Attachment A - Feasibility Study

Upper Peninsula Watershed Drainage Improvements
Dale Mabry/ Henderson Trunkline

Prepared By: Interflow Engineering LLC
IE Project No. 2016_TA03

Prepared For: City of Tampa, FL
Project No. 115215559

November 7, 2016

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Certification

Not valid unless stamped or embossed with Engineer's Seal, signed and dated in contrasting color ink.	
This report, Feasibility Study for Dale Mabry Trunkline, is based on materials provided to or gathered by **Interflow Engineering LLC** on or prior to November 1, 2016. This report was prepared under the responsible charge of John Loper, P.E., and is based on the professional engineer's knowledge, experience, and belief, in accordance with commonly accepted procedures consistent with applicable standards of practice. **Interflow Engineering, L.L.C.** 14499 N. Dale Mabry Hwy, Suite 290, Tampa, FL 33618 P: (813) 322-3876 W: www.interfloweng.com Certificate of Authorization No. 26901	[seal or stamp] John Loper, FL P.E. 54623 11/7/2016 Date

The following appendices may be stamped preliminary/conceptual, or provided by other professionals and may not be certified by the report's Engineer-of-Record.

Appendices

A. Conceptual Plans

B. Engineer's Opinion of Probable Construction Cost

C. SUE Report

D. Soils Information

1. Executive Summary

The purpose of this study is to evaluate the feasibility of constructing stormwater conveyance improvement features which, based on hydrologic and hydraulic modeling by others (see Attachment "C" to the Request for Qualifications), will reduce flooding depth and duration on South Dale Mabry Hwy near Henderson Blvd, Watrous Ave, and Neptune Street. The proposed conveyance features primarily consist of an 8-feet wide by 5-feet high reinforce concrete box (RCB) culvert. This RCB culvert will accept flows from additional proposed stormwater improvements along South Dale Mabry Highway, to be constructed in the future by the FDOT.

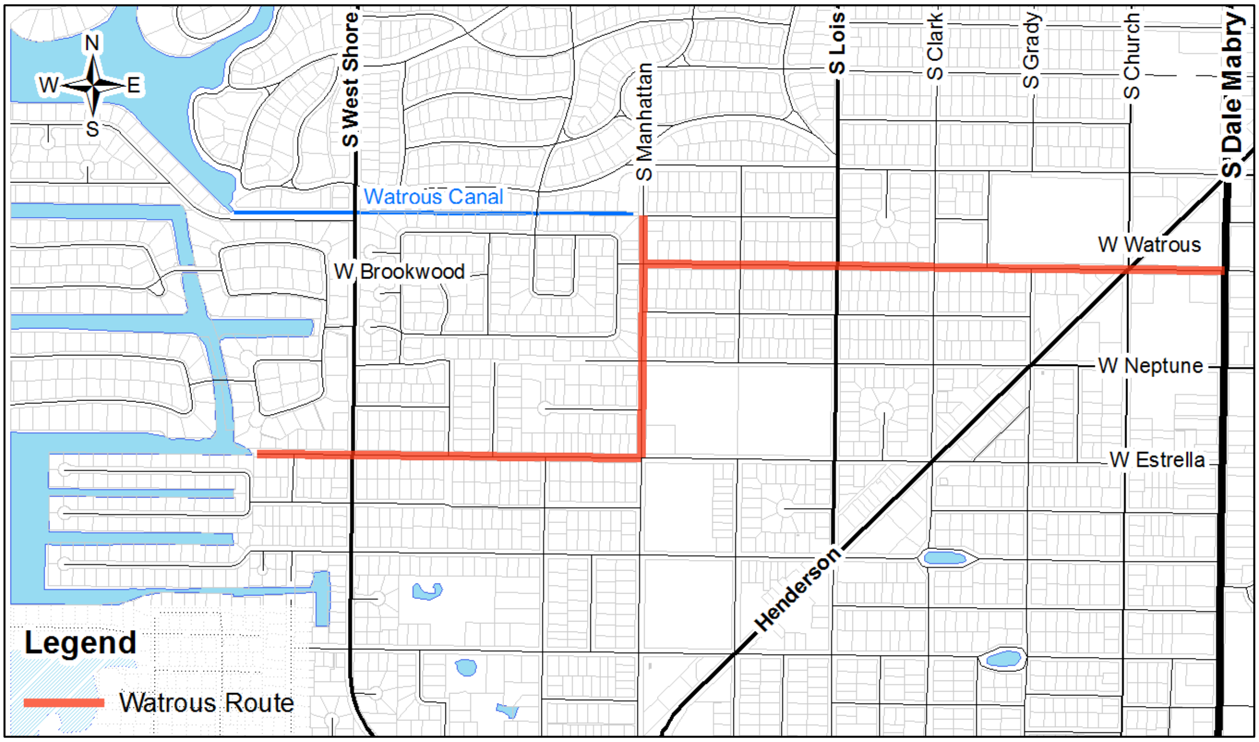


Figure 1. Proposed Route (Watrous Alternative)

The proposed route for the RCB culvert is west on Watrous Ave from Dale Mabry Hwy to Manhattan Ave, south on Manhattan Ave to Estrella St, and west on Estrella St to Tampa Bay, as indicated on **Figure 1.** After evaluating a number of alternative routes, this route appears to be the least impactful. However, there will be impacts during construction to transportation, access to residences, trees in or near the right-of-way, and utilities.

The installation of the proposed RCB culvert can have several benefits beyond drainage improvements for South Dale Mabry Hwy. Namely, improving drainage along the route, replacing aging infrastructure (for example, water mains and sanitary sewers), reconstructing roads, and enhancing public facilities with off-street parking. The route includes a secondary outfall to the Watrous Canal, which is currently being reconstructed for this purpose.

The City has expressed a preference for the Design-Build approach on this project. To that end, a preliminary phasing plan was developed (**Figure 2**), the purpose of which was to allow the design/build team to complete the design and permitting for Phase 1 and begin construction prior to completing the designs for phases 2 and 3. The design/build team may adjust the phasing to suit the final design.

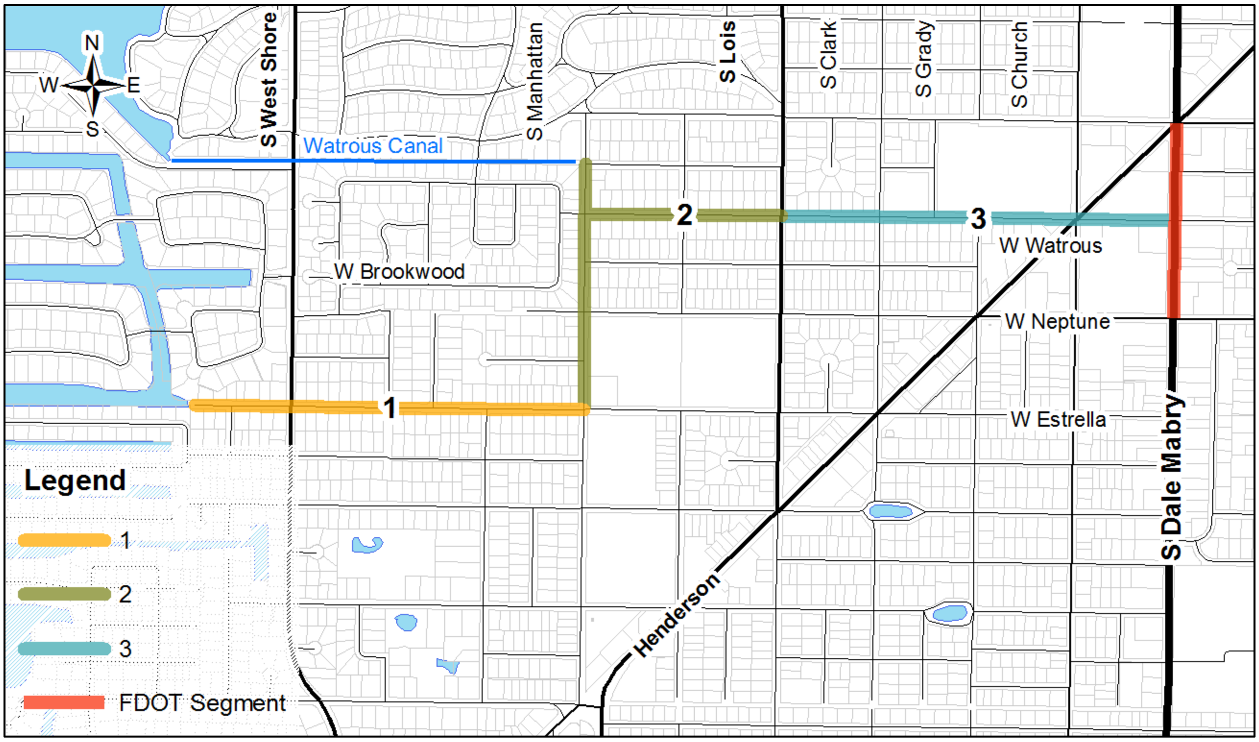


Figure 2. Proposed Construction Phases

The Engineer's Opinion of Probable Construction Costs based on the conceptual plans is approximately 37 million dollars (see **Appendix B** Engineer's Opinion of Probable Construction Cost). The cost is summarized on the following table for the three phases identified in the preliminary phasing plan.

Segment	Engineer's Opinion of Probable Construction Cost
1. West Estrella St.	$13,468,000
2. Manhattan Ave and Watrous (Manhattan to Lois)	$12,043,000
3. Watrous (Lois to Dale Mabry)	$11,073,000
Total	**$36,584,000**

Based on the information available to the authors at the time of this report, the construction of the proposed stormwater conveyance improvements appears to be feasible. Conceptual plans were developed based on available information (**Appendix A**). Existing information on the conceptual plans was compiled from available geographic information system (GIS) data, LiDAR-based topography, and as-built construction plans from the City's files. A comprehensive field survey will provide more accurate and complete description of existing features and facilities. However, it is also important to note that small differences in topography, right-of-way limits, property lines, horizontal and vertical locations of utilities, disposition of trees, etc. will not affect the overall feasibility of this project.

Additionally, hydrologic and hydraulic modeling completed by others (see Attachment "C" to the Request for Qualifications) was used to determine the proposed box culvert dimensions. That modeling effort should be refined and augmented as necessary to account for the connections and sizing of local drainage features along the route, as shown on the Conceptual Plans, with associated adjustments to the primary conveyance features if deemed necessary.

1.1. Recommendations

Interflow, after reviewing the available information, visiting the project area several times, meeting with various stakeholders, recommends the City do the following:

1. Coordinate with regulatory agencies,
2. Obtain a Conceptual ERP Permit (for phases/complete project),
3. Complete a topographic and route survey,
4. Complete a formal tree assessment of all trees in or immediately adjacent to the right-of-way,
5. Complete a geotechnical investigation at regular intervals to assess soils for stability and unsuitable materials,
6. Update and refine the hydrologic/hydraulic analysis for proposed box culvert and local drainage,
7. Create new base drawings and proceed with formal design, and
8. Conduct extensive public outreach, including neighborhood meetings.

2. Introduction

The City of Tampa (City) requested Interflow Engineering, LLC (Interflow) to prepare a feasibility study and conceptual plans for the construction of a reinforced concrete box (RCB) culvert from South Dale Mabry Highway and Watrous Avenue to the western end of Estrella Street. The size of the RCB culvert was determined by hydrologic and hydraulic modeling prepared by others (see Attachment "C" to the Request for Qualifications) as 8-feet wide by 5-feet high with an upstream invert elevation[1] of 7 (NAVD-88) or less.

3. Existing Drainage

Existing drainage problems on S Dale Mabry Hwy from Henderson Blvd to Neptune Ave are frequent and severe. Even relatively frequent storm events (for example, the Mean Annual or 2.33-Year Storm) cause significant flooding (**Figure 3**). The proposed RCB culvert is intended to reduce the frequency and severity of these flooding problems. Refinement of the modeling analysis will be necessary during final design.

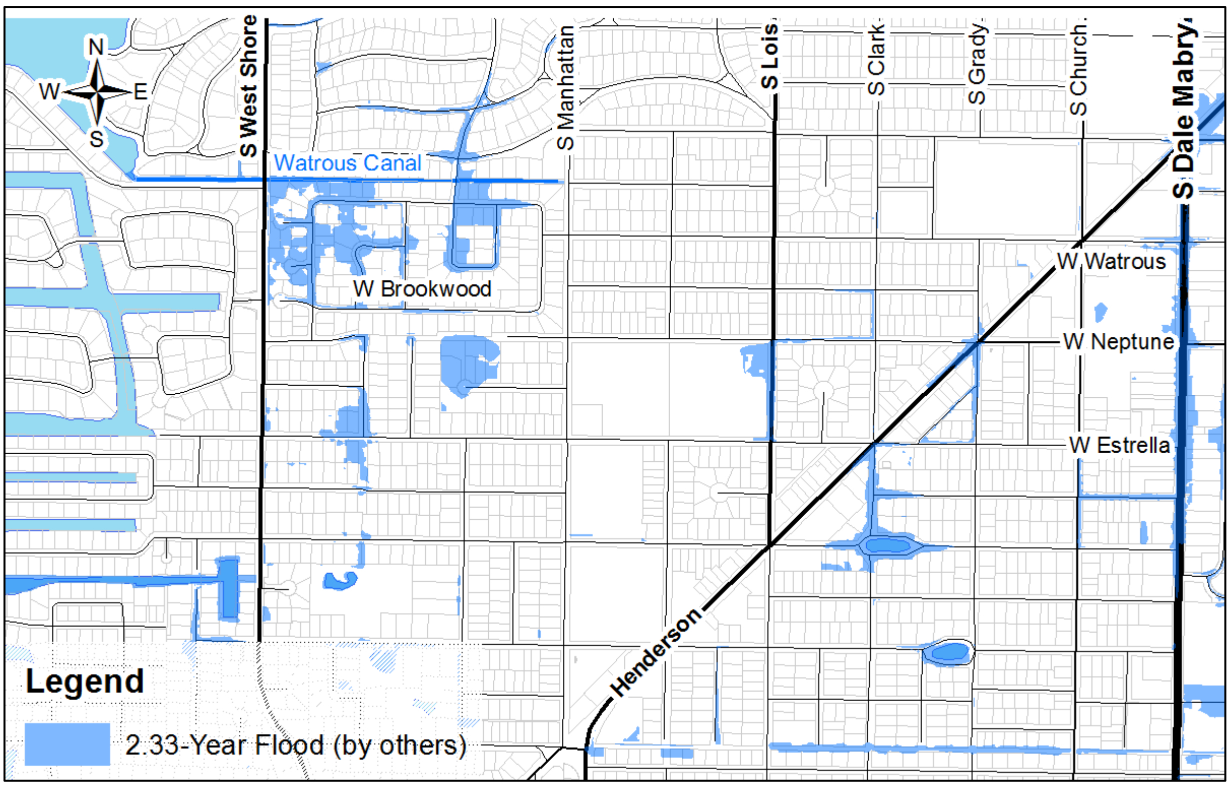


Figure 3. Existing Mean Annual Floodplain

[1] Invert - Lowest inside elevation in a pipe.

4. Alternative Routes

The upstream and downstream end of the study are fixed due to coordination issues (upstream) and available access to Tampa Bay through existing right-of-way (downstream). However, there are several potential routes which could convey stormwater runoff to Tampa Bay (receiving waterbody). Most potential routes must pass through the intersection of Estrella St. and Manhattan Ave., which limits the variation. The Culbreath Isles Route has a different outfall location. The Watrous Canal was ruled out by City staff as a primary outfall, due to its limited hydraulic capacity and insufficient right-of-way for expansion. However, according to the updated hydrologic and hydraulic modeling (by others), which included recent upgrades to the Watrous Canal, the Watrous Canal was designated a secondary outfall.

4.1. Henderson Alternative

The Henderson Alternative (**Figure 4**) would have significant transportation and business impacts, as Henderson Blvd is a major collector (four lanes, undivided) with numerous commercial businesses along it. This route directly impacts Mabry Elementary and Coleman Middle School. There are numerous utilities within the right-of-way along the Henderson Alternative. This alternative route runs several blocks south of the Watrous Canal, complicating any potential tie-in of a secondary outfall.

