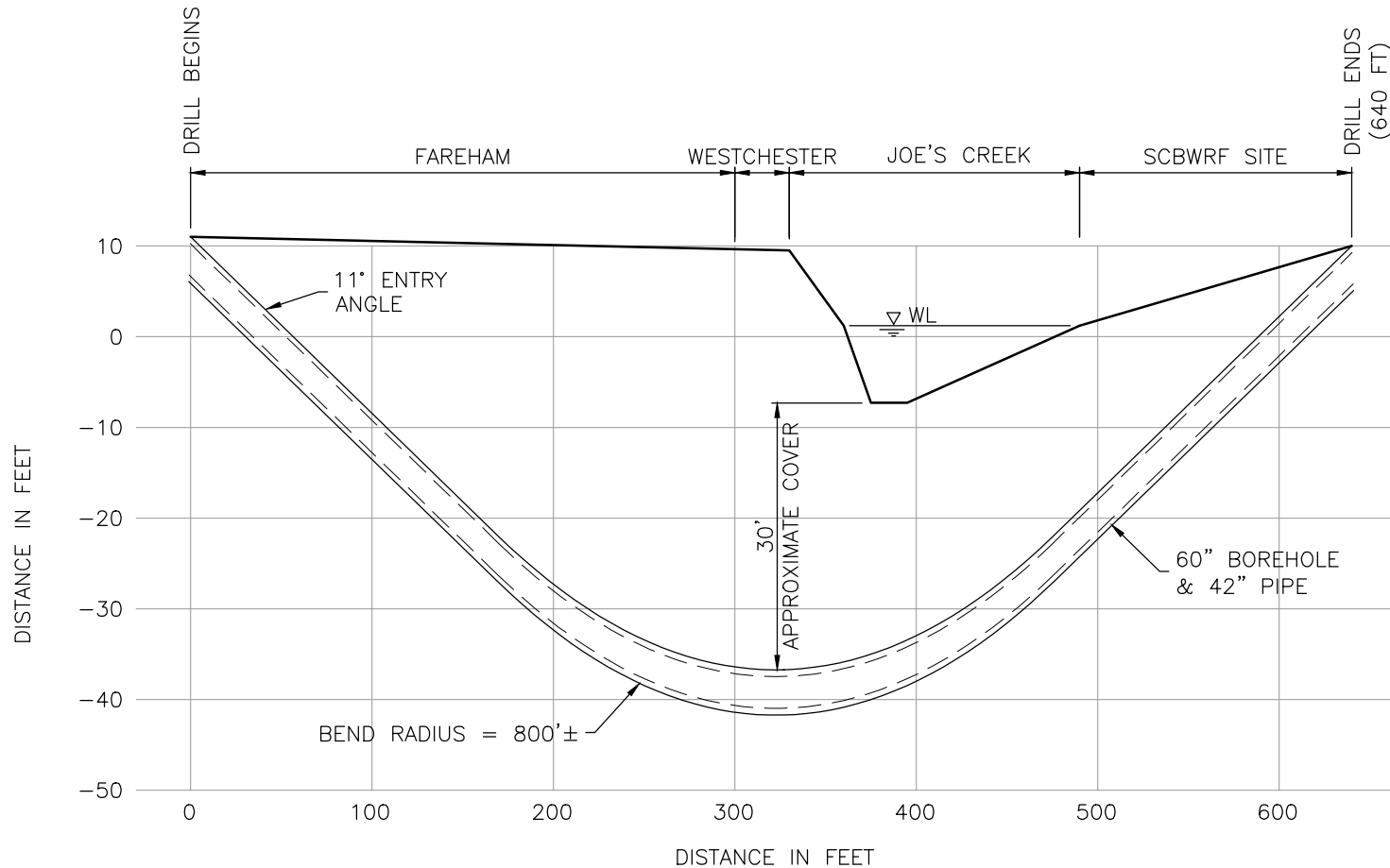
of the pipe should be assembled at the exit point and pulled in one operation to reduce starts and stops and down time for the pipe fusing process during the pipe pull back phase.

The HDD method is typically a cost-effective method for pipe installation of diameters up to 48 inches which is within the range anticipated for the Joe’s Creek project. It is commonly used for pressurized pipelines similar to the proposed force main crossing. It is an ideal method where precision and accuracy of installation is not critical or detrimental to the installed pipe or existing surface and subsurface facilities/utilities. A potential risk of the HDD method is the occurrence of drilling mud seepage or “frac out” through the surrounding soils and rock to the ground surface that may affect existing structures and/or cause contamination of groundwater and surface water. To minimize the risk, it is proposed to install the piping a minimum of 20 feet below the bottom of the Joe’s Creek. The existing Joe’s Creek “As-Built” plans show a bottom elevation of -4.7 feet NGVD29 according to the 1976 Joes Creek Canal (alternate B) project. The survey of the bottom elevation during the Boca Ciega force main indicates a bottom elevation of -7.3 feet NGVD29 in close proximity to the proposed crossing. That would put the top of pipe elevation at a maximum of -28 feet NGVD29 +/-.

Review of closest existing geotechnical boring information indicates loose sandy material at elevation -23 to -28 feet +/- and loose clayey material at elevation -28 to -33 feet +/- NGVD29 followed by a layer of stable limestone (75 blows per foot) at elevation -33 to -44 feet. The sandy and loose clay lenses of undesirable material require the piping to be installed deeper such as a top of pipe depth of -36 to -40 feet within the stable limestone material. The loose material will be troublesome for all types of sub-aqueous crossings, requiring a greater depth and expense for crossing. Reference the soil boring logs, Bore B-24, Sheets P-13 and D-01 of the Boca Ciega Sanitary Force Main Improvement plans, 2001, Parsons Engineering Sciences, Inc. Please see **Figure No. 8** for a profile depiction of a proposed HDD with an example location of the In-Place route.

## **4.2 Conventional Tunneling Method**

This method involves the use of a tunnel boring machine (TBM) with a temporary lining support system consisting of liner plates or pre-cast concrete segments. The TBM configuration will be selected based on the anticipated ground and groundwater conditions. This method will require man entry into the tunnel during the construction phase. The minimum diameter for conventional tunneling is 72 inches. The proposed force main pipe would be installed inside the



temporary lined tunnel. A launching pit and receiving pit will be required to launch and retrieve the TBM from the ground. A smaller staging area will be required compared to that required for the HDD technique if the launching pit is constructed vertically and the TBM is placed into the pit with a crane. However, the pit is likely larger than is feasible on the east side of the Westchester ROW.

The tunnel would likely be proposed to begin at an elevation of approximately -36 feet NGVD29 and would be constructed below the existing Joe’s Creek. While it would be preferential to drill at a higher elevation, beginning roughly 10 feet below the bottom of Joe’s Creek (-18 feet NGVD29) the geotechnical boring indicates sandy and loose material above that level which could lead to issues during construction. Due to the depth below sea level, the proximity to a water body, and a size of the machine required for the tunneling, the dewatering requirements for this type of construction would be very costly. This method is much more costly than the HDD alternative and requires a longer duration of construction to complete.

A significant advantage of conventional tunneling is the potential access for pipe maintenance throughout the design life of the pipeline. In addition, other utility pipes or replacement pipes could be installed inside the tunnel in the future. The disadvantage is that the system would be installed so far below water level that future access would be limited and sealing the tunnel may be difficult. Additionally, due to the required entry for the bore hole, the length of the finished tunnel on the shortest crossing would likely extend from the SCBWRF to the end of the cul-de-sac on Fareham, saving no length from an HDD. The North route would be the only feasible route for tunneling construction but it would be at a high cost.

### **4.3 Horizontal Auger Boring or Pipe Jacking**

Auger boring and pipe jacking are similar operations to each other and are often used synonymously. Both methods get their name from the similar vertical operation, where auger boring is similar to reverse mud drilling of a well and jacking is similar to installing a well casing via hammer tool.

Auger boring is similar to conventional tunneling but is performed with a smaller machine that drills with an auger while, generally, installing a casing pipe in the bore hole during the boring operation. There is a vertical entry pit for the auger to be placed into and man entry into the pit is required. The steel casing piping installed is the sleeve for the proposed force main that will

be installed within the casing, requiring additional operation after the auger boring operation is complete.

The auger boring machine continually drills in front of the casing being advanced and additional casing pipes are added on and welded. At the terminus of the proposed casing, a vertical exit pit is constructed allowing the internal force main piping to be connected at the end of the bore and at the start of the bore hole. Auger boring can generally be utilized for larger bore holes than pipe jacking and can generally be utilized for longer distances. Auger boring will require a large staging area for operation and, similar to tunneling, would not be feasible in the east ROW of Westchester. The cost per foot for auger boring is much higher than for HDD and the advantage is removed by having a final casing that would be nearly as long as the HDD.