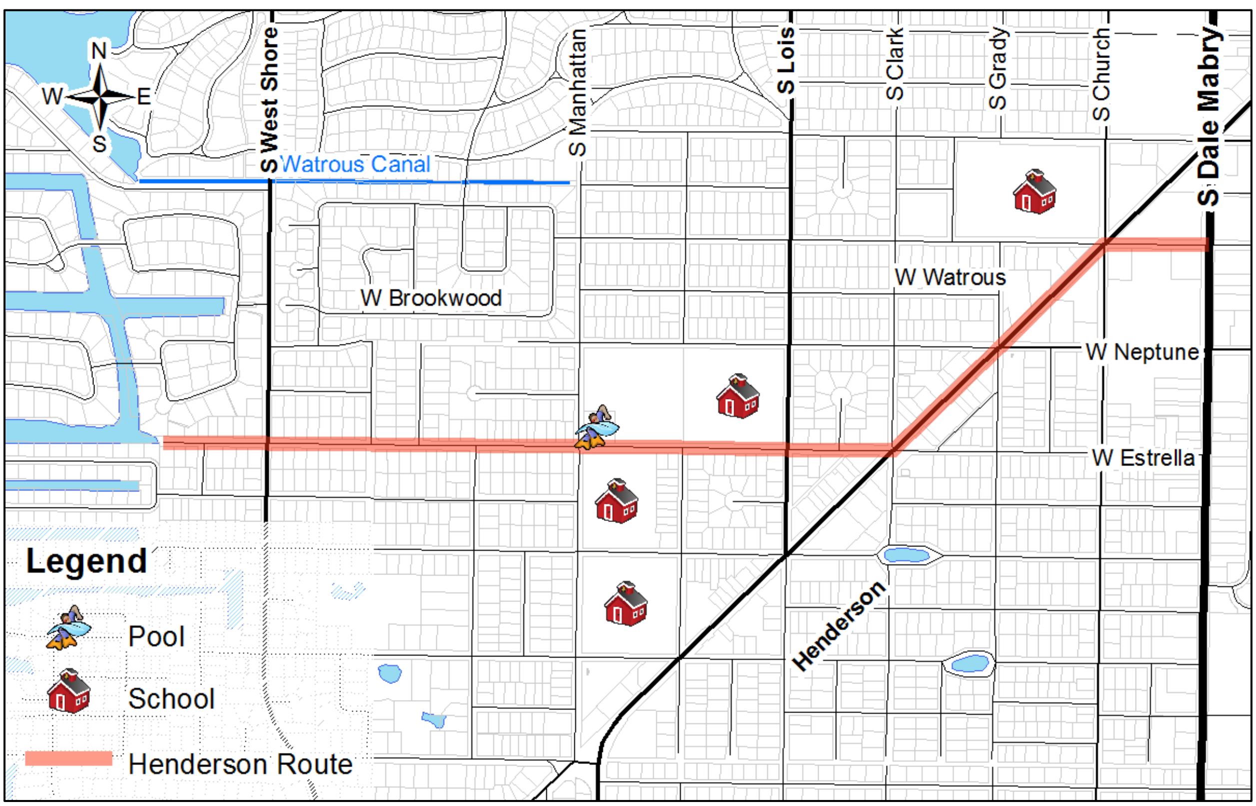


Figure 4. Henderson Route

4.2. Culbreath Isles Alternative

The Culbreath Isles Alternative would have significant transportation challenges as it would impact the only entrance to the Culbreath Isles neighborhood (refer to **Figure 5**). This route is shorter but more circuitous which may affect hydraulic performance. Additionally, west of Manhattan the route appears to only have 50-feet of right-of-way. Several other alternative routes (including the Watrous Ave portion of the Culbreath Isles Alternative), have a 60-foot right-of way. One advantage to this alternative is its proximity to the Watrous Canal, which is being reconstructed in order to provide a secondary outfall for the Upper Peninsula Phase 2 project.

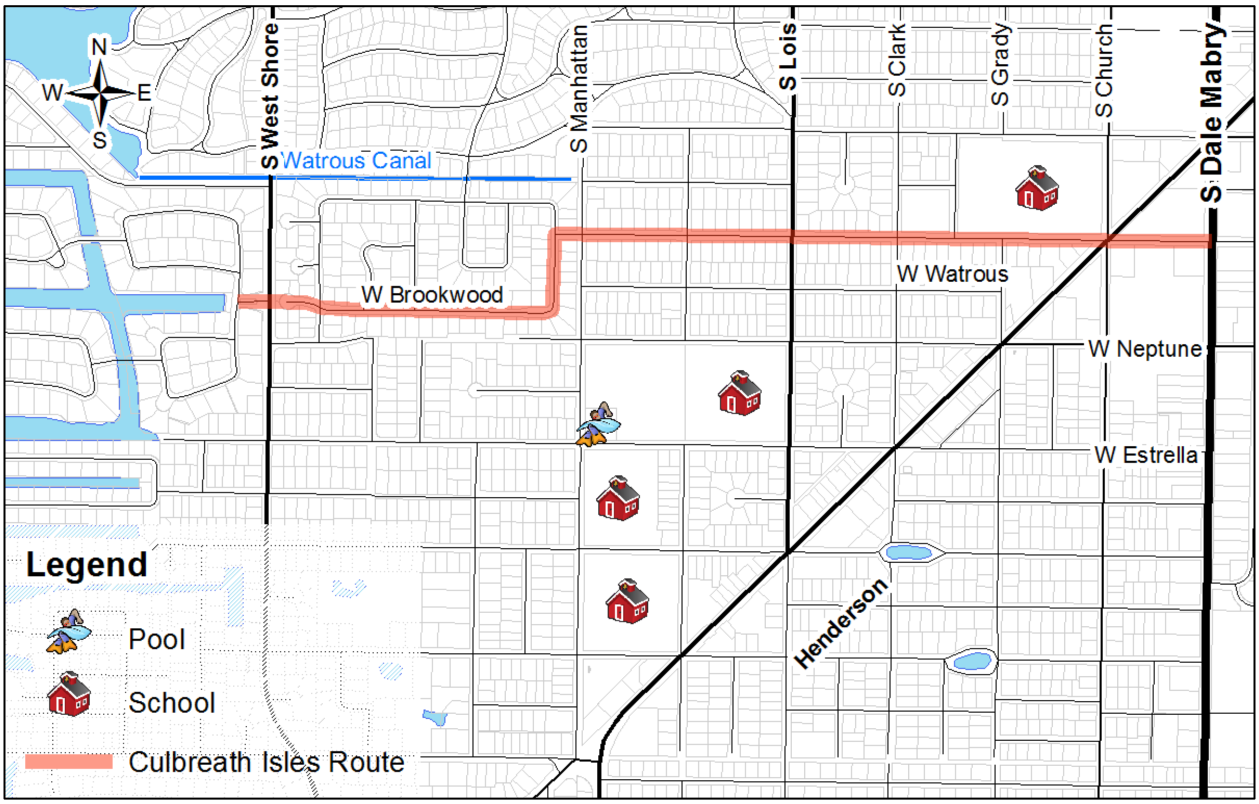


Figure 5. Culbreath Isles Route

4.3. Lois Alternative

The Lois Alternative (**Figure 6**) would have significant transportation impacts, as Lois Avenue is a heavily travelled collector (two lanes, undivided). This route would directly impact Grady Elementary, Mabry Elementary, and Coleman Middle School. This alternative route also runs several blocks south of the Watrous Canal, complicating any potential tie-in of a secondary outfall at that location.

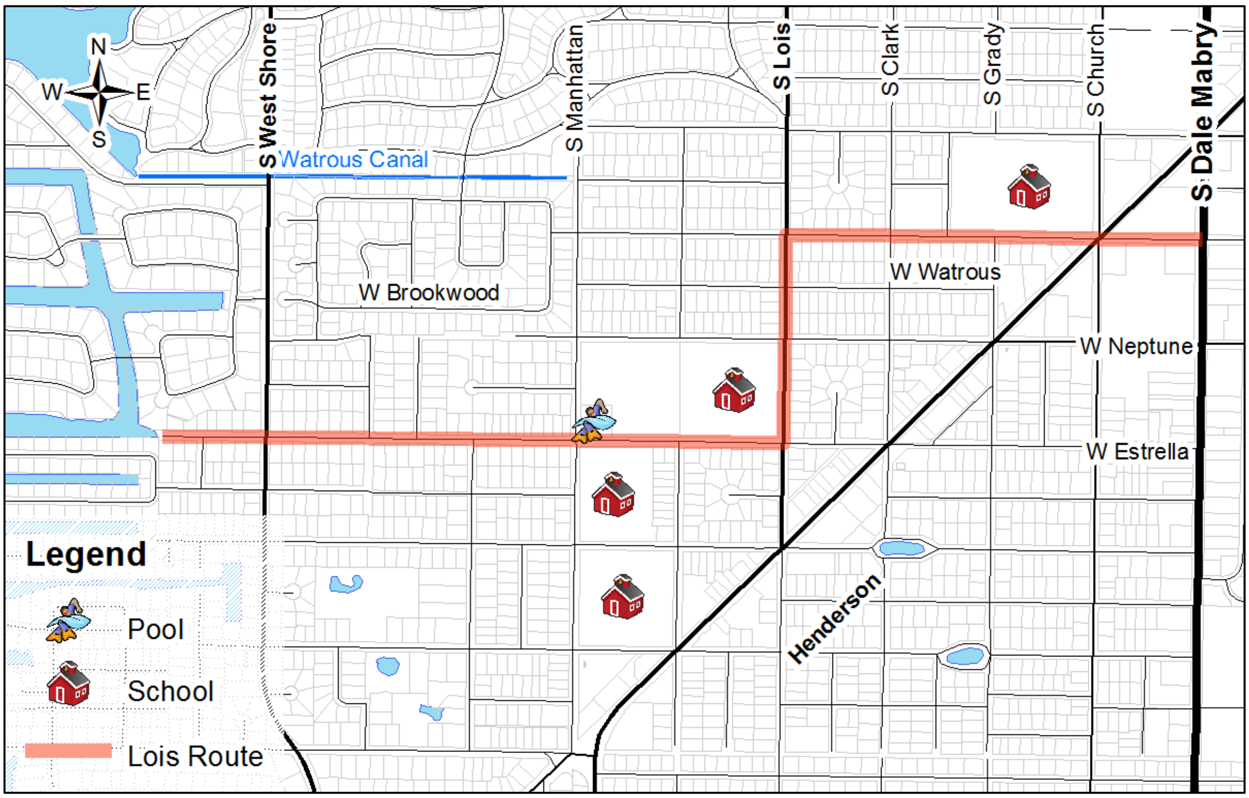


Figure 6. Lois Route

4.4. Watrous Alternative

As is the case with the other alternatives, the Watrous Alternative (**Figure 7**) would have transportation impacts. This route would impact Grady Elementary, Mabry Elementary, and Coleman Middle School. One advantage this alternative shares with the Culbreath Isles alternative is the proximity of the route to the Watrous Canal, which is currently undergoing improvements by the City to enhance conveyance capacity and resistance to erosion. In fact, one of the purposes of the Watrous Canal Project is to provide a secondary outfall for Upper Peninsula Phase 2. Therefore, proximity of the route to the Watrous Canal is an added benefit, as the connection can be made via a relatively short segment of culvert. The City anticipates completion of the Watrous Canal Project in February 2017.

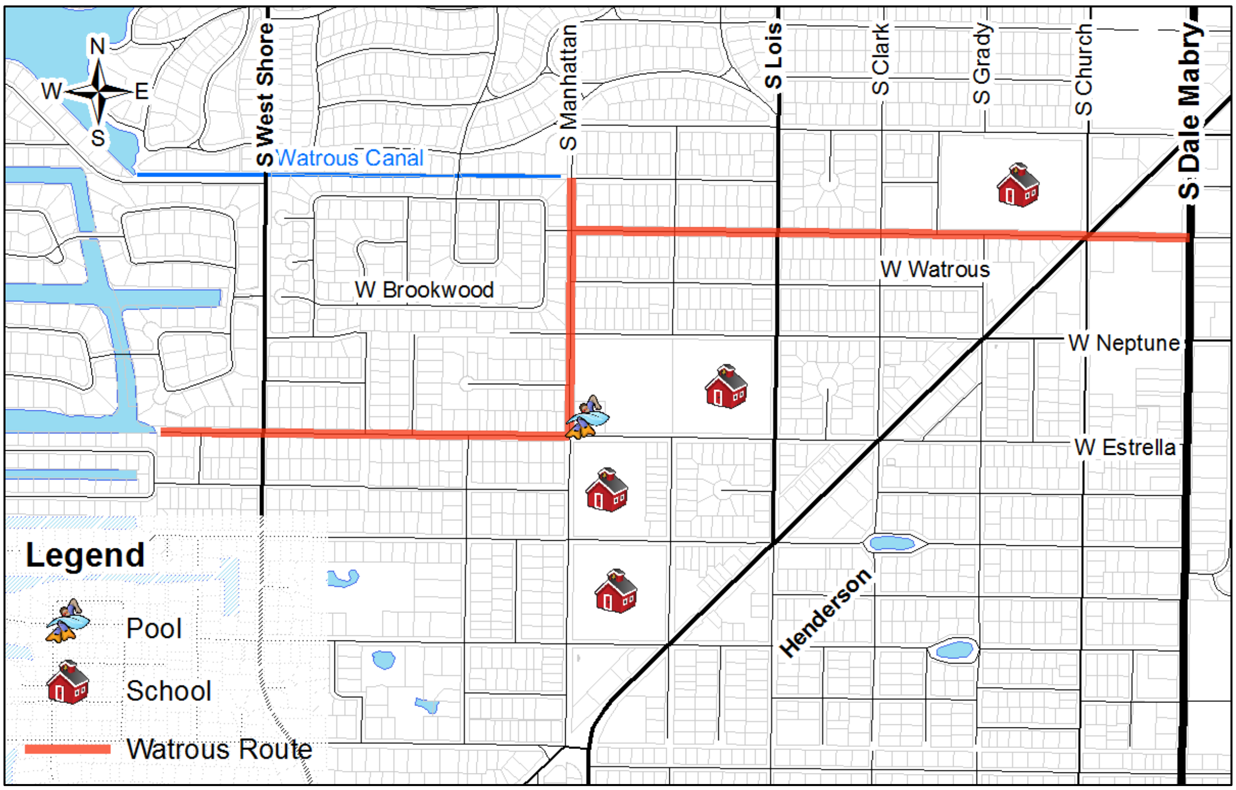


Figure 7. Watrous Route

4.5. Alternative Rankings

The potential alternative routes were ranked based on basic information regarding potential impacts. The rankings are from zero (0) or no impact to five (5) high impact:

- Transportation Impacts: Class of road, geometry of road, and potential duration of impacts. No traffic studies or counts were performed for this ranking.
- Residential Impacts: Number of residences parcels impacted.
- Commercial Impacts: Number of commercial parcels impacted, this does not include residential parcels used for commercial purposes (home businesses).
- Utility Impacts: Review of size, type, and number of utilities impacted.
- Tree Impacts: Tree impacts were considered in the evaluation and ranking of the routes.

Table 1. Alternative Rankings

Alternative	Transportation Impacts	Residential Impacts	Commercial Impacts	Utility Impacts	Tree Impacts	Total
Henderson	5	3	5	5	3	21
Culbreath Isles	5	5	1	3	4	18
Lois	4	2	2	5	3	16
Watrous	3	4	1	2	4	14

Based on the summary rankings provided in **Table 1**, the Watrous Alternative route has the lowest ranking (that is, least impactful). Another advantage of this route is the proximity of the Watrous Canal, which can serve as a limited secondary outfall. Interflow reviewed available topographic and utility information to prepare conceptual plans and construction cost estimates based on this route.

5. Watrous Alternative

The Watrous Route, based on the preliminary review (see Section 4.4 Watrous Alternative), appears to be the least impactful route for conveyance of stormwater runoff to Tampa Bay. Therefore, Interflow developed conceptual plans to evaluate potential construction costs, potential utility conflicts, and overall feasibility (**Appendix A**). These plans are based on best credible information, and useful for conceptual design and third party review.

5.1. Topographic Information

No survey (topographic, boundary or specific purpose) was conducted for this study, report, or conceptual construction plans. Elevation information was exclusively based on publicly available LiDAR[2] data from the Florida Division of Emergency Management (FDEM) development and maintenance of Regional Evacuation Studies. Vertical accuracy of the LiDAR data is approximately ±0.3-feet for unobscured areas.

The LiDAR data was used to create Digital Elevation Models (DEMs) for the project area using 5-feet by 5-feet cell. The DEM reduces the accuracy of the topographic information by homogenizing information in a given area (5-feet by 5-feet area). The overall surface information has an accuracy greater than ±0.3-feet for unobscured areas and even less for highly vegetated areas. The DEM was used in AutoCAD Civil 3D to create profiles and sections.

[2] LiDAR - is a remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light. – Wikipedia, 3 April 2015

5.2. Soils Information

Appendix D provides a characterization of near-surface soils along the Watrous Route, based on the Natural Resources Conservation Service (NRCS) soils mapping database. Soils along the route are primarily fine sands, with the majority (76.4%) being Myakka-Urban Land Complex. This complex is characterized as poorly drained, due to shallow depths to water table in the range of 6 to 18 inches below land surface. The typical profile consists of fine sands from land surface to a depth of 80 inches. Other significant soil units along the route are Urban Land (12.9%) and Malabar Fine Sand (10.2%). The typical Malabar Fine Sand profile consists of fine sand to a depth of 50 inches, with a layer of fine sandy loam from 50 inches to 66 inches, and fine sand again from 66 inches to a depth of 80 inches. The composition of Urban Land is indeterminate from the NRCS data, due to site specific modifications (e.g., excavation, fill, compaction, etc.).

Information on soils along the route at depths greater than 80 inches (6.7 feet) below land surface is sparse. However, according to mapping developed by the Florida Geological Survey, the peninsula of South Tampa is overlain by undifferentiated surficial sands, clayey sands, clays, marls, and peats greater than 20 feet thick (Ref: Geological Map of Hillsborough County; FGS Open File Map Series No. 45). Based on the information reviewed for this feasibility study, it is unlikely that the excavation for the proposed improvements will encounter bedrock. However, it is possible that pockets of unsuitable materials (clay, peat, etc.) will be encountered. These soils should be excavated and replaced with suitable backfill.

The risk of encountering large quantities of unsuitable materials is limited to some extent by the presence of sanitary sewer lines along almost the entire route, much of it at a similar depth (or deeper) than the proposed RCB culvert. It is reasonable to assume that the prior excavations for the sanitary sewer installations were backfilled with clean granular backfill, as is common practice. A conservative assumption regarding quantities of unsuitable material removal has been incorporated into the Engineer's Opinion of Construction Cost for this study (i.e., the bottom 3-feet or so of the excavation along the entire route). Prior to construction, a route-specific geotechnical engineering study is recommended.

Removal of submerged soils in the outfall canal at the end of Estrella Street may be required to accommodate the proposed invert of the box culvert (-5.0 ft. NAVD88). This activity is planned to be completed under a separate contract, and is therefore not included in the Engineer's Opinion of Construction Cost in **Appendix B**.

5.3. Transportation Impacts

The Transportation Impacts caused by the Watrous Route would be of shorter duration and lower intensity than other alternative routes. The impacts are mainly focused on crossings of West Shore Blvd, Lois Ave, and Henderson Blvd. Detours should be planned based on traffic count and type information; no traffic analysis (counts or etc.) was performed for this study. Major detours shown below (see **Figure 8**, **Figure 9**, **Figure 10**, and **Figure 11**) are based on the shortest available route and may not represent the best detour route. Additionally, minor detours (not shown), may reflect a contractor's haul routes, staging areas, and methods.

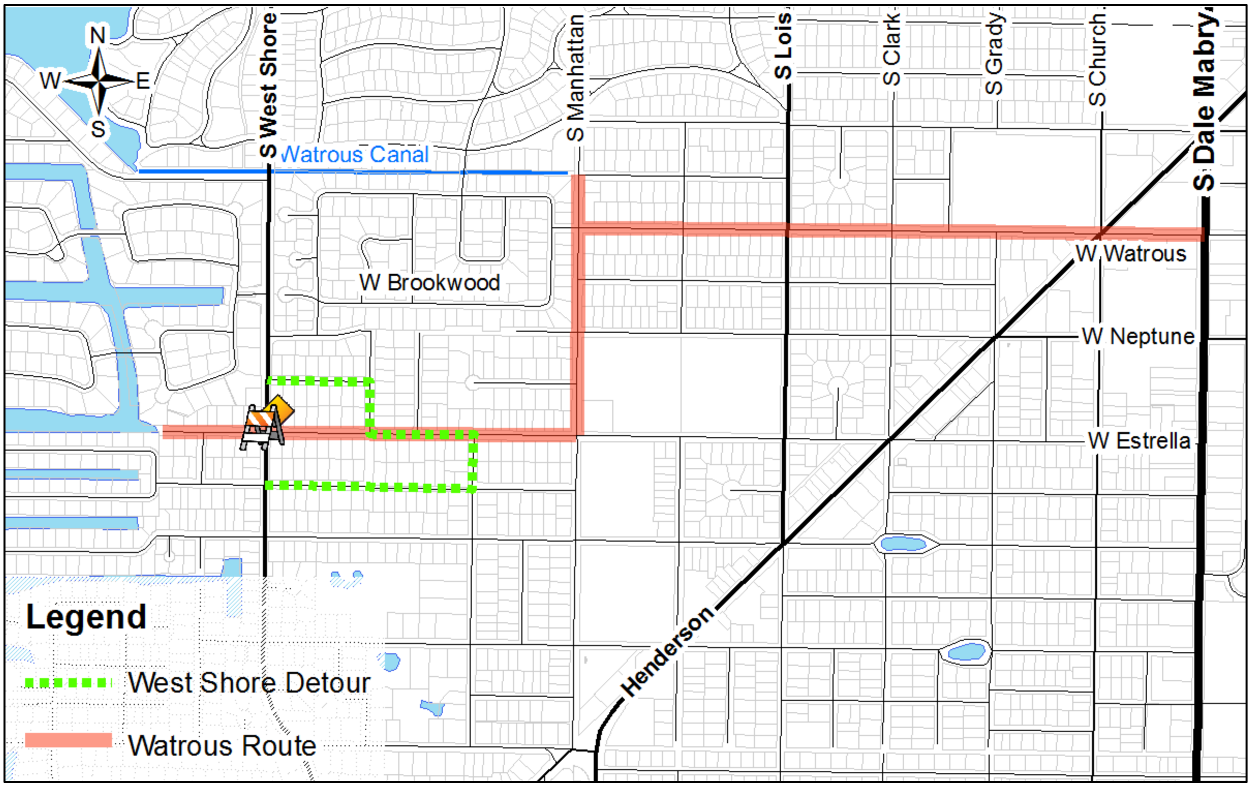


Figure 8. Detour for West Shore Closure

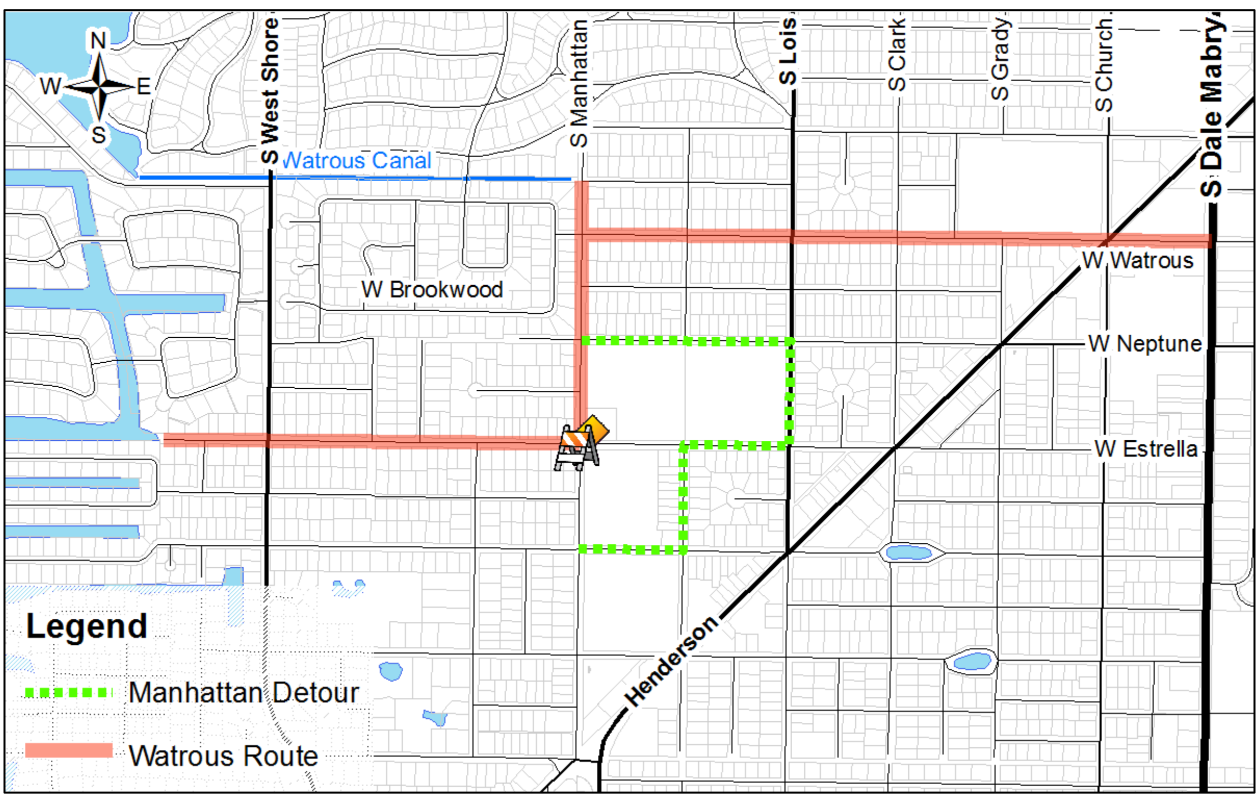


Figure 9. Detour for Manhattan and Estrella Closure

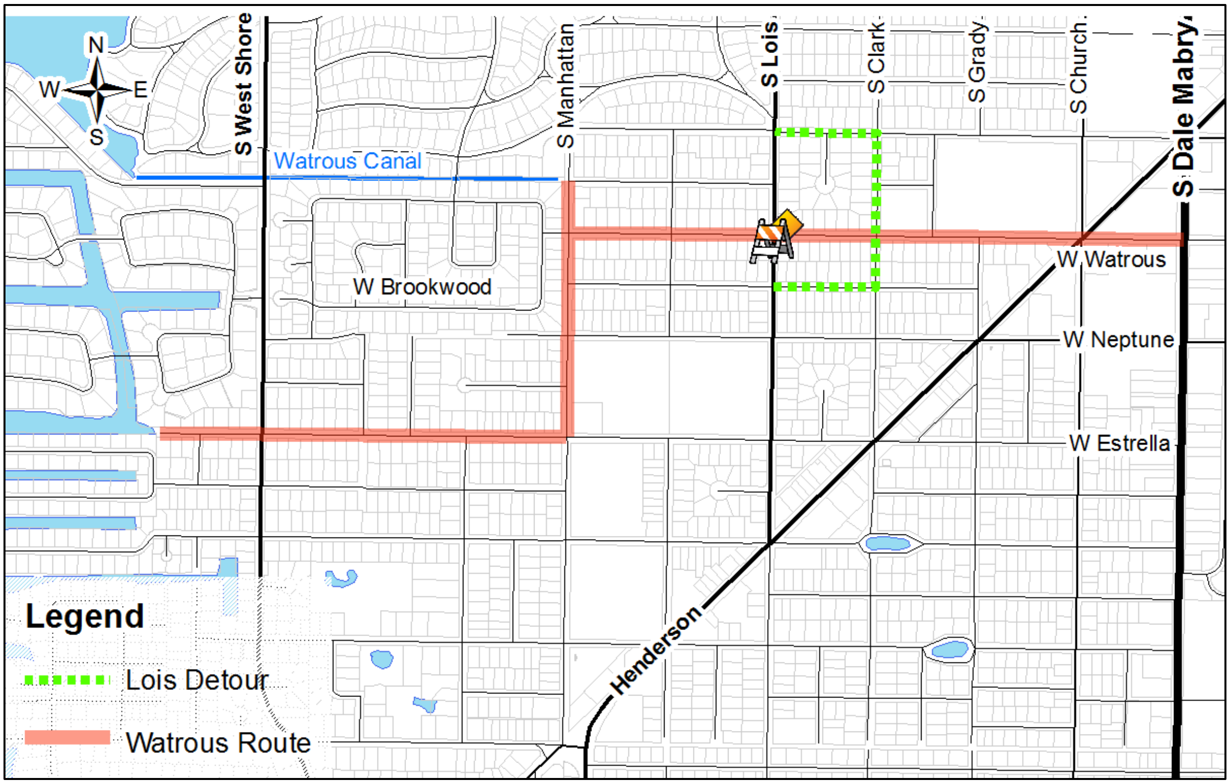


Figure 10. Detour for Lois Closure

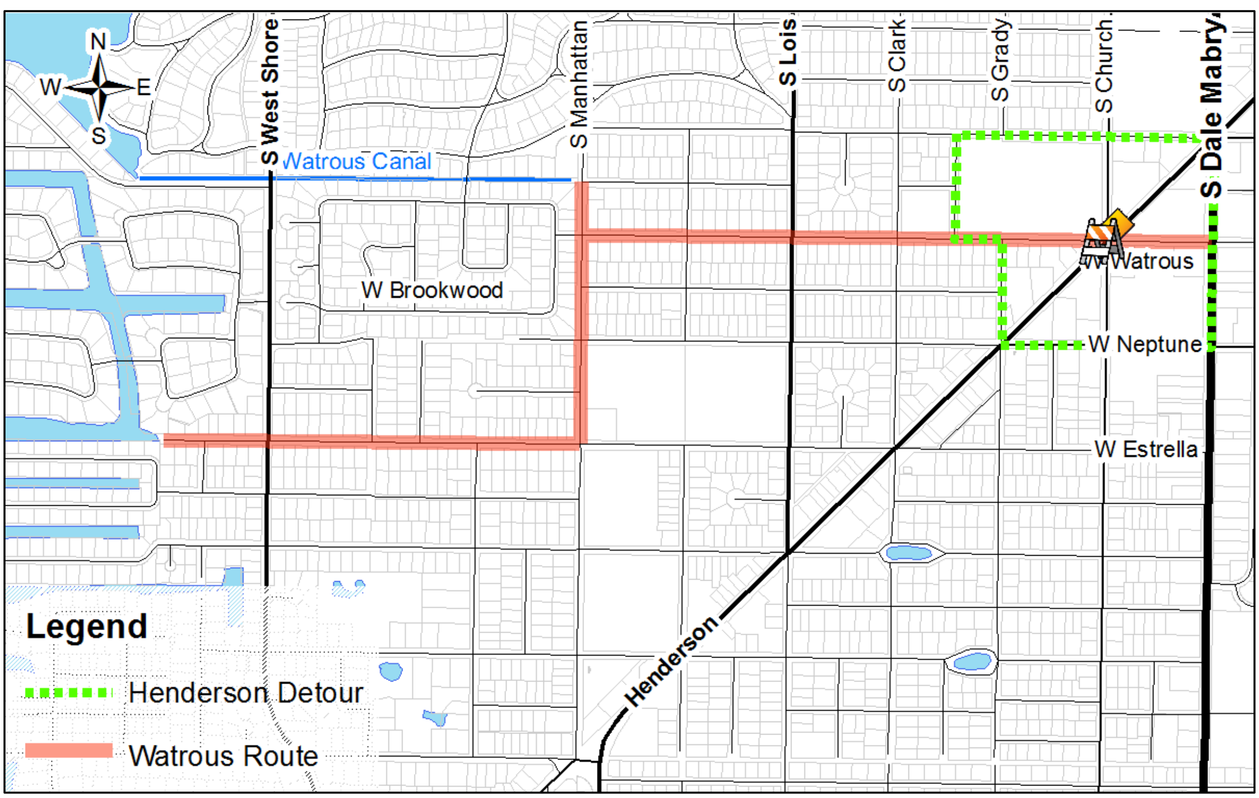


Figure 11. Detour for Henderson Closure

Additionally, there will be impacts to Coleman Middle School and Grady Elementary, which may require additional analysis and planning to reduce the severity of the impacts. Coleman Middle School has drop-off/pick-up procedures and practices which will be directly impacted for an extended period of time. Phasing and timing construction may reduce impacts to schools and other recreational activities. Public Involvement meetings would be advisable prior to and during construction.