Pipe jacking is similar to auger boring with the exception that a pneumatic hammer is utilized to push the horizontal casing through the earth and the soil is removed from the piping after the casing is extended. The size of the equipment is typically similar to auger boring, but because of the force required to push the casing, it is slightly larger equipment to achieve the same size of casing.

Pipe jacking could be performed at a higher elevation than auger boring. The casing could potentially be jacked through the loose or sandy material at elevation -18 feet NGVD29 and below. The difficulty would be finding a machine large enough to perform the operation of jacking a large diameter casing roughly 640 feet. With the larger machine this method would likely exceed the cost of auger boring of the same hole.

For either auger boring or pipe jacking, the casing required would be approximately 1.5 times the diameter of the required piping and the total length of the casing would be between 640 feet for the shortest crossing rather than the apparent length of only 345 feet.

There are both advantages and disadvantage of auger boring versus other methods. Auger boring would be significantly less costly than traditional tunneling and it would allow for future maintenance or replacement of the crossing. However, the depth of the proposed crossing will not allow for easy access to the crossing and the cost of the auger boring will be significantly higher than an HDD, especially when considering the dewatering costs at both the entry and exit pits.

#### **4.4 Micro Tunneling Method**

Micro tunneling is similar to auger boring but it is performed without constantly manning the tunnel entry pit. The operation requires the use of a Micro Tunneling Boring Machine (MTBM) and a pipe jacking operation. The remotely operated MTBM bores in front of the proposed casing and the casing is then pushed in behind the MTBM as it completes its drilling operation.

As with the drilling/auger boring construction methods above, micro tunneling involves the use of mud slurry to keep the bore hole open but casings are also installed similar to auger boring. Therefore the lens of the proposed micro tunnel must be chosen carefully. The MTBM will often overcut the bore hole slightly to allow for an easier pipe jacking operation. Interjacks are sometimes utilized, placed inside the casing to put force on the leading casing to advance it forward.

Similar to tunneling and auger boring, vertical entry and exit pits are required. The size of the equipment required for micro tunneling would prevent it from being setup within the east ROW of Westchester, extending the shortest required casing to approximately the same location as the other drilling operations.

There are both advantages and disadvantage of micro tunneling versus other methods. The line and grade accuracy is much greater than auger boring or HDD as the MTBM can be laser guided and operated with a remote camera. Similar to auger boring, future maintenance of the piping inside of the installed micro tunnel is possible. However, the depth of the proposed crossing will not allow for easy access to the crossing and the cost of the micro tunneling will be significantly higher than either an HDD or auger boring.

#### **4.5 Pipe Bridge/Aerial Crossing**

A pipe aerial crossing is possible but only feasible on the South B Route. Reviewing the existing Joe’s Creek, the body of water is navigable and appears to be utilized for recreation and other activities. Recent aerials of Joe’s Creek show rather large vessels traveling in the creek. If a new crossing were proposed, such as at the North Route or the In-Place route, extensive studies and permitting would be required for hydraulic and scour condition analysis. The project would involve piles and caps to support the large piping, with the piles driven to a depth of roughly -33 feet NGVD29 or lower, pending geotechnical investigation. The bridge would likely be required



to have a similar clearance above water level to the 54<sup>th</sup> Avenue crossing and the spacing would have to be similar if not greater. It is also expected that stake holders in the creek and area residents might object to the installation of an additional crossing, potentially hampering a new crossing completely.

A feasible crossing along the South B Route will require the existing bridge piers to be extended to the north, installing additional piles for the extended bridge. The crossing will generally follow the bridge on the north side and will return to an open cut installation at the eastern and western terminus of the bridge. Investigation of the bridge construction was performed by URS, and it was determined that the spacing between the piers is beyond the typically allowable long span for DIP (45 feet) which would require additional structure to support the piping. That can be satisfied through dual I-beams with a structure between the beams to hold the actual piping.

The installation of the actual piping would be the least expensive of all options for the aerial crossing. The installation of the additional piles, piers, and bridge materials, along with the required additional length for the South B Route and lack of savings on the Boca Ciega force main installation potentially make the South B Route and aerial crossing the most expensive. If there were an existing bridge near the In-Place route, the bridge extension and aerial installation would likely be cost competitive with HDD installation as the crossing would require the shortest length of trenchless installation. Additionally, the benefits of having a fully accessible and maintainable pipeline for the Joe’s Creek crossing may make the cost difference between the aerial installation and subaqueous crossing more feasible.

#### 4.6 Summary of Joe’s Creek Crossing Construction Alternatives

A matrix comparison of the various Joe’s Creek crossing techniques is presented in **Table 4-1** below. The matrix compares the various techniques and includes an opinion for the various crossing operations.

<b>4-1 Comparison of Crossings Techniques</b>					
<b>COMPARISON ITEM</b>	<b>HDD</b>	<b>CONVENTIONAL TUNNELING</b>	<b>HORIZONTAL AUGER BORING</b>	<b>MICRO TUNNELING</b>	<b>AERIAL CROSSING</b>
Cost per lineal foot	\$750 to \$900	\$15,000 to \$20,000	\$4,000 to \$5,000	\$6,000 to \$8,000	\$350 - \$400*
Staging area requirements	Large area required	Smaller than HDD but still sizable.	Smaller than HDD but still sizable.	Smaller than HDD but still sizable.	None required except for additional bridge construction.
Risk of mud leak into surface	Possible	No	Small	Small	No
Future maintenance, pipe replacement, use of space for other utilities	No	Yes	Yes, No Room for Other Utilities	Yes, No Room for Other Utilities	Yes
Alignment control and accuracy	Medium	High	Medium	High	High
Shortest Potential Length of Trenchless Installation	640 feet	640 feet	640 feet	640 feet	180 feet
Dewatering Requirements at Drill Rig	None	High	High	High	N/A
Presence of Karst formation	Problematic	Less problematic	Less problematic	Less problematic	N/A

\*= Cost of the Aerial Crossing does not include pipe bridge. The cost of a pipe bridge would depend on the location.

It should be noted that an open-cut installation of the Joe’s Creek crossing was considered but not recommended. Based on the record drawings the existing crossing was performed by open-cut installation. The record drawings appear to indicate that Joe’s Creek was significantly smaller, both in depth and in width, when the open cut was performed. An open cut crossing would require a shut down and temporary diversion of the creek. While it may be an optional mode of construction, the permitting could take years to accomplish as the water body is navigable and considered Waters of the State. The cost for dewatering and temporarily diverting the creek would be similar to the cost of conventional tunneling, but the permitting costs could be significantly higher.

Based on the review of crossing options presented in **Table 4-1**, the recommended crossing technique is HDD or aerial crossing. As discussed in the aerial crossing section, the only feasible location is at the existing bridge in the South B Route. It should also be noted that the cost estimate for the aerial crossing presented in **Table 4-1** is for the piping, only, and does not include the additions to the bridge. The relatively higher costs for the various tunneling methods are estimated due to the increased time for the drilling operation and include significant dewatering of the entry and exit pits. The various routes will now be compared to determine the optimal route.

## **5.0 ANALYSIS OF CROSSING ALTERNATIVES**

Four pipeline alignments are proposed for consideration of installing the new 36-inch force main across Joe’s Creek. The routes are anticipated to be installed using a combination of open-cut and HDD techniques or an aerial crossing in the case of the South B Route. It should be noted that the original 20-inch force main crossing of Joe’s Creek was an aerial crossing and was replaced with a direct buried crossing in 1976. As described in the previous section, and in the aerial discussion in Section 4.5, the best location for the aerial crossing would be adjacent to the existing 54<sup>th</sup> Avenue bridge. Each of the four route alignments explored for the crossing are discussed in further detail below. The seven criteria considered in analysis of each route includes:

1. Constructability
2. Existing Utilities
3. Impact to Public
4. Permitting
5. Operations and Maintenance
6. Land Acquisition
7. Construction Cost

### **5.1 North Alignment Route**

#### **Description**

In the North alignment route the proposed force main would connect to the 36-inch existing force main on 62<sup>nd</sup> Ave North at approximately the 7800 block. The force main would then travel east along the 62<sup>nd</sup> Ave ROW for approximately 590 feet to a large ROW area east of the intersection of 62<sup>nd</sup> Ave North and Westchester bordering Joe’s Creek. There is sufficient ROW to install the force main along 62<sup>nd</sup> Ave via open-cut. Once bordering the banks of Joe’s Creek, the force main would cross Joe’s Creek via approximately 640 feet of HDD. While the optimal length is 475 feet, based on preliminary investigation of geotechnical conditions, the length appears to be longer due to potential drilling issues as illustrated in **Figure No. 8**. Once on the east side of Joe’s Creek, the force main would travel east along the north boundary of the SCWRF for approximately 475 feet, then south for approximately 1,835 feet and turn west just south of the reclaimed water storage tanks for approximately 30 feet to the connection point before the Madeira Beach 24-inch force main connection. The installation of the force main

around the perimeter of the facility could be accomplished via open-cut. The North Alignment route is shown in **Figure No. 4**.

### **Constructability Issues**

The North Route appears to be the most constructible of the four potential routes. There appears to be appropriate space in this ROW open area and County owned parcels on the west side of Joe’s Creek to set up the drill rig and support equipment. There is sufficient space on the east side of Joe’s Creek to string the sections of butt-fused HDPE along the perimeter of the facility in preparation for the final pull. Conversely, the drill rig could be set up on the SCBWRF site minimizing impact to plant activities. There is sufficient ROW space on the west side of Joe’s Creek and along 62<sup>nd</sup> Ave to string the butt-fused length of HDPE. It should be noted that a buffer zone with a minimum width of 15 feet and an average width of 25 feet should be provided for any construction adjacent to wetlands to ensure no adverse impacts to the wetlands associated with the permitted construction. Although open-cut is recommended when possible for economic reasons, HDD could be employed to install the entire length of force main even for the proposed piping on the plant site with the exception of the tie-ins at the south end of the facility. Care must be maintained on the Joe’s Creek crossing to maintain the piping within the County’s property or ROW. Directly to the North of the SCBWRF is a club/lodge with a large property owned by the Dixie Junior Rebels, Inc. The North route will be close to their property and a higher level of care than standard may be required to keep the HDD within County owned land.

### **Existing Utilities**

The North Route will encounter a small number of existing utilities when traversing the 62<sup>nd</sup> Avenue corridor. It is anticipated, due to the large size of the ROW along 62<sup>nd</sup> Avenue, that the impact or conflict with existing utilities should be minimal. There is an existing 8-inch water main and some existing 12-inch storm sewer in close proximity to the intersection of Westchester Boulevard and 62<sup>nd</sup> Avenue. Upon crossing under Joe’s Creek, the SCBWRF has a large number of utilities. However, the chosen crossing route should have minimal utilities as it is on the northern periphery of the SCBWRF. Due to a number of parallel utility lines on the east side of the SCBWRF, it is suggested that this piping be installed on the absolute east edge of the property.

As noted previously, there is a proposed 1,050 feet long 30-inch HDD that is proposed between just north of the Westchester Boulevard and 62<sup>nd</sup> Avenue intersection south to near Westchester

Boulevard and Fareham Court North. If the North Route is selected, the 1,050 feet long HDD could be eliminated from the future Boca Ciega force main project and a shorter open-cut of roughly 150 feet could tie the 30-inch main to the 36-inch North Route of Joe’s Creek Crossing.

### **Impact on Public**

It is anticipated that the North Route would have the least impact to the public. The majority of the pipeline is proposed on the SCBWRF and the proposed HDD has the most available room. As noted in earlier sections, the North Route HDD crossing of Joe’s Creek will have to be laid out carefully to avoid impact to the neighboring property to the North of the SCBWRF. There is a school located on the north side of 62<sup>nd</sup> Ave North. Installation of the proposed force main from the end of the directional drill crossing to the existing 36” force main would need to be coordinated with school activities.

### **Permitting**

The permit complexity of the North Route appears to be the same level as the In-Place Route and the South A but slightly less than the South B Routes. It is anticipated that all routes will include HDD crossings of wetlands, crossing of Joe’s Creek, and the construction within County ROW. The following are the anticipated permits required for the project. It is anticipated that, due to the County owning the ROW, that permits for ROW use will be waived.

### **Florida Department of Environmental Protection**

Pursuant to Chapter 62-604.600, Florida Administrative code (F.A.C.), a Florida Department of Environmental Protection (FDEP) permit is required for the addition of a new force main to the existing wastewater collection and transmission system.

A completed FDEP application form 62-604.300(8)(a) Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System with the respective fees must be completed and submitted to FDEP for review and approval.

## **Federal Permits**

A 404 Federal Dredge and Fill Permit from the U.S. Army Corps of Engineers (USACE) will be required for this project. The complexity of the permitting process will depend on the degree of the impact to jurisdictional wetland areas. A Nationwide Permit 12 – Utility Line Activities will likely be required for the proposed pipeline installation if waters of the U.S. are temporarily impacted by construction. The Nationwide permit will require compliance with the General Conditions for Nationwide Permit 12, including the restoration of all impacted wetland areas to preconstruction grade, no adverse impacts to fish or wildlife, use of only clean fill (if needed), no impounding of water or draining of waters of the U.S., and the use of proper sediment and erosion controls during construction.

## **Environmental Resource Permit**

An Environmental Resource Permit (ERP) also from the Florida Department of Environmental Protection (FDEP) will be required for this project. Like the 404 Federal Dredge and Fill Permit, the complexity of the permitting process will depend on the degree of the impact to jurisdictional wetland areas. A Notice of General Permit (NGP) will likely be required for the proposed project if wetlands are to be impacted during construction. Depending on the type of pipeline installation method, the General Permit will require compliance with either Chapter 62-330.455, F.A.C., for construction of aerial pipelines across a water body, or Chapter 62-330.453, F.A.C., for the installation of utility lines via directional drilling. Chapters 62-330.455 and 62-330.453, F.A.C. reference the required conditions to follow for each method.

In addition to the ERP, a National Pollutant Discharge Elimination System (NPDES) permit will be required pursuant to 40 CFR Part 122 for point source discharges of stormwater associated with construction of the pipeline. Under FDEP’s delegated authority to administer the NPDES program, operators that have stormwater discharge associated with one acre or more of construction clearing must file for and obtain either coverage under an appropriate generic permit contained in Chapter 62-621, F.A.C. (one to five acres of construction), or an individual permit issued pursuant to Chapter 62-620, F.A.C. (greater than 5 acres of construction). A major component of the NPDES permit is the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site and discusses good engineering

practices that will be used to reduce the pollutants. The contractor is required to obtain the NPDES permit.

Chapter 253 Florida Statutes (F.S.) requires authorization from the Board of Trustees of the Internal Improvement Trust Fund (Board) for any activities in, on or over state-owned, sovereign submerged lands (state lands). A public easement will likely be required in accordance with Chapter 18-21.005, F.A.C. for installation of the pipeline across state lands. The public easement will be processed by FDEP concurrently with the ERP application. The public easement will require compliance with Chapter 18-21.004, F.A.C., including minimizing adverse impacts to state lands, not being contrary to the public interest, and the applicant having sufficient upland interest in the adjacent riparian properties.

### **Miscellaneous Permits**

A Spill Management and Prevention Plan will need to be developed and implemented during construction of all HDD crossings of wetlands and surface waters. This plan will need to be developed prior to the permitting phase of this project and submitted as part of the ERP application. The Spill Management and Prevention Plan needs to contain monitoring procedures for inadvertent loss or spills of drilling fluids, the types and storage locations of sediment and erosion control materials to be used in the event of a loss or spill of drilling fluids, and procedures for restoring the disturbed areas.

### **Permitting Schedule**

The permitting review process is expected to span approximately 60 days however, it could take as long as 180 days.

At this time there are no other Federal, State, County or City permits anticipated to be required for the project.



### **Operations and Maintenance**

The proposed North Route includes the installation of 36-inch ductile iron piping, 42-inch HDPE piping and connections to the existing 36-inch and 20-inch force mains. All piping and tie-ins are proposed to be installed below grade. The expected life of the piping for all installations is approximately 50 years.

Due to the depth of the proposed Joe’s Creek crossing, there is little maintenance that can be performed on the main. It should be noted that the North Crossing will delete 1,050 feet of HDD piping, but will net an additional 2,500<sup>+</sup> feet of piping to the project, with the majority on the SCBWRF site. Due to the proximity to the plant, the piping should be under relatively constant low pressures which should allow the piping to last longer without issues. If desired, a testing assembly can be installed as part of the project to determine if there is a subsurface leak in the force main. The testing assembly would bypass a closed valve indicating loss in terms of flow in the closed crossing section. If valves installed on each side of the Joe’s Creek crossing are closed, a small diameter bypass around the first upstream valve with a flow indicator assembly can determine if there is unintended flow within the closed section of pipe.

### **Land Acquisition**

The proposed North Route does not immediately indicate the need for acquiring land. Easements may be required through a parcel on the west side of Joe’s Creek south of 62<sup>nd</sup> Avenue, but the parcel is owned by Pinellas County. As illustrated in **Figure No. 4**, the HDD may be required to pass through Parcel ID 9. Care must be taken to line up the HDD between the 62<sup>nd</sup> Avenue ROW and the SCBWRF parcel to not install the main partially within the property to the north of the SCBWRF.