5.4. Residential Impacts

Any conceivable route from S Dale Mabry Hwy to Tampa Bay will impact residential access. The Watrous Route has four Dead End or No Outlet streets, where the project could impact vehicle access for several days (see **Figure 12**, **Figure 13**, **Figure 14**, and **Figure 15**). Two of these streets intersect Estrella west of Manhattan (and would be common impacts to all alternatives except Culbreth Isles). The other two streets intersect Manhattan north of Estrella. The greatest impact, based on duration, is at the outfall (see **Figure 12**), where construction is complicated by dewatering and limited access. The greatest impact, based on residences affected, is Clear Ave (see **Figure 14**), as Clear Ave affects more residences.

Public involvement prior and during construction is necessary to minimize impacts and reduce uncertainty for the residents. A selected contractor, at a minimum: 1. should notice impacted residences; 2. Provide as much access as safely possible; 3. Plan for short duration, high intensity construction for impacts to more than four (4) residences.

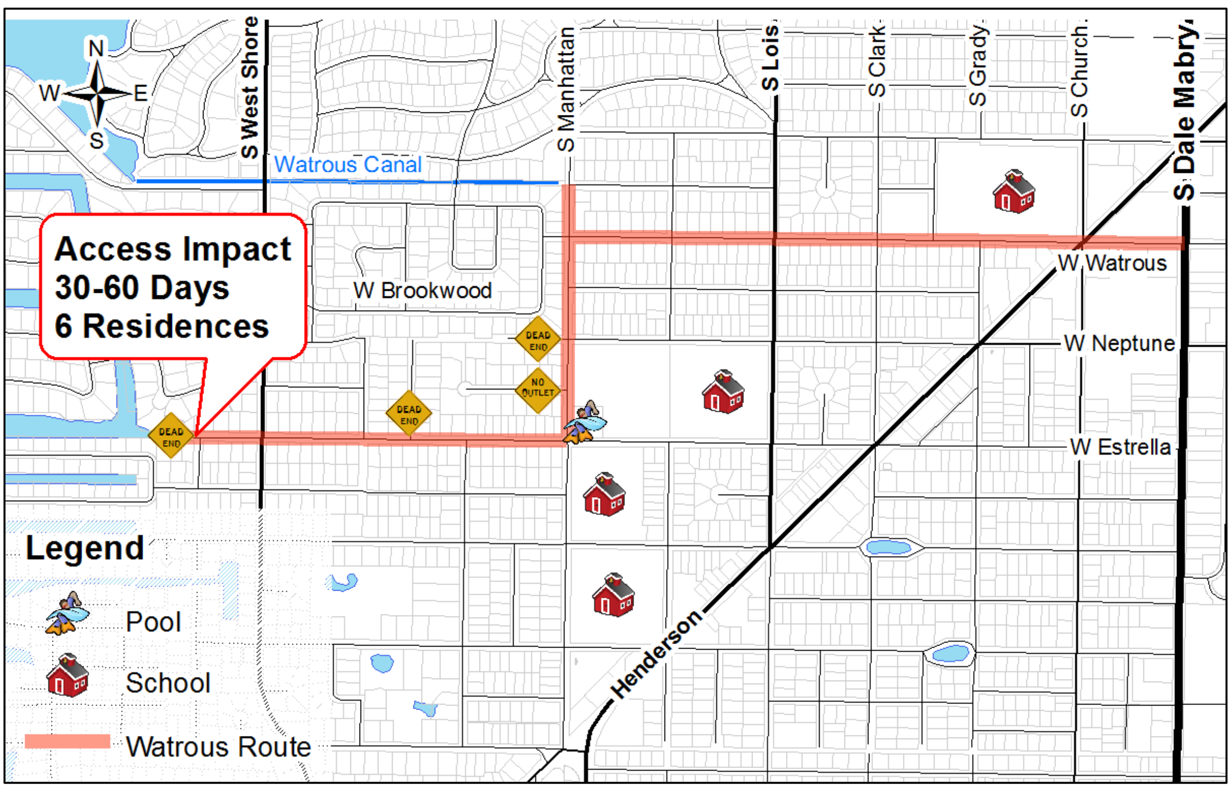


Figure 12. Impacts to Access near Outfall

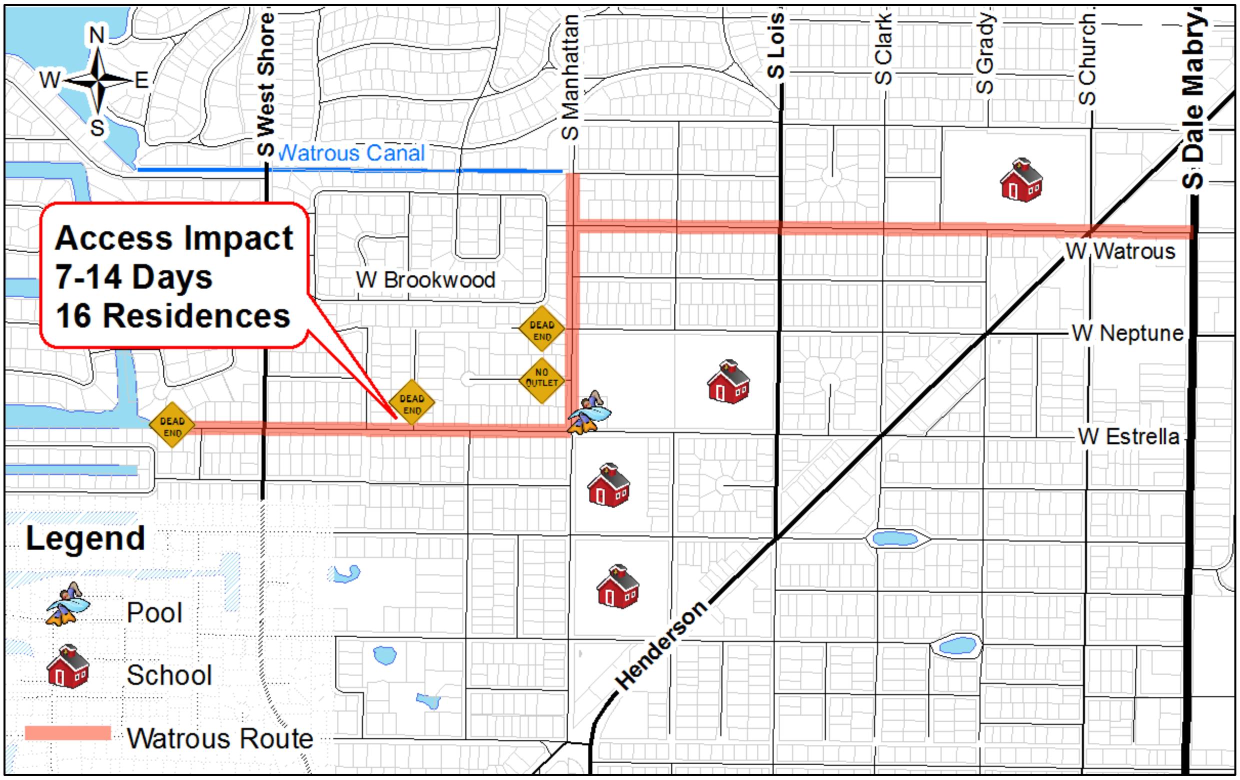


Figure 13. Impacts to Access near Sheridan Forest and Estrella

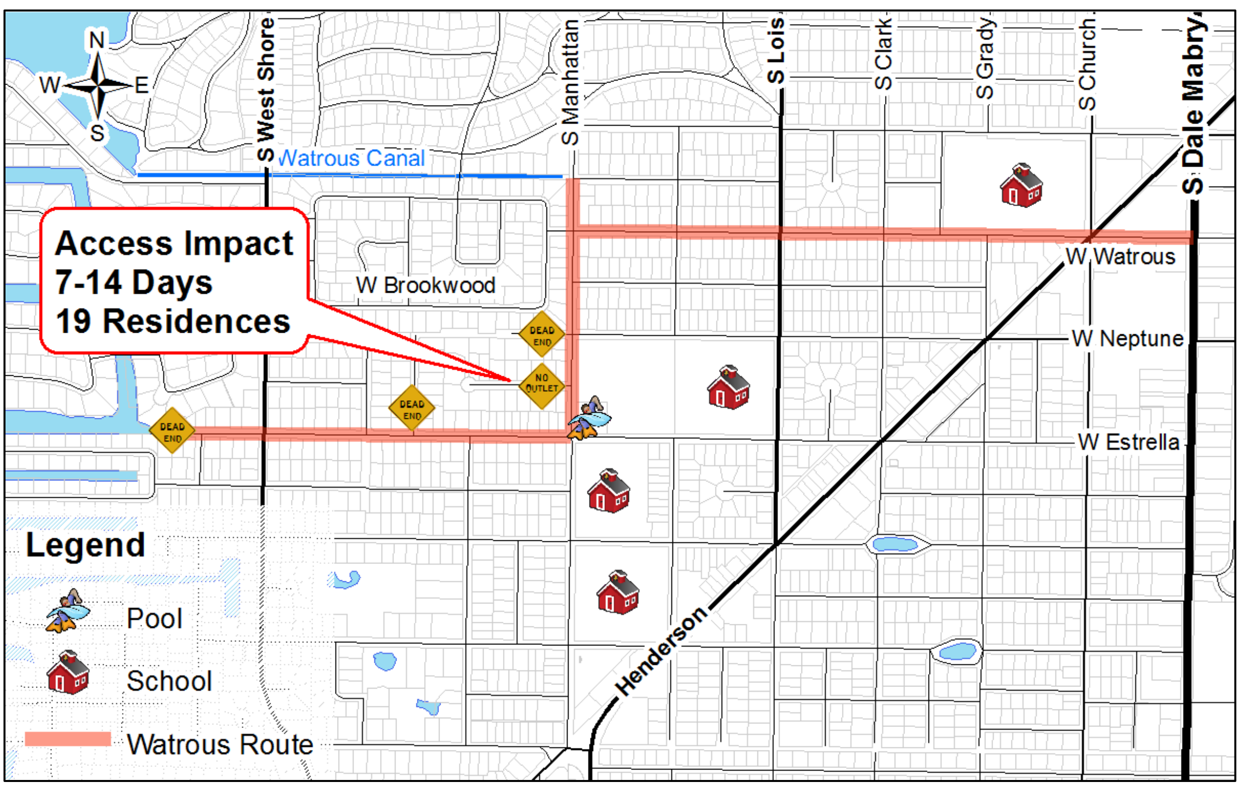


Figure 14. Impacts to Access near Clear and Manhattan

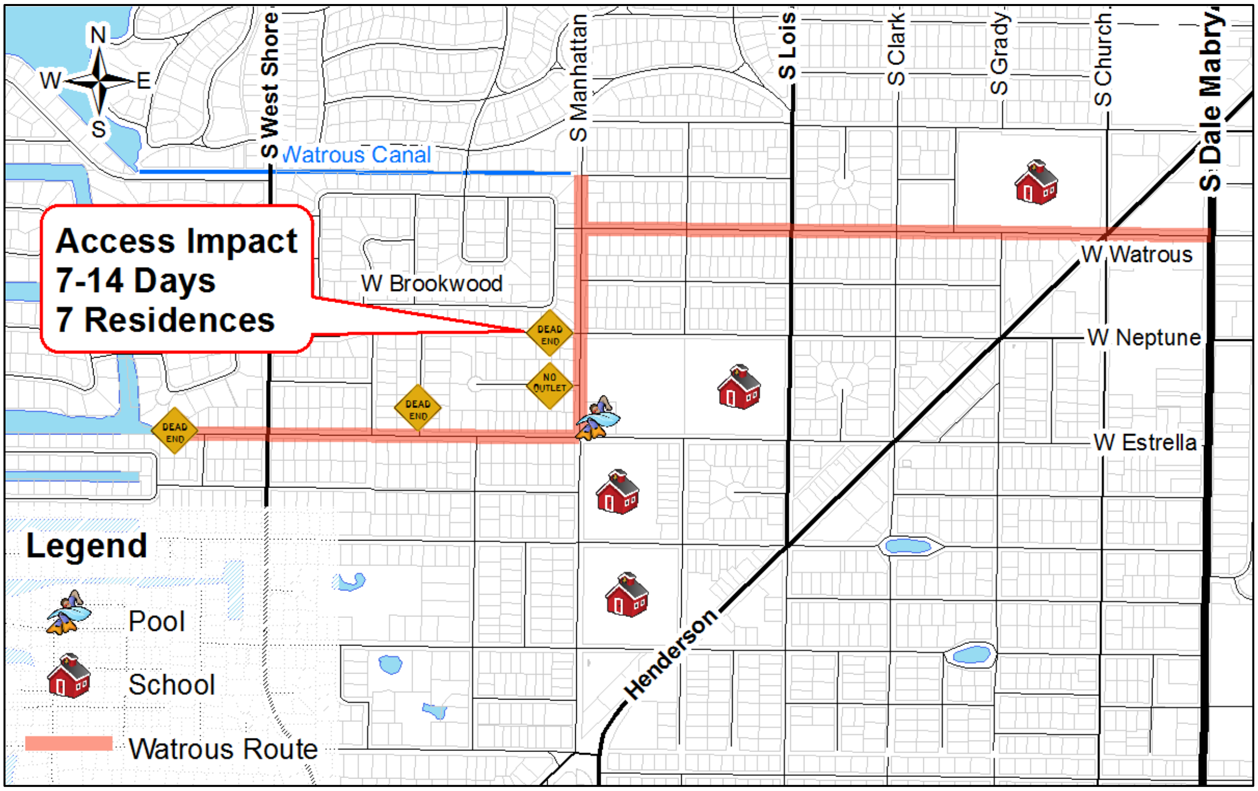


Figure 15. Impacts to Access near Neptune and Manhattan

Any route will affect residences while construction occurs in the adjacent right-of-way. However, construction requirements can be imposed, with public involvement, to reduce the severity of the impacts.

5.5. Utility Impacts

Interflow reviewed the available utility information provided by the City and other utility owners. Accommodating existing utilities appears possible with the greatest difficulty accommodating existing gravity utilities (storm and sanitary sewer) and maintaining separations for the potable water mains. A list of utility owners contacted and coordinated with is provided below:

- Fiberlight LLC (communications)
- TW Telecom Tampa (communications)
- Bright House Networks (communications)
- Verizon (communications)
- TECO (electricity, mostly overhead)
- TECO Peoples Gas (natural gas)
- Tampa Pipeline Corp (fuel pipeline)
- Tampa Water Department (potable water, sewer, reclaimed)

5.5.1. City of Tampa Utility Information

The City of Tampa provided utility Information for Wastewater, Stormwater, Potable Water, and Reclaimed Water structures in the vicinity of the proposed route. The elevations contained in the provided utility information was based on several different datum, for example a local datum (referred to as City Bench Mark "A") and National Geodetic Vertical Datum of 1929 (NGVD29).

The following assumptions were used to adjust all elevation information to approximately North American Vertical Datum of 1988 (NAVD88):

1. All data with an installation date prior to 1970 is City Bench Mark "A"
2. All data with an installation date after 1970 is NGVD29

Conversion Equations to NAVD88 for the given Datums are:

City Bench Mark "A" – 1.02 = NAVD88

Based on City of Tampa's guidance (via email 2/20/2015)

NGVD29 – 0.86 = NAVD88

Based on NOAA Website (http://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.prl)

When information is obviously unknown, for example:

1. Where the rim elevation is -99, -88, or 0, a value from the existing topographic elevation was used.
2. Where the invert elevation is -99 or -88 an approximate value was used based on surrounding information and engineering judgment.

For utilities not explicitly located (see Table 2. Approximate Depth for Utilities Not Located), Interflow assumed the following depths to the top of the utility.

Table 2. Approximate Depth for Utilities Not Located

Utility	Depth
Water	3-feet below land surface
Reclaimed Water	4-feet below land surface
Gas	4-feet below land surface

5.5.2. Subsurface Utility Locates

Subsurface Utility Exploration (SUE) was performed at six (6) locations shown on **Figure 16** based on review of available information. These selected subsurface utilities were chosen based on the magnitude of potential impacts to the proposed RCB culvert. The measure down (MD) information was considered with the development of conceptual plans and is included in the appendix (see **Appendix C**).

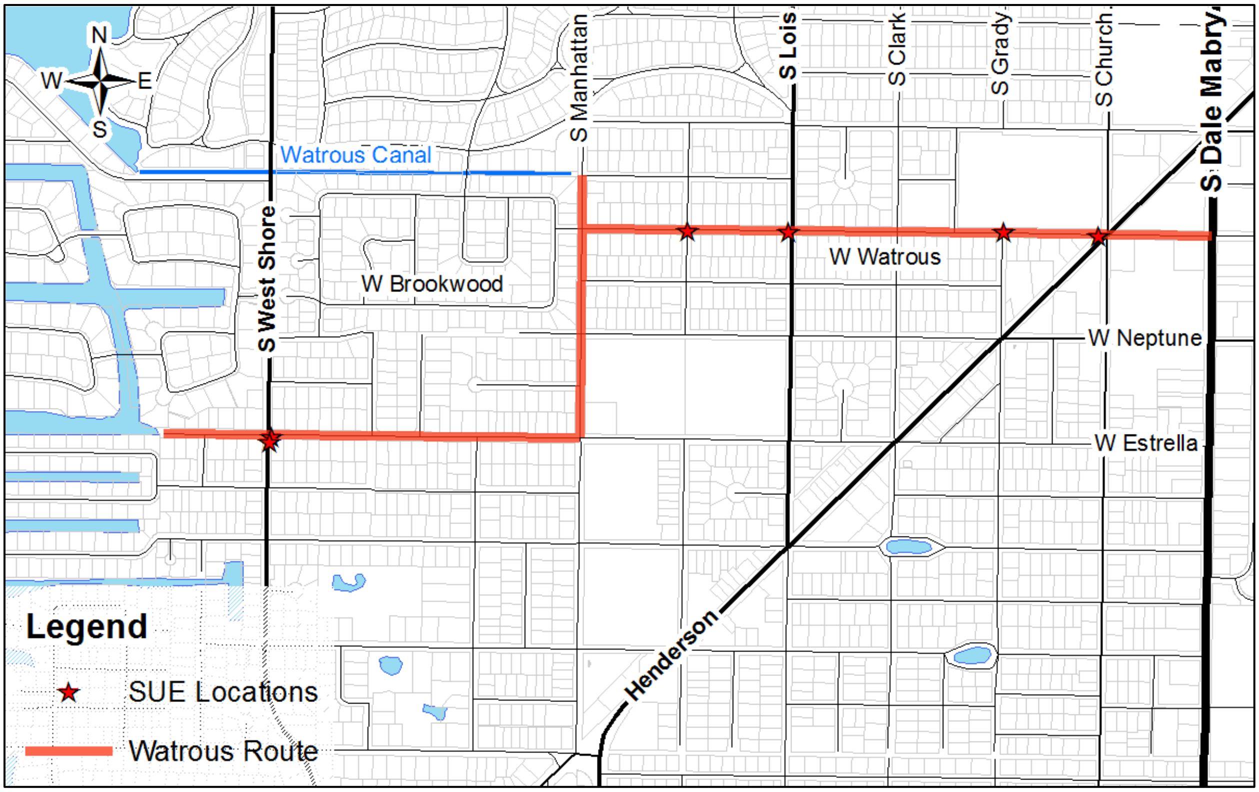


Figure 16. Subsurface Utility Exploration Points

5.6. Tree Impacts

The project is located in a highly urbanized area of the City of Tampa (**Figure 25**). Interflow Engineering staff and City of Tampa arborists walked the route on 25 February 2015 and 9 March 2015 to identify and evaluate potential tree impacts. During both field visits the impacts to existing landscaping and trees was considered and the proposed alignment was adjusted accordingly. No grand oak trees were identified to be removed. Further refinement of the proposed subsurface utilities (RCB culvert and relocated utilities) is possible with a site survey and formal tree assessment.

Figure 17. Aerial Photograph (circa 2013)

The alignment of the RCB culvert was adjusted to the southern half of West Watrous Ave (see Photograph *1.* W Watrous Ave (near Lois Ave)) to minimize impacts to existing trees. The alignment shift may also reduce impacts to the existing sanitary sewer and water mains located on the northern half of West Watrous Ave.

Photograph 1. W Watrous Ave (near Lois Ave)

5.7. Typical Sections

The following typical sections were based on approximate construction dimensions. Appropriate horizontal and vertical separations between utilities was considered, however since no survey information was acquired, utility conflicts may exist.

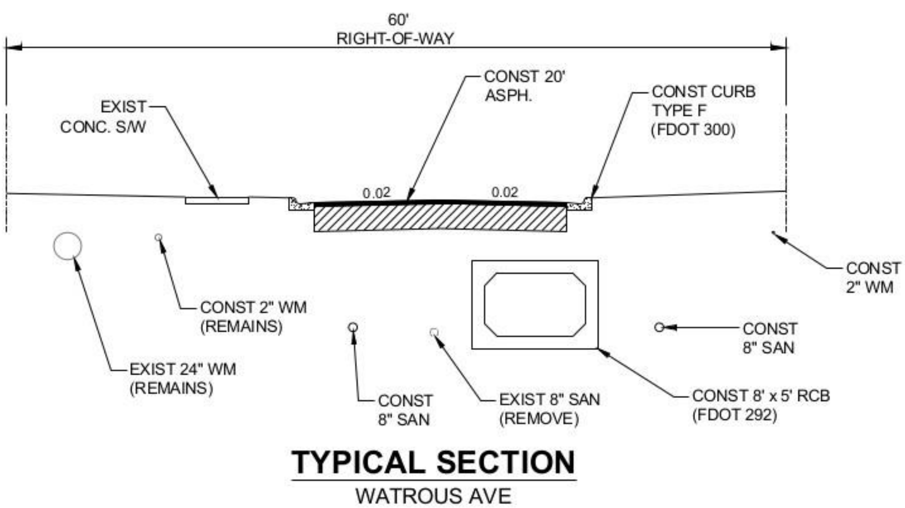


Figure 18. Watrous Ave Typical Section (not to scale)

The proposed alignment places the RCB culvert under the southern half of Watrous Ave to reduce impacts to existing utilities and trees (**Figure 18**).

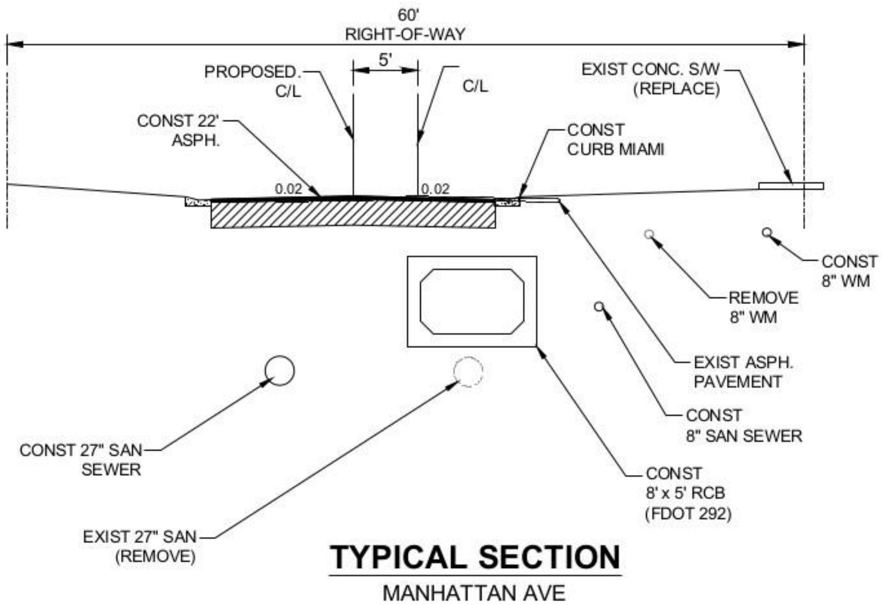


Figure 19. Manhattan Ave Typical Section (not to scale)

The proposed alignment favors the eastern side of the existing Manhattan Ave (**Figure 19**). The potential for shifting Manhattan 5-feet west (generally near the Interbay Pool and little league baseball fields) can add and enhance off-street parking.

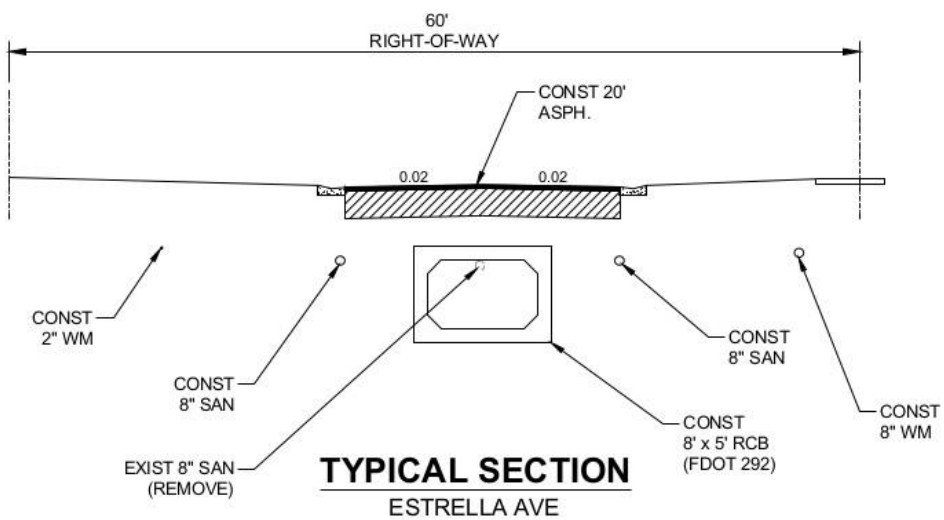


Figure 20. Estrella St Typical Section (not to scale)

The alignment along Estrella is challenging due to the tree impacts. Placing the RCB culvert in the middle of Estrella appears to minimize the impacts as much as possible (**Figure 20**).

Additional details are provided in the Conceptual Plans (see **Appendix A**).

5.8. Water Quality Improvements

Improving stormwater quality in highly developed urban and residential areas is challenging. Using typical approaches (for example, stormwater ponds) for treatment are not economical as vacant land is not available. Alternatively, use of baffle boxes (for example, **Figure 22** Suntree Technologies, Inc. Nutrient Separating Baffle Box), screens and skimmers can improve the water quality of stormwater discharges. Many of these systems are be used to retrofit existing systems or can be constructed with new features.

Potential locations for baffle boxes should be evaluated based on site specific conditions. The following sites may warrant further investigation (**Figure 21**):

- Existing 3.5' x 4' RCB on Neptune Street east of Manhattan Ave.
- Existing 30" RCP on Estrella Street east of Manhattan Ave.

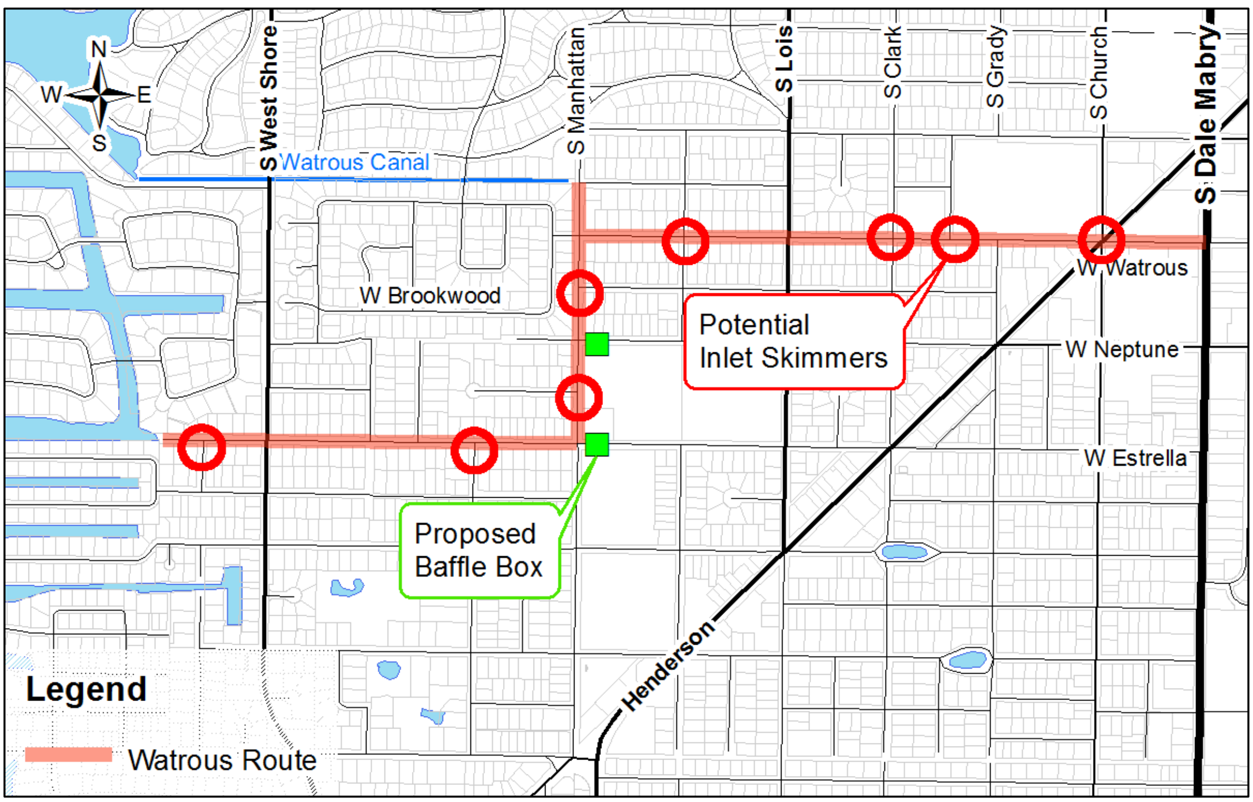


Figure 21. Proposed/Potential Water Quality Improvements

Additionally, the proposed curb and grate inlets along the project may be fitted with inlet baskets (screens) (for example, **Figure 23**, Suntree Technologies, Inc. Grate Inlet Skimmer Box) to remove decaying vegetation and other suspended pollutants from the runoff prior to discharging to the downstream receiving water body (Tampa Bay).