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**Construction Cost**

**Table 5-1** defines the opinion of conceptual construction cost for the North Route portion of the project.

<b>Table 5-1 North Route Conceptual Construction Cost</b>					
<b>#</b>	<b>Project</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Project Cost</b>
1.	Mobilization	LS	1	\$150,000	\$150,000
2.	General Conditions	LS	1	\$100,000	\$100,000
3.	F&I 42” HDPE Pipe by HDD	LF	640	\$750	\$480,000
4.	F&I 36” DIP Pipe by Open Cut	LF	2,930	\$400	\$1,172,000
5.	F&I Connections to existing force main	EA	3	\$50,000	\$150,000
6.	Site Demolition/Restoration	LF	3,000	\$50	\$150,000
7.	Subtotal				\$2,202,000
8.	Contingency (20%)				\$440,000
9.	Subtotal				2,642,000
10.	Credit for Deletion of Future 30” HDPE	LF	-1,050	\$500	-525,000
11.	Total				<b>\$2,117,000</b>

## **5.2 In-Place Alignment Route**

The original 20-inch force main was an aerial installation and was replaced in 1976 with a new 20-inch force main. The replacement 20-inch force main was installed via direct bury with a parallel 36-inch force main installed at the same time. Both force mains were installed with approximately 2-feet of minimum cover. The proposed In-Place replacement layout would connect to the existing force mains on the east side of Westchester as they exit the easement between residential homes (between Gibraltar and Fareham) and cross under Westchester. From the connection point, the force main would travel south approximately 130 feet to offset the HDD crossing of Joe’s Creek to the intersection with Fareham Court. This short section would be accomplished via open cut. Once in line with Fareham Court, the drill rig could be set up on Fareham Court at the end of the cul-de-sac minimizing disruption to traffic and residential access. The butt-fused section of HDPE would be strung along in the facility in preparation for the pull. The force main would then cross Joe’s Creek via approximately 640 feet of HDD to the connection point within the facility. To connect the HDD to the existing force mains, a direct

bury installation of the 36-inch force main would need to be installed from the end of the Fareham cul-de-sac to the east side of Westchester. **Figure No. 5** depicts the proposed In-Place alignment route.

### **Constructability Issues**

The In-Place appears difficult to construct from a maintenance of traffic (MOT) and surrounding owner’s perspective. Due to the location of the sub-aqueous crossing and lack of available location for the rig to be placed, the drill will be required within the Fareham roadway. The ideal location for setup of the drill rig is the west end of the Fareham cul-de-sac, which necessitates a drill of roughly 640 feet to achieve a depth within a desirable material, maintainig ideal entry/exit angles, and maintaining reasonable drilling rig bending radii. **Figure No. 8** illustrates a cross section of the drill from the Fareham Court location to the SCBWRF. There appears to be sufficient space on the east side of Joe’s Creek to string the sections of butt-fused HDPE along the perimeter of the facility in preparation for the final pull. After the HDD is complete, a section of 36-inch force main will have to be constructed via open cut in the Fareham ROW which may be beneath the pavement. This route will likely require repaving of the entirety of Fareham Court. Further survey and subsurface investigation will be needed to determine if the 36-inch force main can be moved out of the center of Fareham Court.

### **Existing Utilities**

The In-Place Route will encounter a small number of existing utilities when traversing Fareham and crossing under Westchester. It is anticipated, due to the depth of the proposed HDD, that the impact or conflict with existing utilities should be minimal. There is an existing sanitary sewer that is centered along Fareham that will have to be considered and there is an existing 4-inch water main along the North ROW of Fareham. Upon crossing under Joe’s Creek, the SCBWRF has a large number of utilities. However, the chosen crossing route should have minimal utilities as it is on the western periphery of the SCBWRF. The tie-in to the existing 36-inch force main on the SCBWRF should be the first utility encountered upon entering the facility site.

### **Impact on Public**

It is anticipated that the In-Place route would have the largest impact to the public of the four routes considered, but it will be limited to the residents of Fareham Court. The majority of the pipeline is proposed either within Fareham crossing under Westchester or within the SCBWRF. There will be significant MOT requirements to allow access for residents during the HDD operation and open cut operation of Fareham. It is anticipated that the HDD operation will take less than three weeks, but the residents of Fareham must be made aware of the operation and the final layout and location of the drilling should be coordinated with them.

### **Permitting**

The permit complexity of the In-Place Route appears to be the same level as the North Route and the South A but slightly less than the South B Route. It is anticipated that all routes will include HDD crossings of wetlands, crossing of Joe’s Creek, and the construction within County ROW. The following are the anticipated permits required for the project. It is anticipated that, due to the County owning the ROW, that permits for ROW use will be waived.

### **Florida Department of Environmental Protection**

Pursuant to Chapter 62-604.600, Florida Administrative code (F.A.C.), a Florida Department of Environmental Protection (FDEP) permit is required for the addition of a new force main to the existing wastewater collection and transmission system.

A completed FDEP application form 62-604.300(8)(a) Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System with the respective fees must be completed and submitted to FDEP for review and approval.

### **Federal Permits**

A 404 Federal Dredge and Fill Permit from the U.S. Army Corps of Engineers (USACE) will be required for this project. The complexity of the permitting process will depend on the degree of the impact to jurisdictional wetland areas. A Nationwide Permit 12 – Utility Line Activities will likely be required for the proposed pipeline installation if waters of the U.S. are temporarily impacted by construction. The Nationwide permit will require compliance with the General

Conditions for Nationwide Permit 12, including the restoration of all impacted wetland areas to preconstruction grade, no adverse impacts to fish or wildlife, use of only clean fill (if needed), no impounding of water or draining of waters of the U.S., and the use of proper sediment and erosion controls during construction.

### **Environmental Resource Permit**

An Environmental Resource Permit (ERP) also from the Florida Department of Environmental Protection (FDEP) will be required for this project. Like the 404 Federal Dredge and Fill Permit, the complexity of the permitting process will depend on the degree of the impact to jurisdictional wetland areas. A Notice of General Permit (NGP) will likely be required for the proposed project if wetlands are to be impacted during construction. Depending on the type of pipeline installation method, the General Permit will require compliance with either Chapter 62-330.455, F.A.C., for construction of aerial pipelines across a water body, or Chapter 62-330.453, F.A.C., for the installation of utility lines via directional drilling. Chapters 62-330.455 and 62-330.453, F.A.C. reference the required conditions to follow for each method.

In addition to the ERP, a National Pollutant Discharge Elimination System (NPDES) permit will be required pursuant to 40 CFR Part 122 for point source discharges of stormwater associated with construction of the pipeline. Under FDEP’s delegated authority to administer the NPDES program, operators that have stormwater discharge associated with one acre or more of construction clearing must file for and obtain either coverage under an appropriate generic permit contained in Chapter 62-621, F.A.C. (one to five acres of construction), or an individual permit issued pursuant to Chapter 62-620, F.A.C. (greater than 5 acres of construction). A major component of the NPDES permit is the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site and discusses good engineering practices that will be used to reduce the pollutants. The contractor is required to obtain the NPDES permit.

Chapter 253 Florida Statutes (F.S.) requires authorization from the Board of Trustees of the Internal Improvement Trust Fund (Board) for any activities in, on or over state-owned, sovereign submerged lands (state lands). A public easement will likely be required in accordance with Chapter 18-21.005, F.A.C. for installation of the pipeline across state lands. The public

easement will be processed by FDEP concurrently with the ERP application. The public easement will require compliance with Chapter 18-21.004, F.A.C., including minimizing adverse impacts to state lands, not being contrary to the public interest, and the applicant having sufficient upland interest in the adjacent riparian properties.

### **Miscellaneous Permits**

A Spill Management and Prevention Plan will need to be developed and implemented during construction of all HDD crossings of wetlands and surface waters. This plan will need to be developed prior to the permitting phase of this project and submitted as part of the ERP application. The Spill Management and Prevention Plan needs to contain monitoring procedures for inadvertent loss or spills of drilling fluids, the types and storage locations of sediment and erosion control materials to be used in the event of a loss or spill of drilling fluids, and procedures for restoring the disturbed areas.

### **Permitting Schedule**

The permitting review process is expected to span approximately 60 days however, it could take as long as 180 days.

At this time there are no other Federal, State, County or City permits anticipated to be required for the project.

### **Operations and Maintenance**

The proposed In-Place Route includes the installation of 36-inch ductile iron piping in the Fareham ROW, extending north in the Westchester ROW. The main will connect to the existing 36-inch and 20-inch force mains between Fareham and SCBWRF on the east end of the piping and the proposed 42-inch HDPE HDD piping on the west end of Fareham. All piping and tie-ins are proposed to be installed below grade. The expected life of the piping for all installations is approximately 50 years.

Due to the depth of the proposed Joe’s Creek crossing, there is little maintenance that can be performed on the main. Due to the proximity to the plant, the piping should be under relatively constant low pressures which should allow the piping to last longer without issues. If desired, a



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testing assembly can be installed as part of the project to determine if there is a subsurface leak in the force main. The testing assembly would bypass a closed valve indicating loss in terms of flow in the closed crossing section. If valves installed on each side of the Joe’s Creek crossing are closed, a small diameter bypass around the first upstream valve with a flow indicator assembly can determine if there is unintended flow within the closed section of pipe.