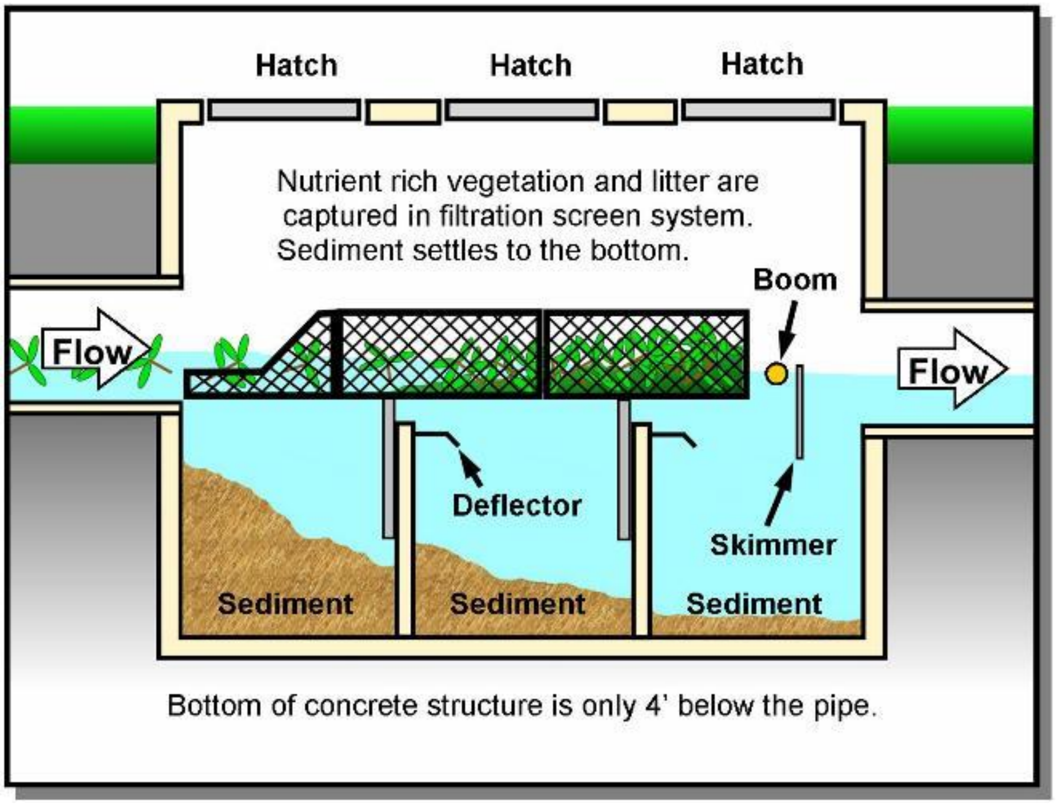


Figure 22 Nutrient Separating Baffle Box

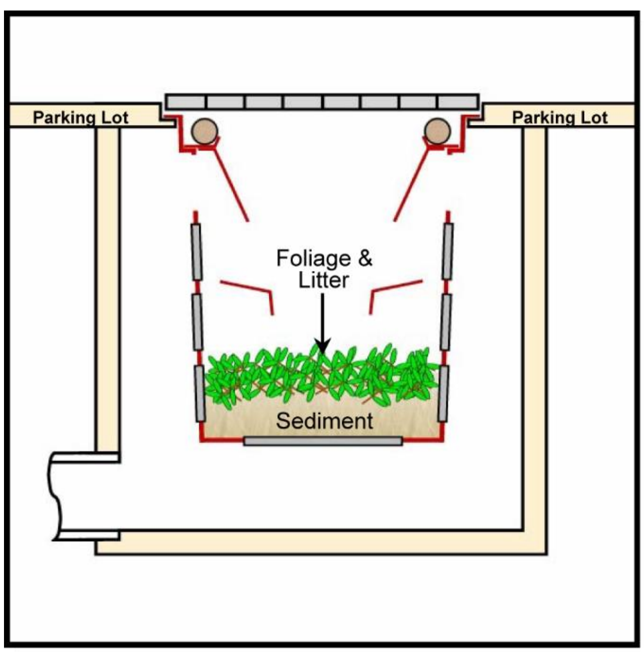


Figure 23. Grate Inlet Skimmer Box

5.9. Construction Contracting and Phasing

The City has expressed a preference for the Design-Build approach on this project. To that end, a preliminary phasing plan was developed (**Figure 24**), the purpose of which was to allow the design/build team to complete the design and permitting for Phase 1 and begin construction prior to completing the designs for phases 2 and 3. The design/build team may adjust the phasing to suit the final design. Construction of phases during the dry season[3] may reduce costs for dewatering.

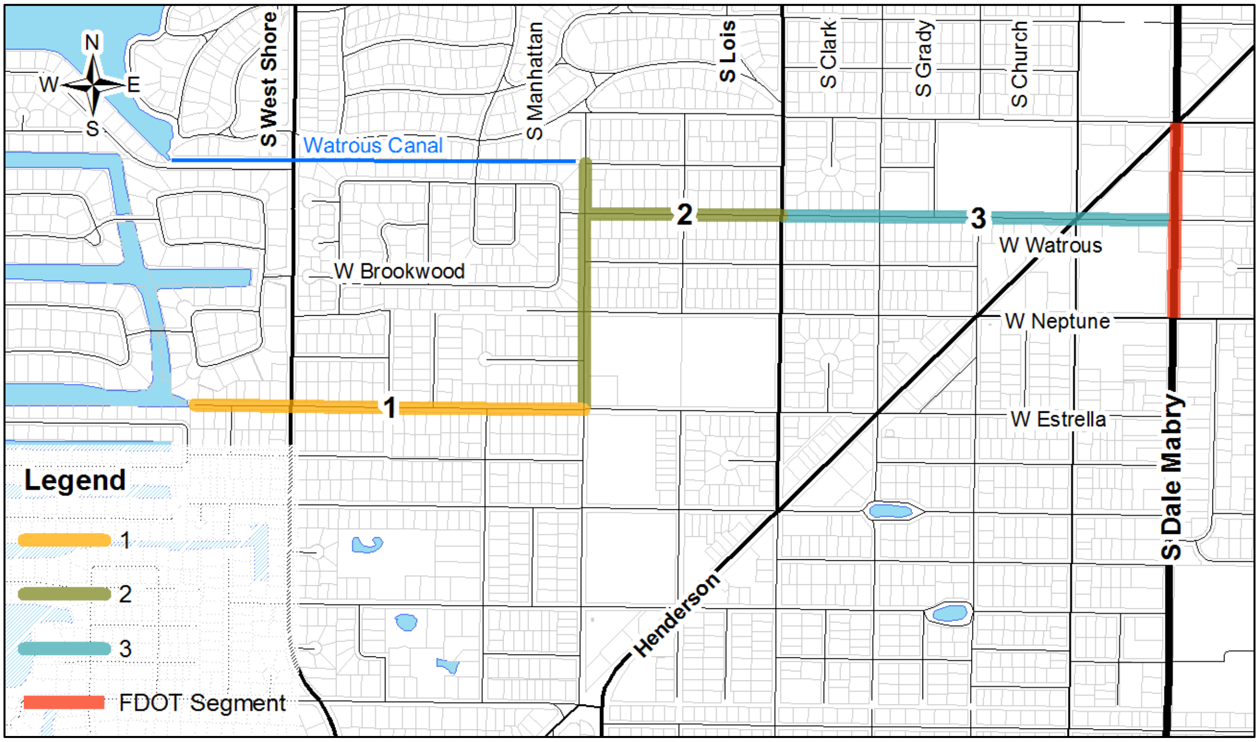


Figure 24. Proposed Construction Phases

[3] Dry season for West-Central Florida is typically October through May, see Southwest Florida Water Management District Rainfall Summary Tables.

5.10. Conclusions and Recommendations

Based on the information available to the authors at the time of this report, the construction of the proposed stormwater conveyance improvements appears to be feasible. Conceptual plans were developed based on available information including geographic information system (GIS) data, LiDAR-based topography, and as-built construction plans from the City's files. A comprehensive field survey will provide more accurate and complete description of existing features and facilities. However, it is also important to note that small differences in topography, right-of-way limits, property lines, horizontal and vertical locations of utilities, disposition of trees, etc. will not affect the overall feasibility of this project.

Additionally, hydrologic and hydraulic modeling completed by others was used to determine the proposed box culvert dimensions. That modeling effort should be refined and augmented as necessary to account for the connections and sizing of local drainage features along the route, as shown on the Conceptual Plans, with associated adjustments to the primary conveyance features if deemed necessary.

5.10.1. Recommendations

Interflow, after reviewing the available information, visiting the project area several times, meeting with various stakeholders, recommends the City do the following:

1. Coordinate with regulatory agencies,
2. Obtain a Conceptual ERP Permit (for phases/complete project),
3. Complete a topographic and route survey,
4. Complete a formal tree assessment of all trees in or immediately adjacent to the right-of-way,
5. Complete a geotechnical investigation at regular intervals to assess soils for stability and unsuitable materials,
6. Update and refine the hydrologic/hydraulic analysis for proposed box culvert and local drainage,
7. Create new base drawings and proceed with formal design, and
8. Conduct extensive public outreach, including neighborhood meetings.

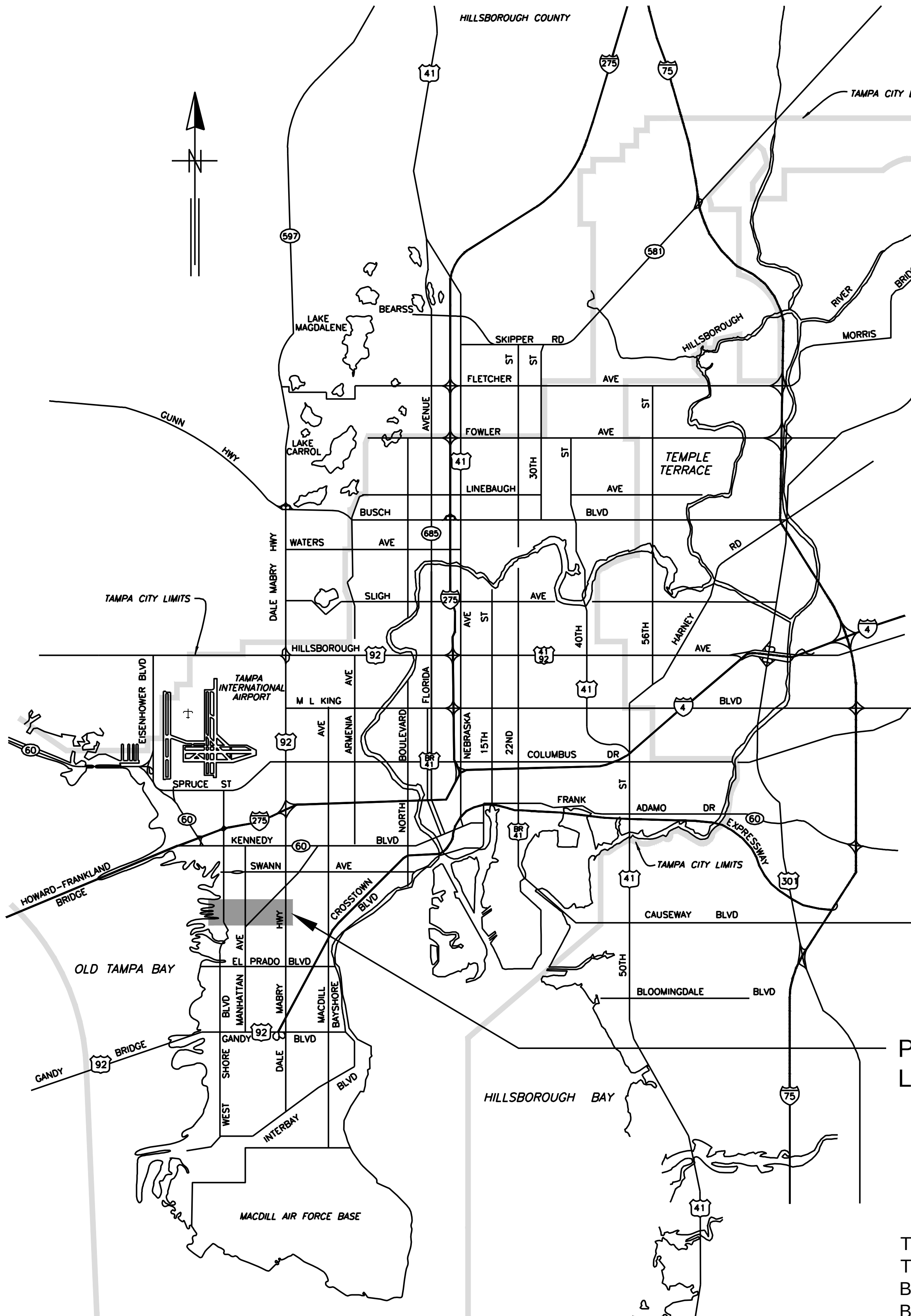
Figure 25. Aerial Photograph of Project Area

Appendices

A. Conceptual Plans

By Interflow Engineering LLC

CONCEPTUAL



VICINITY MAP

CITY of TAMPA

Department of Transportation and Stormwater Services
Stormwater Engineering Division

Upper Peninsula Watershed Drainage Improvements - Dale Mabry/ Henderson Trunkline

THE PURPOSE OF THESE CONCEPTUAL DRAWINGS WAS TO ATTAIN FEASIBILITY FOR THE CONSTRUCTION OF THE BOX CULVERTS. THE DRAWINGS WERE NOT PREPARED BASED ON TOPOGRAPHIC SURVEY, AND THE EXISTING UTILITIES WERE SHOWN BASED ON THE BEST INFORMATION AVAILABLE.

APPENDIX A - CONCEPTUAL DRAWINGS

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www.interfloweng.com
CA Lic. No: 26901

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CKD:	JL
DATE:	11/4/16

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Stormwater Engineering Division

Upper Peninsula Watershed Drainage Improvements - Dale Mabry/ Henderson Trunkline

COVER SHEET

115215559

SHEET 1 OF 17

CONCEPTUAL

LEGEND

	EXISTING	PROPOSED
Buried Telephone Cable	bt b	
Buried Fiber Optic Cable	fo fo	
Gas Main	4" gas 4" ga	4" GAS
Water Main	2" wm 2" wm	2" WM
Reclaimed Water	6" rcwm 6" rc	6" RCWM
Sanitary Pipe		
Sanitary Manhole		
Storm Pipe		
Storm Manhole		
Storm Catch Basin/ Curb inlet		
Storm Baffle Box		
Storm Junction Box		
Storm Structure I.D.		1000
Sanitary Structure I.D.		100

TABLE OF CONTENTS

GENERAL NOTES

1. Elevations based on National American Vertical Datum of 1988 (NAVD-1988). Topographic information derived from Digital Elevation Model (DEM) based on LiDAR from the Florida Division of Emergency Management (FDEM). All elevations should be considered approximate.

2. No site specific survey was conducted to prepare these plans. All locations, depths, sizes, and materials should be considered approximate.

3. No engineering calculations were performed for proposed local drainage features (I.E. Minor system storm laterals). Appropriate size and type of all storm inlets and pipe connections should be verified during formal design.

4. All feature locations shown are approximate.

5. Locations, elevations, and dimensions of the existing utilities, structures and other features are shown according to available GIS/Atlas information at the time of the preparation of these plans and do not purport to be absolutely correct.

6. No engineering calculations were performed for adjustment of existing or proposed utilities (stormwater, water, reclaimed water, sanitary, gas, etc). Confirmation of appropriate size and type of all utilities should be performed prior to construction.