### **Land Acquisition**

The proposed In-Place does not immediately indicate the need for acquiring land. The proposed route is within existing Pinellas County ROW and the SCBWRF site. As illustrated in **Figure No. 5**, the HDD route should not pose any issues and should not require any land acquisition.

### **Construction Cost**

**Table 5-2** defines the opinion of conceptual construction cost for the In-Place Route project alternative.

<b>Table 5-2 In-Place Route Conceptual Construction Costs</b>					
<b>#</b>	<b>Project</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Project Cost</b>
1.	Mobilization	LS	1	\$100,000	\$100,000
2.	General Conditions	LS	1	\$60,000	\$60,000
3.	F&I 42” HDPE Pipe by HDD	LF	640	\$750	\$480,000
4.	F&I 36” DIP Pipe by Open Cut	LF	450	\$400	\$180,000
5.	F&I Connections to existing force main	EA	3	\$50,000	\$150,000
6.	F&I Maintenance of Traffic	LS	1	\$15,000	\$15,000
7.	Mill and Resurface Fareham	LF	330	\$36	\$12,000
8.	Site Demolition/Restoration	LF	400	\$50	\$20,000
9.	Subtotal				\$1,017,000
10.	Contingency (20%)				\$203,000
	<b>Total</b>				<b>\$1,220,000</b>

### **5.3 South A Alignment Route**

The South A proposed alignment route would connect to the existing 36-inch force main on the east side of Westchester and travel south within the ROW along Westchester for approximately 575 to 600 feet to an open ROW area on the west bank of Joe’s Creek. This location is approximate and could be adjusted north or south along the west bank of Joe’s Creek. Drawings

reviewed show a proposed 10-inch Reclaimed Water Main on this side of the street which may have been constructed. This section could be installed via open-cut but will likely require significant amounts of dewatering due to the ground elevation (5 – 6 feet NGVD29).

From the ROW area on the west bank of Joe’s Creek, the force main would cross Joe’s Creek via approximately 650 feet of HDD to the facility. The drill rig could be set up within the facility property since there is sufficient available ROW space to string the butt-fused HDPE force main along Westchester. Once on the facility, the force main would travel approximately 200 to 260 feet along the south end of the SCBWRF to the connection point before the manifold with the Madeira Beach 24-inch force main. The last section of the force main within the facility could be installed via open-cut. **Figure No. 6** illustrates the proposed South A Route alignment.

### **Constructability Issues**

The South A Route appears difficult to construct from a dewatering and location perspective. To allow for the potential for the HDD, a connection must be made to the existing 36-inch force main and the proposed Joe’s Creek crossing must be extended to the south. The HDD receiving pit would be in close proximity to Westchester which may require some MOT. Existing utilities and structures must be considered, including the existing reclaimed water pump station onsite at the SCBWRF.

### **Existing Utilities**

The South A route will encounter limited utilities when traversing the east ROW of Westchester. As noted, there is a proposed, or potentially existing 10-inch reclaimed water main along the east side of Westchester. It is anticipated, due to the depth of the proposed HDD, that the impact or conflict with existing utilities should be minimal. Upon crossing under Joe’s Creek, the SCBWRF has a large number of utilities. However, the chosen crossing route should have minimal utilities as it is on the western periphery of the SCBWRF. There are existing utilities along the south boundary which must be considered including the existing 36-inch force main that this proposed 36-inch force main will tie into. Note that the South A route is proposed to be drilled from the SCBWRF and offers the benefit of limiting potential damage to the utilities onsite at the SCBWRF during the drilling process.

### **Impact on Public**

It is anticipated that the South A Route would have minimal impact to the public pending MOT requirements along Westchester. The majority of the pipeline is proposed within the Westchester ROW and inside the SCBWRF.

### **Permitting**

The permit complexity of the South A Route appears to be the same level as the North Route and the In-Place Route but slightly less than the South B Route. It is anticipated that all routes will include HDD crossings of wetlands, crossing of Joe’s Creek, and the construction within County ROW. The following are the anticipated permits required for the project. It is anticipated that, due to the County owning the ROW, that permits for ROW use will be waived.

### **Florida Department of Environmental Protection**

Pursuant to Chapter 62-604.600, Florida Administrative code (F.A.C.), a Florida Department of Environmental Protection (FDEP) permit is required for the addition of a new force main to the existing wastewater collection and transmission system.

A completed FDEP application form 62-604.300(8)(a) Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System with the respective fees must be completed and submitted to FDEP for review and approval.

### **Federal Permits**

A 404 Federal Dredge and Fill Permit from the U.S. Army Corps of Engineers (USACE) will be required for this project. The complexity of the permitting process will depend on the degree of the impact to jurisdictional wetland areas. A Nationwide Permit 12 – Utility Line Activities will likely be required for the proposed pipeline installation if waters of the U.S. are temporarily impacted by construction. The Nationwide permit will require compliance with the General Conditions for Nationwide Permit 12, including the restoration of all impacted wetland areas to preconstruction grade, no adverse impacts to fish or wildlife, use of only clean fill (if needed), no impounding of water or draining of waters of the U.S., and the use of proper sediment and erosion controls during construction.

### **Environmental Resource Permit**

An Environmental Resource Permit (ERP) also from the Florida Department of Environmental Protection (FDEP) will be required for this project. Like the 404 Federal Dredge and Fill Permit, the complexity of the permitting process will depend on the degree of the impact to jurisdictional wetland areas. A Notice of General Permit (NGP) will likely be required for the proposed project if wetlands are to be impacted during construction. Depending on the type of pipeline installation method, the General Permit will require compliance with either Chapter 62-330.455, F.A.C., for construction of aerial pipelines across a water body, or Chapter 62-330.453, F.A.C., for the installation of utility lines via directional drilling. Chapters 62-330.455 and 62-330.453, F.A.C. reference the required conditions to follow for each method.

In addition to the ERP, a National Pollutant Discharge Elimination System (NPDES) permit will be required pursuant to 40 CFR Part 122 for point source discharges of stormwater associated with construction of the pipeline. Under FDEP’s delegated authority to administer the NPDES program, operators that have stormwater discharge associated with one acre or more of construction clearing must file for and obtain either coverage under an appropriate generic permit contained in Chapter 62-621, F.A.C. (one to five acres of construction), or an individual permit issued pursuant to Chapter 62-620, F.A.C. (greater than 5 acres of construction). A major component of the NPDES permit is the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site and discusses good engineering practices that will be used to reduce the pollutants. The contractor is required to obtain the NPDES permit.

Chapter 253 Florida Statutes (F.S.) requires authorization from the Board of Trustees of the Internal Improvement Trust Fund (Board) for any activities in, on or over state-owned, sovereign submerged lands (state lands). A public easement will likely be required in accordance with Chapter 18-21.005, F.A.C. for installation of the pipeline across state lands. The public easement will be processed by FDEP concurrently with the ERP application. The public easement will require compliance with Chapter 18-21.004, F.A.C., including minimizing adverse impacts to state lands, not being contrary to the public interest, and the applicant having sufficient upland interest in the adjacent riparian properties.



### **Miscellaneous Permits**

A Spill Management and Prevention Plan will need to be developed and implemented during construction of all HDD crossings of wetlands and surface waters. This plan will need to be developed prior to the permitting phase of this project and submitted as part of the ERP application. The Spill Management and Prevention Plan needs to contain monitoring procedures for inadvertent loss or spills of drilling fluids, the types and storage locations of sediment and erosion control materials to be used in the event of a loss or spill of drilling fluids, and procedures for restoring the disturbed areas.

### **Permitting Schedule**

The permitting review process is expected to span approximately 60 days however, it could take as long as 180 days.

At this time there are no other Federal, State, County or City permits anticipated to be required for the project.

### **Operations and Maintenance**

The proposed South A Route includes the installation of 36-inch ductile iron piping in the Westchester ROW connecting to the existing 36-inch and 20-inch force mains, extending from the existing Joe’s Creek subaqueous crossing south for roughly 600 feet. The main will then extend via HDD under Joe’s Creek with the proposed 42-inch HDPE HDD to the western edge of the SCBWRF. The 36-inch DIP piping will then extend to the east along the south border of the SCBWRF and connect to the existing 36-inch force main where it combines with the 24-inch Madeira Beach force main. All piping and tie-ins are proposed to be installed below grade. The expected life of the piping for all installations is approximately 50 years.

Due to the depth of the proposed Joe’s Creek crossing, there is little maintenance that can be performed on the main. Due to the proximity to the plant, the piping should be under relatively constant low pressures which should allow the piping to last longer without issues. If desired, a testing assembly can be installed as part of the project to determine if there is a subsurface leak in the force main. The testing assembly would bypass a closed valve indicating loss in terms of flow in the closed crossing section. If valves installed on each side of the Joe’s Creek crossing

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are closed, a small diameter bypass around the first upstream valve with a flow indicator assembly can determine if there is unintended flow within the closed section of pipe.

The location of the main in the South A Route would be similar in maintenance to the North Route but slightly shorter. The open cut section would be installed partially within the water table making access more difficult.

### **Land Acquisition**

The proposed South A Route does not indicate the need for acquiring land. The proposed route is within existing Pinellas County ROW and the SCBWRF site. As illustrated in **Figure No. 7**, the HDD route should not require any land acquisition.

### **Construction Cost**

**Table 5-3** defines the opinion of conceptual construction cost for the In-Place Route project alternative.

<b>Table 5-3 South A Route Conceptual Construction Costs</b>					
<b>#</b>	<b>Project</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Project Cost</b>
1.	Mobilization	LS	1	\$100,000	\$100,000
2.	General Conditions	LS	1	\$60,000	\$60,000
3.	F&I 42" HDPE Pipe by HDD	LF	650	\$750	\$487,500
4.	F&I 36" DIP Pipe by Open Cut	LF	835	\$400	\$334,000
5.	F&I Connections to existing force main	EA	3	\$50,000	\$150,000
6.	F&I Maintenance of Traffic	LS	1	\$5,000	\$5,000
7.	Dewatering for Main Installation	LF	300	\$100	\$30,000
8.	Site Demolition/Restoration	LF	850	\$50	\$43,000
9.	Subtotal				\$1,209,500
10.	Contingency (20%)				\$242,000
	<b>Total</b>				<b>\$1,451,500</b>

## **5.4 South B Alignment Route**

The South B proposed alignment, similar to the south A alignment, would connect to the existing force mains in the ROW along the east side of Westchester, given the location of the water

service on the west side. The force main would then travel along Westchester for approximately 500 feet, roughly to the intersection of Dover Ct. North. Once at the intersection of Westchester and Dover, the main would be installed by HDD for approximately 1,000 feet to 54<sup>th</sup> Avenue North. The force main would then travel east approximately 500 feet to the entrance to the facility on 74<sup>th</sup> Street North including an approximate length of 200 feet crossing Joe’s Creek via aerial crossing with a bridge extension. There appears to be sufficient available space along the banks of Joe’s Creek at the crossing with 54<sup>th</sup> Ave but the bridge piers will need to be extended to accommodate the proposed aerial crossing. Once at the entrance to the facility, the force main would travel for approximately 735 feet north and then 30 feet west to the connection point. **Figure No. 7** illustrates the proposed South B alignment.

Given the number of utilities and storm water structures along Westchester and 54<sup>th</sup> Ave, the South B force main route is proposed using a combination of open cut and HDD along the Westchester and Joe’s Creek ROW. The 42-inch HDD from Dover Court to 54<sup>th</sup> Avenue is proposed to be installed under and terminate in a parcel owned by Pinellas County, Parcel 7 of **Figure No. 7**. Appropriate locations would have to be selected for entry and exit HDD pits taking into consideration existing obstructions, utilities and minimizing impact to the traffic patterns and residential access. There is a Verizon terminal building along 54<sup>th</sup> Ave with numerous conduits arriving from the north and south directions. As such, routing preference was given to employing HDD technology for the installation of the force main along the Joe’s Creek Canal ROW as defined in the route. Appropriate as-built information would have to be obtained from all utilities to estimate the best installation method for the force main along 54<sup>th</sup> Ave.

### **Constructability Issues**

The South B appears the most difficult to construct of the four routes considered. Maintenance of Traffic (MOT), utility conflicts, and the physical construction of the Joe’s Creek crossing appear to be very difficult for the South B Route considered. Most notably, the crossing will include the addition of piles and extension of piers to allow the main to traverse the crossing aerially.

The construction along Joe’s Creek will be close to the creek and will be performed through less than ideal soil conditions. The ideal location for setup of the drill rig is next to Westchester Boulevard within the ROW, extending the main to the south under marshy wet land. **Figure No. 7** illustrates the route. While there appears to be adequate space for the main installation along 54<sup>th</sup> Street, there are significant numbers of utilities including the existing Verizon building. The

Westchester Blvd ROW was not pursued due to the proximity to houses, traffic and utilities impacts and the conflicts with Verizon duct banks that are likely located in the ROW.

### **Existing Utilities**

The South B Route will encounter a large number of existing utilities when traversing 54<sup>th</sup> Avenue North. The Westchester and Joe’s Creek ROW sections are not anticipated to have significant conflict. Due to the depth of the proposed HDD, the impact along the Joe’s Creek ROW or conflict with existing utilities should be minimal. The conflict along Westchester should be similar to that encountered when considering the South A Route.

There is a Verizon main terminal building along the route located at 7575 54<sup>th</sup> Ave North. URS contacted Verizon regarding as-built drawings for the facility. Verizon indicated that there numerous large conduits arriving from the North and South at this building and that it would be an extremely congested installation. Verizon did not provide drawings but requested any future plans to install a force main in order to provide red-lines of existing cable conduits.

Upon entering the SCBWRF from the South, the facility has a large number of utilities. It appears that it may parallel the existing 24-inch Madeira Beach force main that enters the facility from the South.

### **Impact on Public**

It is anticipated that the South B route would have some impact to the public. The majority of the pipeline is proposed within the Westchester and Joe’s Creek ROW. As noted previously, the HDD along Westchester is proposed to land or traverse through Parcel 7 of **Figure No. 7**.

It is anticipated that the largest impact to the public may be during the modification to the existing 54<sup>th</sup> Avenue bridge. If the aerial crossing were to proceed along the existing bridge, and the piers were to be extended out to the North, it is anticipated that the bridge would have to be partially shut down during the construction.



## **Permitting**

The permit complexity of the South B Route appears to be much more difficult than the three other routes, mainly due to the additional piling added in Joe’s Creek for the aerial crossing. It is anticipated that all routes will include HDD crossings of wetlands, crossing of Joe’s Creek, and the construction within County ROW. The following are the anticipated permits required for the project. It is anticipated that, due to the County owning the ROW, that permits for ROW use will be waived. However, it is anticipated that extra scrutiny will be given to the proposed piers added within the Joe’s Creek Canal.

### **Florida Department of Environmental Protection**

Pursuant to Chapter 62-604.600, Florida Administrative code (F.A.C.), a Florida Department of Environmental Protection (FDEP) permit is required for the addition of a new force main to the existing wastewater collection and transmission system.

A completed FDEP application form 62-604.300(8)(a) Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System with the respective fees must be completed and submitted to FDEP for review and approval.

### **Federal Permits**

A 404 Federal Dredge and Fill Permit from the U.S. Army Corps of Engineers (USACE) will be required for this project. The complexity of the permitting process will depend on the degree of the impact to jurisdictional wetland areas. A Nationwide Permit 12 – Utility Line Activities will likely be required for the proposed pipeline installation if waters of the U.S. are temporarily impacted by construction. The Nationwide permit will require compliance with the General Conditions for Nationwide Permit 12, including the restoration of all impacted wetland areas to preconstruction grade, no adverse impacts to fish or wildlife, use of only clean fill (if needed), no impounding of water or draining of waters of the U.S., and the use of proper sediment and erosion controls during construction.

### **Environmental Resource Permit**

An Environmental Resource Permit (ERP) also from the Florida Department of Environmental Protection (FDEP) will be required for this project. Like the 404 Federal Dredge and Fill Permit, the complexity of the permitting process will depend on the degree of the impact to jurisdictional wetland areas. A Notice of General Permit (NGP) will likely be required for the proposed project if wetlands are to be impacted during construction. Depending on the type of pipeline installation method, the General Permit will require compliance with either Chapter 62-330.455, F.A.C., for construction of aerial pipelines across a water body, or Chapter 62-330.453, F.A.C., for the installation of utility lines via directional drilling. Chapters 62-330.455 and 62-330.453, F.A.C. reference the required conditions to follow for each method.

In addition to the ERP, a National Pollutant Discharge Elimination System (NPDES) permit will be required pursuant to 40 CFR Part 122 for point source discharges of stormwater associated with construction of the pipeline. Under FDEP’s delegated authority to administer the NPDES program, operators that have stormwater discharge associated with one acre or more of construction clearing must file for and obtain either coverage under an appropriate generic permit contained in Chapter 62-621, F.A.C. (one to five acres of construction), or an individual permit issued pursuant to Chapter 62-620, F.A.C. (greater than 5 acres of construction). A major component of the NPDES permit is the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site and discusses good engineering practices that will be used to reduce the pollutants. The contractor is required to obtain the NPDES permit.