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GENERAL NOTES

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KEY SHEET

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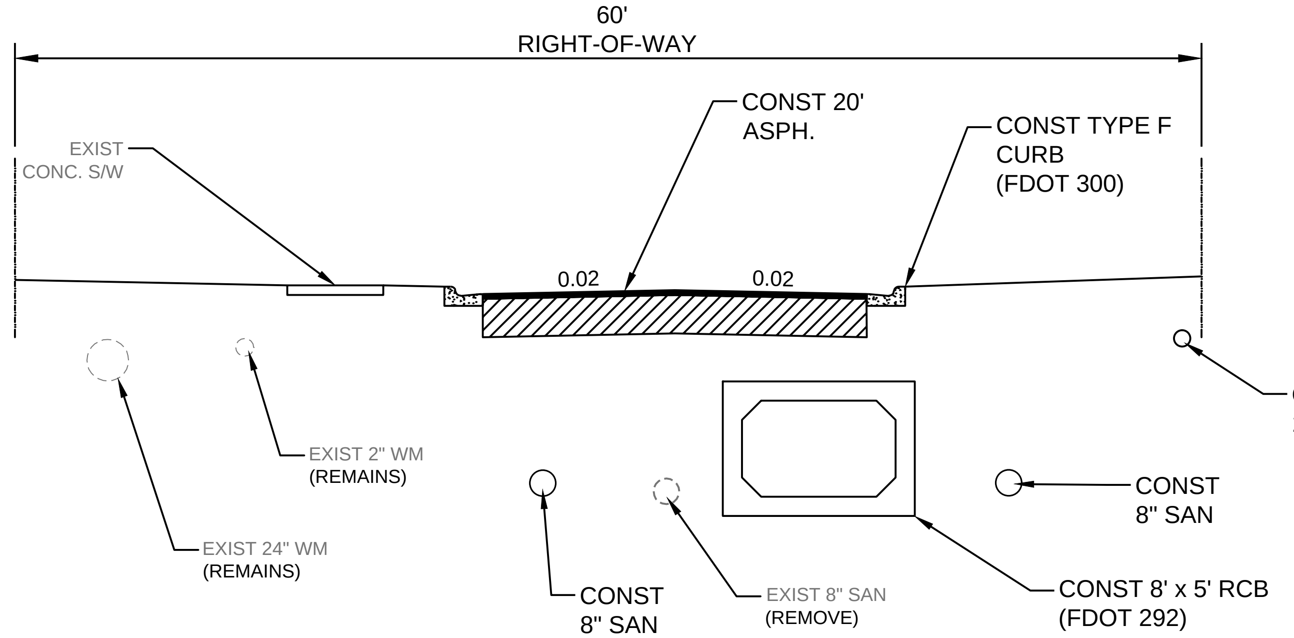
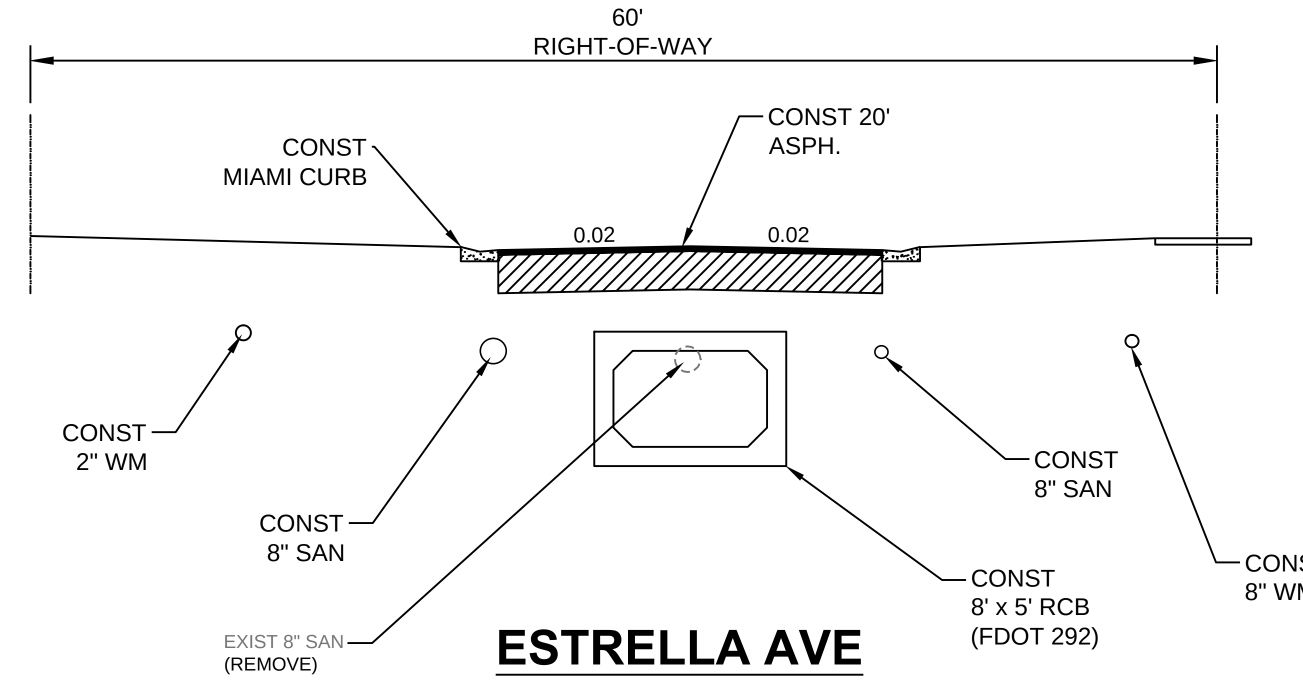
CONCEPTUAL



WATROUS AVE

N.T.S.



ESTRELLA AVE

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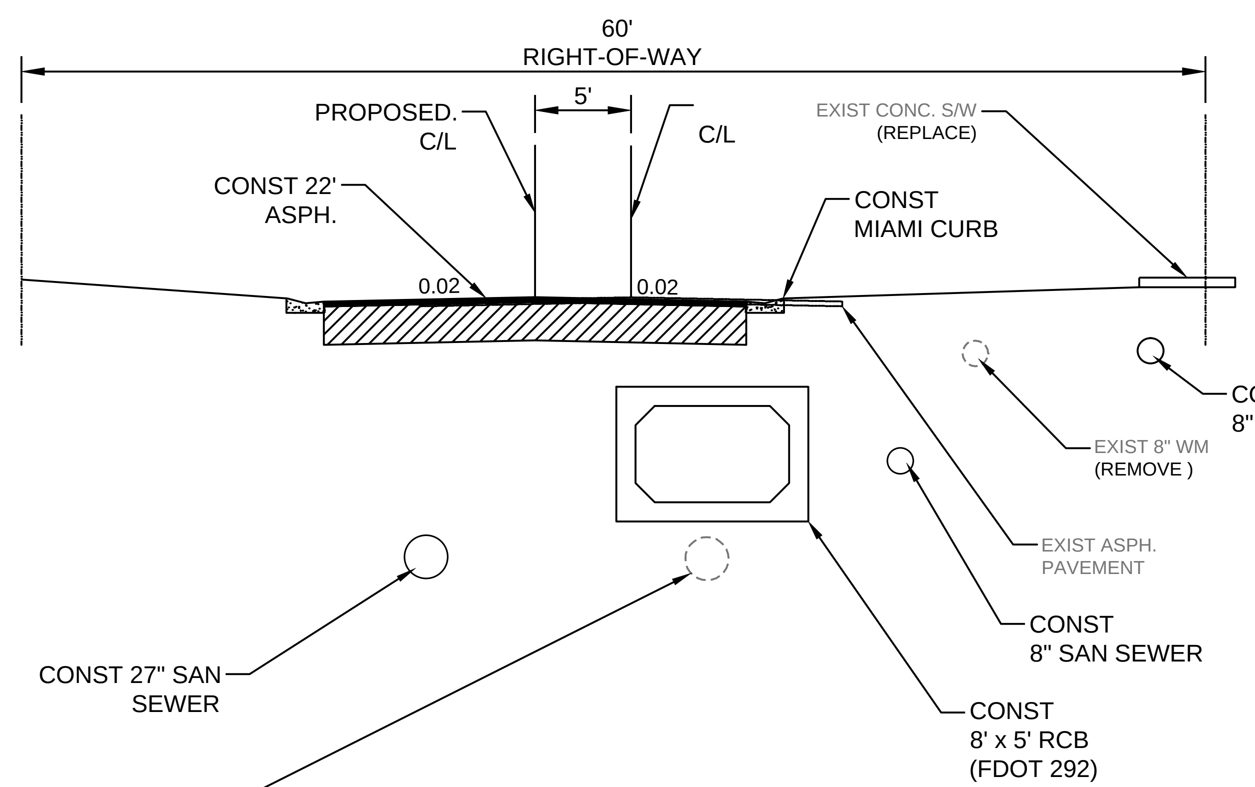

MANHATTAN AVE

N.T.S.

NOTES:

1. Horizontal and vertical separations between public water system mains and stormwater sewers, sanitary sewers, and reclaimed water mains, must comply with 62-555.314 FAC.

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TYPICAL SECTIONS

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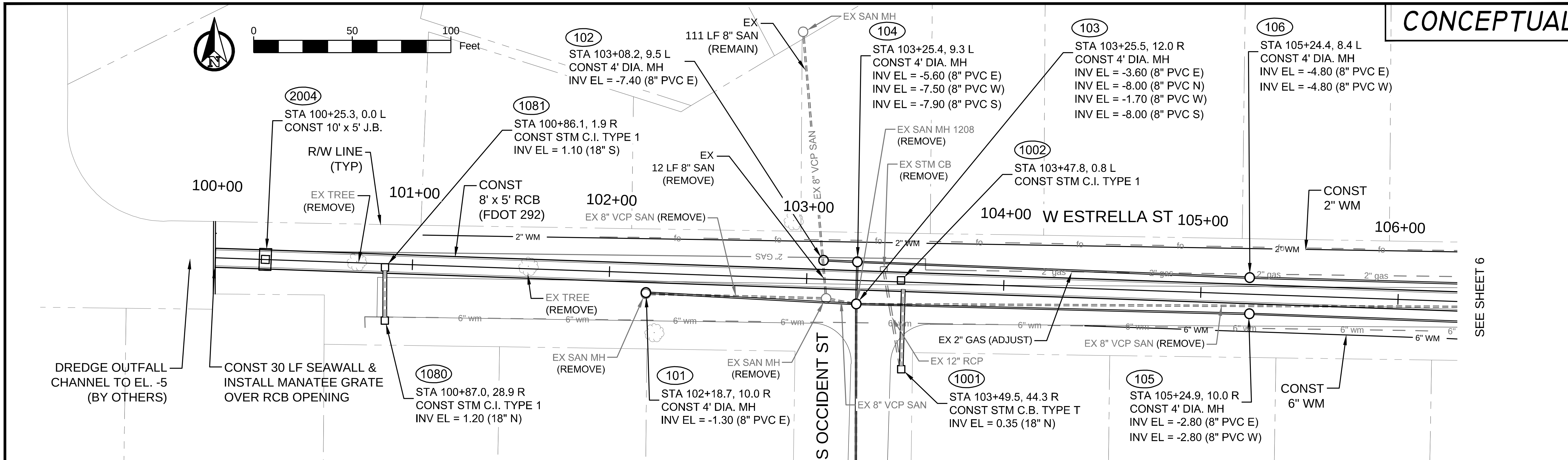

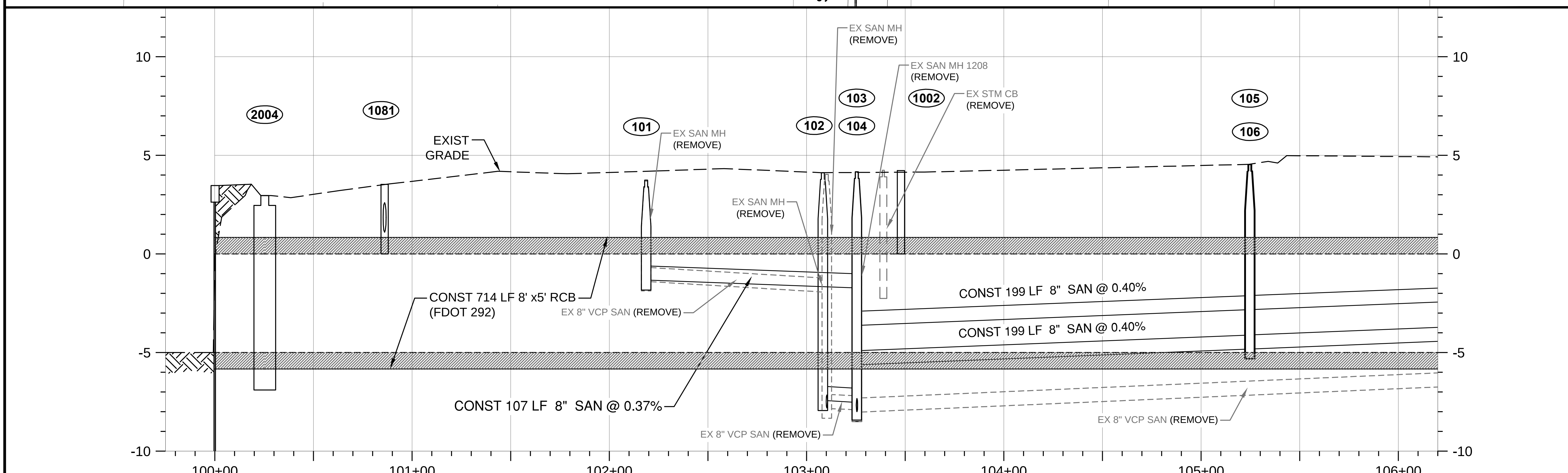

SCALE: H:1"= 50' V:1"= 5'

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W ESTRELLA ST

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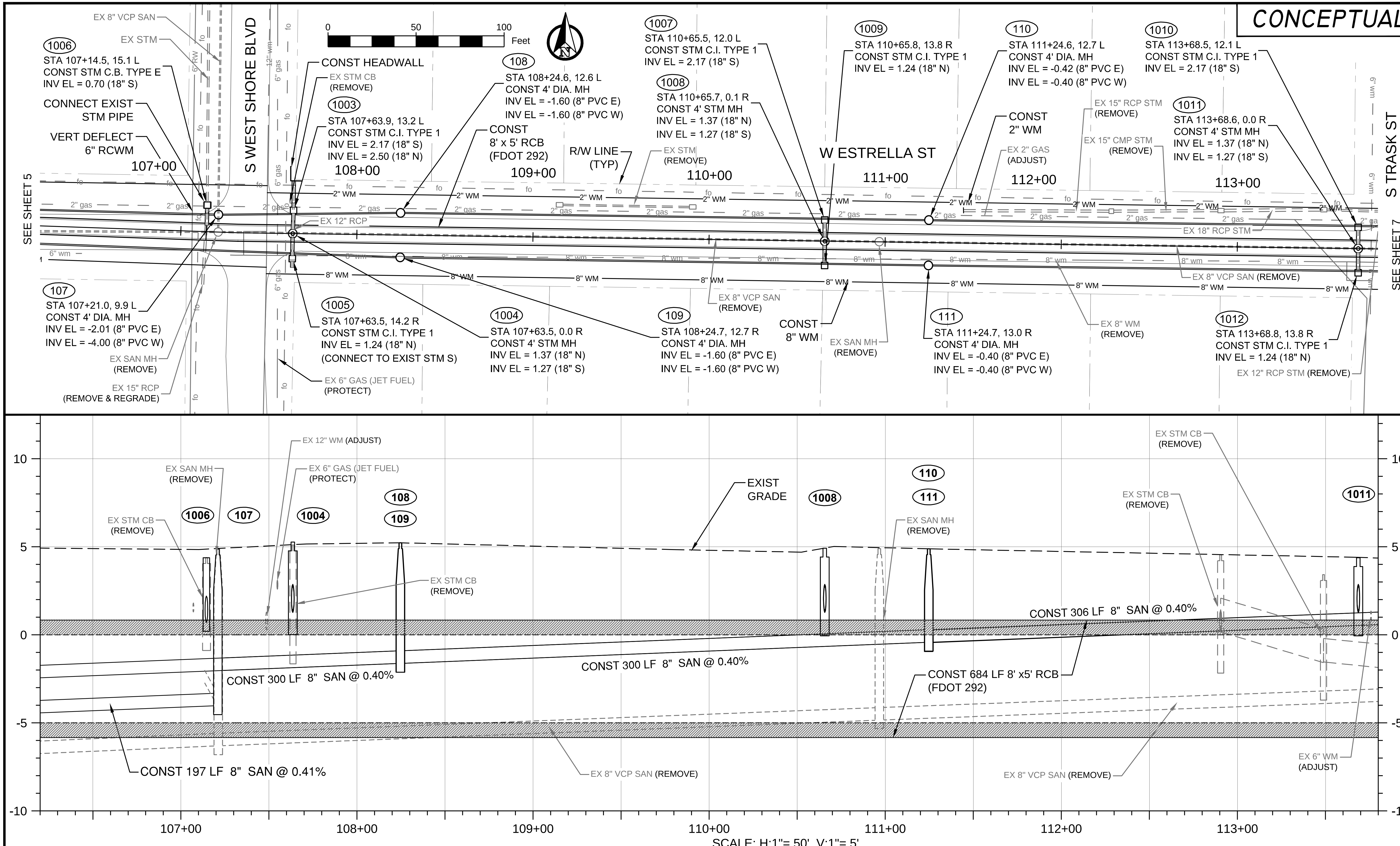