Chapter 253 Florida Statutes (F.S.) requires authorization from the Board of Trustees of the Internal Improvement Trust Fund (Board) for any activities in, on or over state-owned, sovereign submerged lands (state lands). A public easement will likely be required in accordance with Chapter 18-21.005, F.A.C. for installation of the pipeline across state lands. The public easement will be processed by FDEP concurrently with the ERP application. The public easement will require compliance with Chapter 18-21.004, F.A.C., including minimizing adverse impacts to state lands, not being contrary to the public interest, and the applicant having sufficient upland interest in the adjacent riparian properties.

### **Miscellaneous Permits**

A Spill Management and Prevention Plan will need to be developed and implemented during construction of all HDD crossings of wetlands and surface waters. This plan will need to be developed prior to the permitting phase of this project and submitted as part of the ERP application. The Spill Management and Prevention Plan needs to contain monitoring procedures for inadvertent loss or spills of drilling fluids, the types and storage locations of sediment and erosion control materials to be used in the event of a loss or spill of drilling fluids, and procedures for restoring the disturbed areas.

### **Permitting Schedule**

The permitting review process is expected to span approximately 60 days however, it could take as long as 180 days.

At this time there are no other Federal, State, County or City permits anticipated to be required for the project.

### **Operations and Maintenance**

The proposed South B Route includes the installation of 36-inch ductile iron piping connecting to the existing 36-inch and 20-inch force mains in the Joe’s Creek, Westchester, and 54<sup>th</sup> Avenue North ROW, extending north in the 74<sup>th</sup> Street ROW entering the SCBWRF. The main will connect to the existing 36-inch force main between Fareham and Gibraltar but will have a proposed 42-inch HDPE HDD piping in the west ROW of Joe’s Creek and within Parcel 7 on **Figure No. 7**. All piping and tie-ins are proposed to be installed below grade. The expected life of the piping for all installations is approximately 50 years.

The crossing of Joe’s Creek is proposed to be installed by aerial crossing at this location, which should greatly enhance the ability to maintain the aqueous crossing. This aerial crossing would also lend itself to visually spotting potential piping issues.

The only added difficulty for Operations and Maintenance is the necessity to add an air release valve on the east side of the Joe’s Creek crossing. The blow-off piping will need to connect to an existing sanitary sewer on the eastern side of Joe’s Creek to prevent unintentionally spilling sewage into the creek.



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**Land Acquisition**

The proposed South B does not immediately indicate the need for acquiring land. However, it does appear the main would be installed beneath Parcel 7 as indicated on **Figure No. 7**. The remainder of the proposed route is within existing Pinellas County ROW and the SCBWRF site. As illustrated in **Figure No. 7**, the HDD route should not pose any issues and should not require any land acquisition. The aerial crossing should be within the ROW and should not require any land acquisition.

**Construction Cost**

**Table 5-4** defines the opinion of conceptual construction cost for the South B Route project alternative.

<b>Table 5-4 South B Route Conceptual Construction Costs</b>					
<b>#</b>	<b>Project</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Project Cost</b>
1.	Mobilization	LS	1	\$150,000	\$150,000
2.	General Conditions	LS	1	\$100,000	\$100,000
3.	F&I 42" HDPE Pipe by HDD	LF	1,000	\$750	\$750,000
4.	F&I 36" DIP Pipe by Open Cut	LF	1,530	\$400	\$612,000
5.	F&I Connections to existing force main	EA	3	\$50,000	\$150,000
6.	Dewatering for Main Installation	LF	500	\$100	\$50,000
7.	F&I 36" DIP Pipe by Aerial Installation	LF	200	\$350	\$23,000
8.	Bridge Extension	LF	200	\$2,500	\$500,000
9.	F&I Maintenance of Traffic (Bridge Closing)	LS	1	\$75,000	\$75,000
10.	Site Demolition/Restoration	LF	1,700	\$50	\$85,000
11.	Subtotal				\$2,542,000
12.	Contingency (20%)				\$508,000
	<b>Total</b>				<b>\$3,050,000</b>

## **6.0 MATRIX ANALYSIS AND RECOMMENDED ALIGNMENT**

### **6.1 Matrix Analysis and Recommendation**

To compare the four routes on more than just the opinion of cost, a matrix scoring system is proposed be utilized to analyze the routes. The comparison items parallel those described in Section 5 of the report and include:

1. Constructability (1 = easy, 10 = hard)
2. Existing Utilities (1 = few, 10 = many)
3. Impact to Public (1 = none, 10 = large)
4. Permitting (1 = least issues, 10 = most issues)
5. Operations and Maintenance (1 = easiest O&M, 10 = most difficult O&M)
6. Land Acquisition (1 = none, 10 = most potential acquisition)
7. Construction Cost (1 = cheapest, 10 = most expensive)

Each category is provided a differing weight based on the perceived importance to Pinellas County. A higher number provides more importance to the County. The following is a draft of the proposed weights for the seven categories listed:

1. Constructability = 10
2. Existing Utilities = 5
3. Impact to Public = 20
4. Permitting = 10
5. Operations and Maintenance = 15
6. Land Acquisition = 10
7. Construction Cost = 30

It is proposed that all “relative” categories be scored on a 1, 5, and 10 basis. If the subject route has a category is relatively simpler complexity than another, it should be provided a 1. If the complexity is of medium relative complexity, the score should be a 5. If the complexity is notably more difficult than average, the score of the category should be a 10. For construction cost, it is proposed that the lowest cost be given a score of 1 and the highest a score of 10. The costs are linearly scored between 1 and 10 based on their proximity to the lowest or highest cost.

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It is proposed that the lowest score is the recommended route on a comparison of the various criteria. The maximum score, based on this scale, is 1000 and the minimum score is 100. The following **Table 6-1** is a matrix comparison of the four proposed Joe’s Creek crossing routes.

<b>Table 6-1 Matrix Comparison of Routes</b>					
		<b>North Route</b>	<b>In-Place Route</b>	<b>South A Route</b>	<b>South B Route</b>
1.	Constructability (10)	1	5	5	5
2.	Existing Utilities (5)	1	1	5	10
3.	Impact to Public (20)	5	10	5	10
4.	Permitting (10)	5	5	5	10
5.	Operations and Maintenance (15)	5	5	5	1
6.	Land Acquisition (10)	5	1	1	5
7.	Construction Cost (30)	5.5	1	1.1	10
<b>Total (Weighted)</b>		<b>455</b>	<b>420</b>	<b>343</b>	<b>765</b>

Based on the aforementioned, the preferred recommended alignment is the South A alignment route. While the In-Place alignment offers the most cost efficient replacement for the Joe’s Creek force main crossing, it has the greatest impact to the public and requires that the entire Fareham Court be milled and resurfaced. If the cost of the In-Place route were still much less than the South A route, that would be the selected route. However, in relative terms of the routes compared the cost was not notably higher.

Another advantage of the South A route alignment is that it replaces the force main to the point south of the reclaimed water storage tanks before the manifold with the 24-inch Madeira Beach force main replacing an additional section of force main on the facility yard. It should be noted that the existing force main may be utilized for other uses as there appears to be a surge tank and pump station in close proximity to the existing 20-inch and 36-inch force mains as they enter the SCBWRF. The final design of the force main will incorporate other uses or the elimination of the existing, onsite, 36-inch force main.

The South A alignment is the second most cost efficient replacement of the Joe’s Creek crossing and replaces the existing crossing from the point of the future connection to the proposed 30-inch Boca Ciega force main termination and the in-plant section of the existing force main to the point where it manifolds with the 24-inch Madeira Beach force main. However it should be noted that the South A alternative does not replace any portion of the proposed Boca Ciega force main.



The North alignment route is third in cost with the longest alignment. The North route eliminates approximately 1,050 feet from the proposed future Boca Ciega force main and offers ample ROW space for the construction of the force main along 62<sup>nd</sup> Ave and at the point of crossing Joe’s Creek for staging equipment and construction activities. The North alignment also replaces the in-plant portion of the existing force main to the point before the manifold with the 24-inch Madeira Beach force main. As noted above, the onsite 36-inch force main may be utilized by the existing surge tank and pump station. With the weighting, the total cost of the North route was still too high to recommend even with the potential benefits of the route.

The South B alternative offers the least advantages of all the evaluated alternatives also not replacing any portion of the proposed Boca Ciega force main. The South B alternative also has the most congested route and appears to be the most expensive option.

## **6.2 Easement Acquisitions**

The proposed South A alignment as anticipated should not require any permanent or temporary construction easements on private properties. It appears that adequate room is available for construction. The complete alignment and construction staging could be placed within the ROW and the SCBWRF. Based on the proposed alignments for evaluation, it is anticipated that no easements would be required on private properties for any of the proposed alignments. The North alignment route briefly crosses property ID 9 and the South B alignment route crosses under property ID 7 which are listed as owned by Pinellas County. **Figures No. 5, 6, and 7** illustrate the placement of the evaluated alignments for the new force main. **Table 6-2** lists the properties and owners, respectively, adjacent to the alignments by a unique map ID as listed in the respective figures.

**Table 6-2 Adjacent Parcels Alternative Alignment Routes**

<b>Map ID</b>	<b>Parcel Number</b>	<b>Owner Name</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
1	313016000003200200	PINELLAS COUNTY	315 COURT ST	CLEARWATER	FL	33756
2	313016000003300100	PINELLAS COUNTY	509 EAST AVE S	CLEARWATER	FL	33756
3	313016962670000010	BARIL, DONALD C TRUST	5611 WESTCHESTER BLVD N	ST PETERSBURG	FL	33709

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**Table 6-2 Adjacent Parcels Alternative Alignment Routes**

<b>Map ID</b>	<b>Parcel Number</b>	<b>Owner Name</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
4	313016962670000910	CRANE, DAVID	7651 DOVER CT N	ST PETERSBURG	FL	33709
5	313016962680000920	KELLER, THOMAS E	7650 EATON CT N	ST PETERSBURG	FL	33709
6	313016962680001040	FLETCHER, PHILIP A	7655 EATON CT N	ST PETERSBURG	FL	33709
7	313016000003300500	PINELLAS COUNTY	315 COURT ST	CLEARWATER	FL	33756
8	313016000002300100	NORTHSIDE BAPTIST CHURCH INC	6000 38TH AVE N	ST PETERSBURG	FL	33710
9	313016000003200100	PINELLAS COUNTY	315 COURT ST	CLEARWATER	FL	33756
10	313016962680001630	KAY, GREGG	3068 E 1879TH RD	OTTAWA	IL	61350
11	313016962680001640	WHITE, TIMOTHY M	7692 62ND AVE N	ST PETERSBURG	FL	33709
12	313016962680001650	SWANSON, HELEN J	7724 62ND AVE N	ST PETERSBURG	FL	33709
13	313016962680001660	HUEPENBECKER, DALE	7746 62ND AVE N	ST PETERSBURG	FL	33709
14	313016962680001670	MC CONAUGHEY, ANNE C	2501 CHEROKEE CIR	LAS CRUCES	NM	88011
15	313016962680001680	VINCENT, IVY MARIA	7780 62ND AVE N	ST PETERSBURG	FL	33709
16	313016962680001050	DAVIS, DARRREN G	5800 WESTCHESTER BLVD N	ST PETERSBURG	FL	33709
17	313016962680001150	CIECIEZNSKI, ROBERT L	7659 FAREHAM CT N	ST PETERSBURG	FL	33709
18	313016000002200100	PINELLAS COUNTY	315 COURT ST	CLEARWATER	FL	33756
19	313016000002300300	DIXIE JUNIOR REBELS INC	PO BOX 2715	PINELLAS PARK	FL	33780
20	313016102250000101	CARR, MARK J	5564 73RD ST N	ST PETERSBURG	FL	33709
21	313016102250000102	MESSENGER, WILLIAM E	5586 73RD ST N	ST PETERSBURG	FL	33709
22	313016102250000103	SECOR, KAREN B	5608 73RD ST N	ST PETERSBURG	FL	33709
23	313016102250000104	HELLSTERN, STEVEN F	5630 73RD ST N	ST PETERSBURG	FL	33709

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<b>Map ID</b>	<b>Parcel Number</b>	<b>Owner Name</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
24	313016102250000105	DARLINGTON, KEITH F	5652 73RD ST N	ST PETERSBURG	FL	33709
25	313016102250000106	BLOSS, RICHARD K	5674 73RD ST N	ST PETERSBURG	FL	33709
26	313016102250000107	KOCHER, MARY I	5696 73RD ST N	ST PETERSBURG	FL	33709
27	313016102250000108	PARRIS, CYNTHIA L	5728 73RD ST N	ST PETERSBURG	FL	33709
28	313016102250000109	GOZZARD, RANDY L	5760 73RD ST N	ST PETERSBURG	FL	33709
29	313016102250000110	SMITH, AMY	5792 73RD ST N	ST PETERSBURG	FL	33709
30	313016102260000590	FARRELL, BARBARA L	7319 55TH AVE N	ST PETERSBURG	FL	33709
31	313016102210040010	FARRELL, MARY P	6130 73RD ST N	ST PETERSBURG	FL	33709
32	313016102210040020	MAYO, ROBERT A	6118 73RD ST N	ST PETERSBURG	FL	33709
33	313016102210040030	SWILLER, MICHAEL	5480 58TH ST N	KENNETH CITY	FL	33709
34	313016102210040040	FORRESTER, JOHN DAMION	2531 W DAVID DR	GULFPORT	MS	39503
35	313016102210040050	SEBASTIAN, ELMER JR	3032 COLUMBUS AVE # 5	SPRINGFIELD	OH	45503
36	313016102220040060	LIGHTFIELD, ROLLIN D	7235 18TH ST NE	ST PETERSBURG	FL	33702
37	313016102220040070	RATCLIFFE, MARTIN A	6058 73RD ST N	ST PETERSBURG	FL	33709
38	313016102220040080	ANDERSON, EDWARD P TRUST	536 JOHNS PASS AVE	MADEIRA BEACH	FL	33708
39	313016102220040090	HANLEY, RICHARD E	6034 73RD ST N	ST PETERSBURG	FL	33709
40	313016102220040100	KLINGER, DON L	6022 73RD ST N	ST PETERSBURG	FL	33709
41	313016102220040110	STOFFO, EMILY	51 STARMOUNT DR	ASHEVILLE	NC	28806
42	313016102220040120	BOURGEAU, KIRK S	5998 73RD ST N	ST PETERSBURG	FL	33709



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**Table 6-2 Adjacent Parcels Alternative Alignment Routes**

<b>Map ID</b>	<b>Parcel Number</b>	<b>Owner Name</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
43	313016102220040130	TYPPI, JEREMY L	5986 73RD ST N	ST PETERSBURG	FL	33709
44	313016102250000111	BLANKLEY, TIMOTHY A	5824 73RD ST N	ST PETERSBURG	FL	33709
45	313016102250000112	BERRA, BARBARA J	5856 73RD ST N	ST PETERSBURG	FL	33709
46	313016102250000113	DUNCAN, ANDREW S	503 N HUBERT AVE # 3	TAMPA	FL	33609
47	313016102250000114	COLVIN, RANDALL D	5920 73RD ST N	ST PETERSBURG	FL	33709
48	313016102250000115	COLOMBOTTI, THOMAS E	5952 73RD ST N	ST PETERSBURG	FL	33709
49	313016667150000001	PARKSIDE VILLAS HMOWN	7368 PARKSIDE VILLAS BOX 3	ST PETERSBURG	FL	33709
50	313016667150001230	PARKSIDE VILLAS HMOWNS ASSN IN	PO BOX 5033	CLEARWATER	FL	33758
51	313016102260000320	ALTAF, FARIDA	7318 55TH AVE N	ST PETERSBURG	FL	33709
52	313016000003300200	PINELLAS COUNTY	315 COURT ST	CLEARWATER	FL	33756
53	313016000003300300	PINELLAS COUNTY	315 COURT ST	CLEARWATER	FL	33756
54	313016962680001060	LAURO, FREDERICK W	7670 FAREHAM CT N	ST PETERSBURG	FL	33709
55	313016962680001070	WINTERS, MIRANDA N	7692 FAREHAM CT N	ST PETERSBURG	FL	33709
56	313016962680001080	AMBROSIO, FRANCIS J	223 176TH AVE E	REDINGTON SHORES	FL	33708
57	313016962680001090	BOUVIER, RON SR	7736 FAREHAM CT N	ST PETERSBURG	FL	33709
58	313016962680001100	HANSEN, WILLIAM C	7758 FAREHAM CT N	ST PETERSBURG	FL	33709
59	313016962680001110	MUNOZ, VINCENT	7773 FAREHAM CT N	ST PETERSBURG	FL	33709
60	313016962680001120	DAVIS, KURTIS T	7761 FAREHAM CT N	ST PETERSBURG	FL	33709
61	313016962680001130	MOORE, RODNEY O	7755 FAREHAM CT N	ST PETERSBURG	FL	33709

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**Table 6-2 Adjacent Parcels Alternative Alignment Routes**

<b>Map ID</b>	<b>Parcel Number</b>	<b>Owner Name</b>	<b>Mailing Address</b>	<b>City</b>	<b>State</b>	<b>Zip</b>
62	313016962680001140	RIMANDO, INOCENCIO	7717 FAREHAM CT	ST PETERSBURG	FL	33709

## **7.0 CONCEPTUAL SCHEDULE**

The time required to prepare construction documents, obtain the required permits, bid and award the construction contract and complete the construction works is estimated to be 660 days. This includes 240 days for design and permitting, 120 days to bid and award the construction contract and 300 days to construct the new force main. This estimate is based on conservative time estimates for obtaining permits, bidding and awarding the construction contract.