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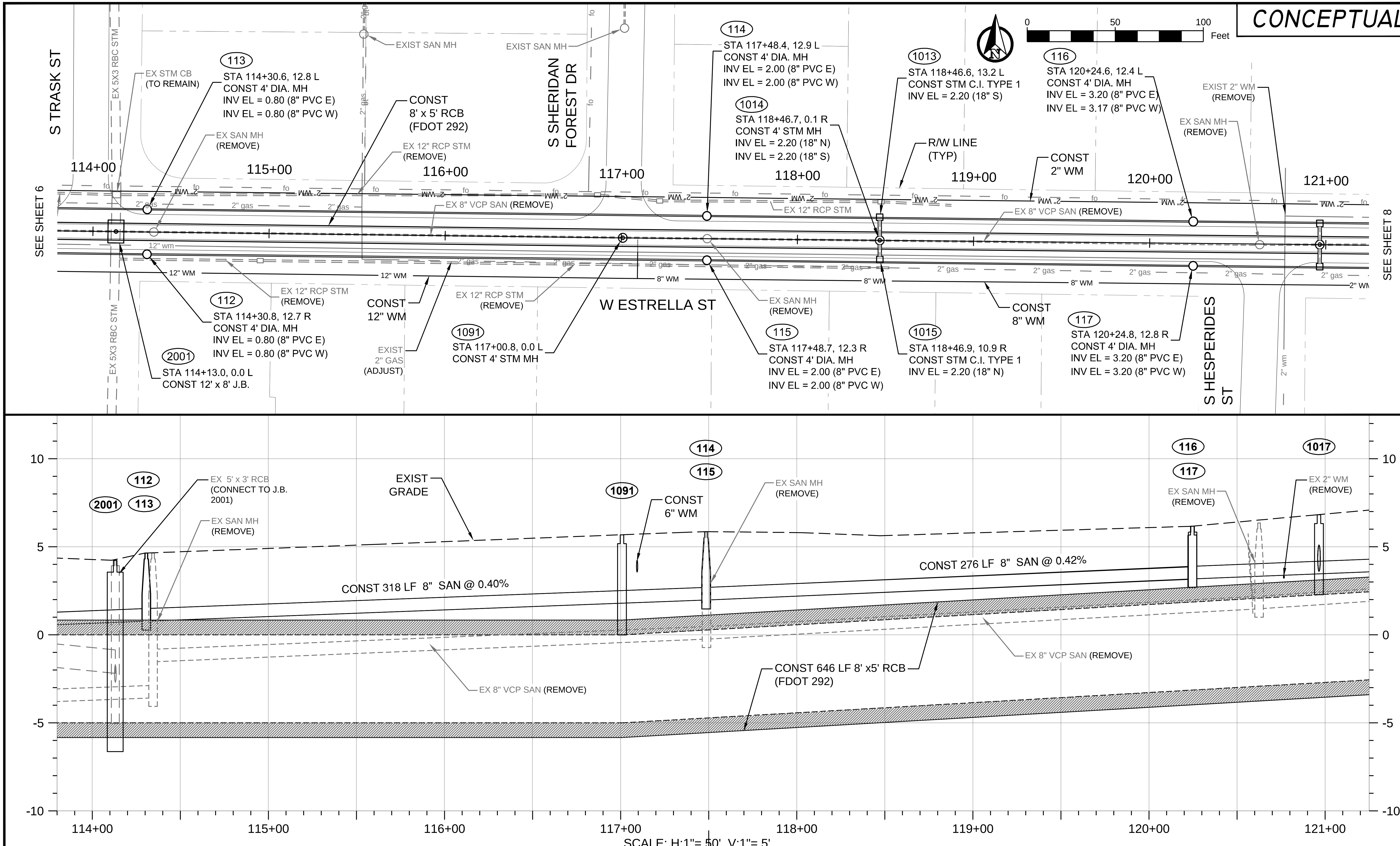

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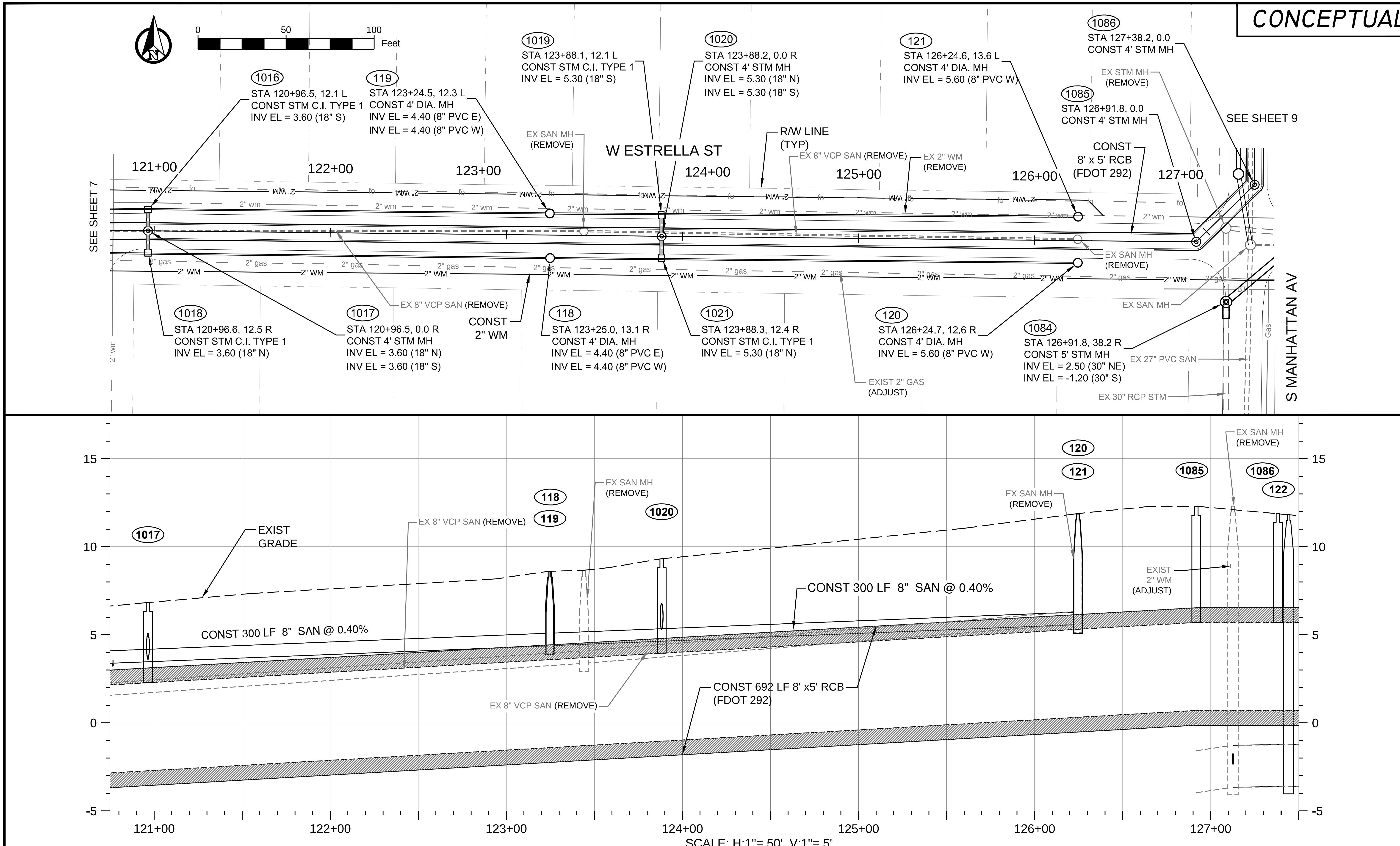

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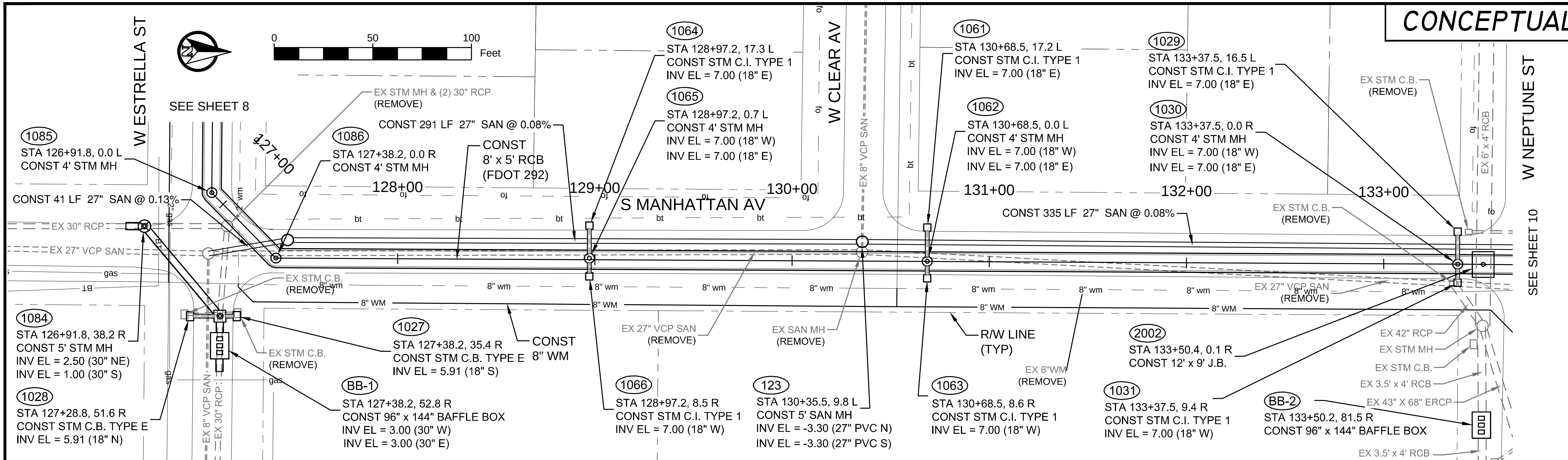

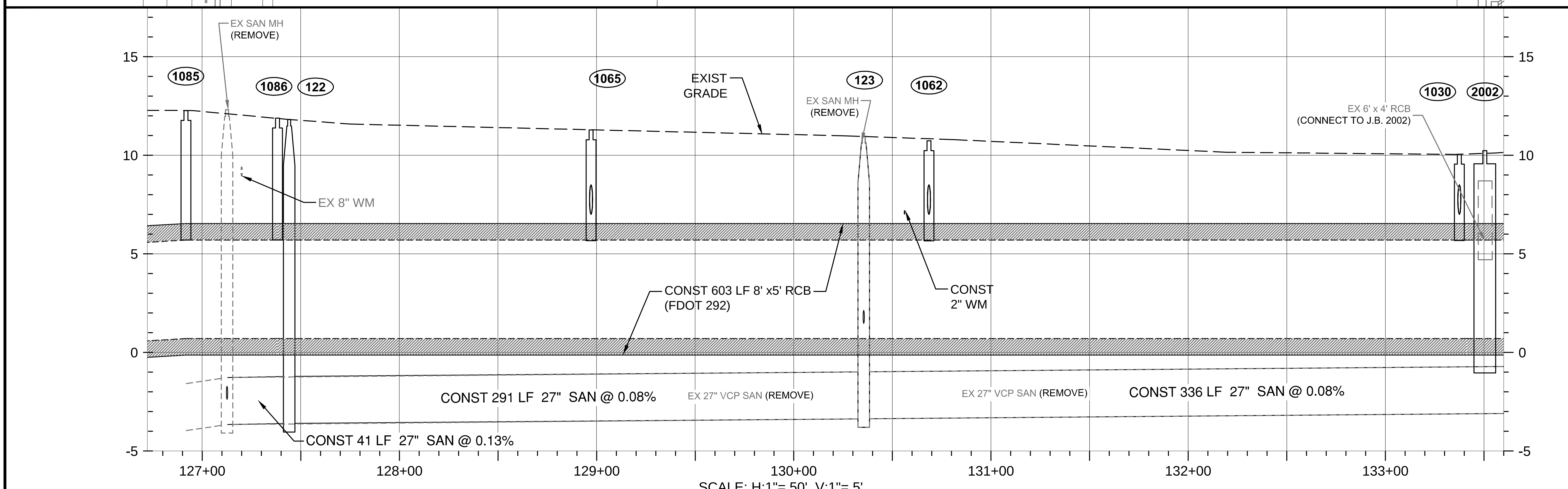

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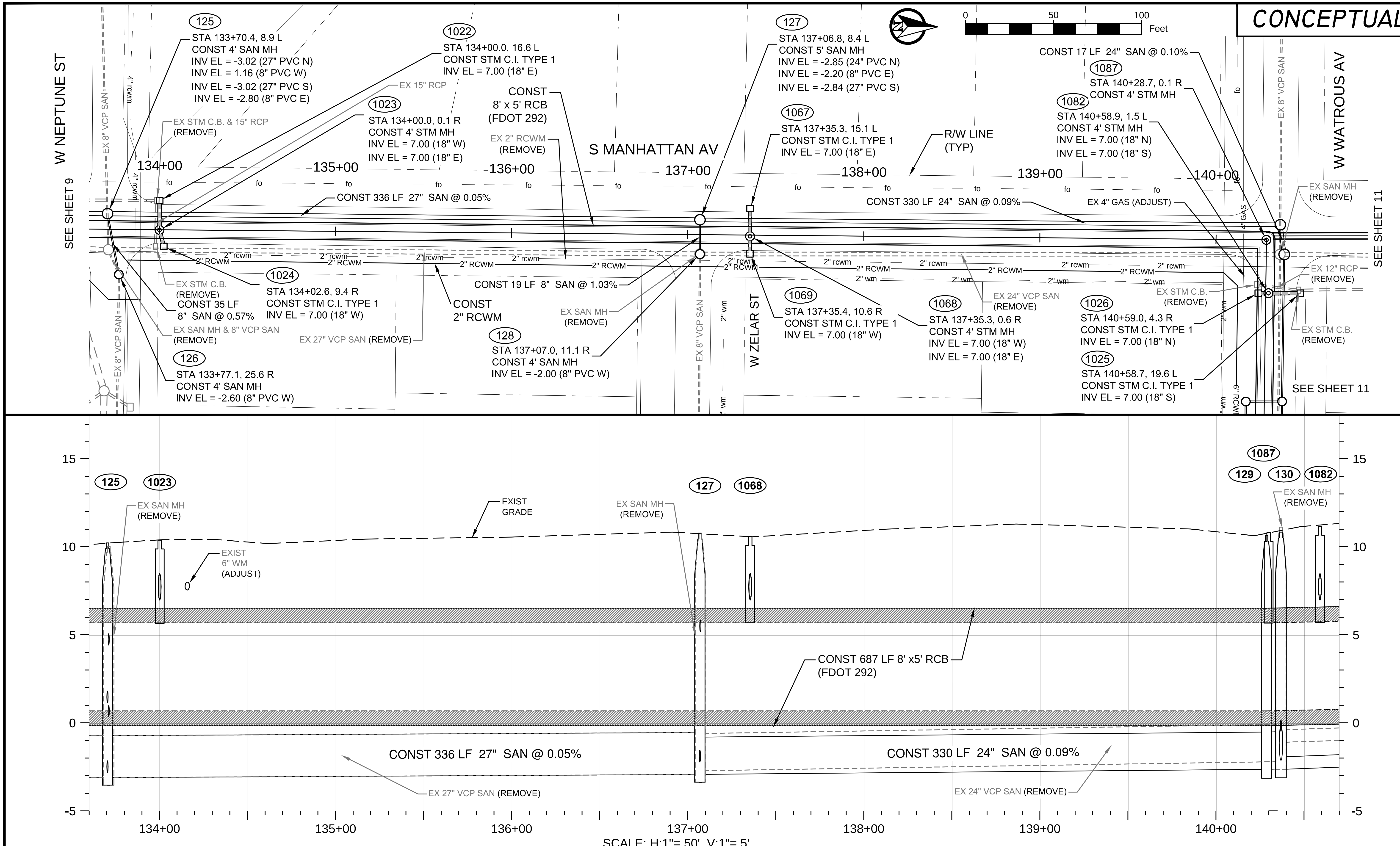

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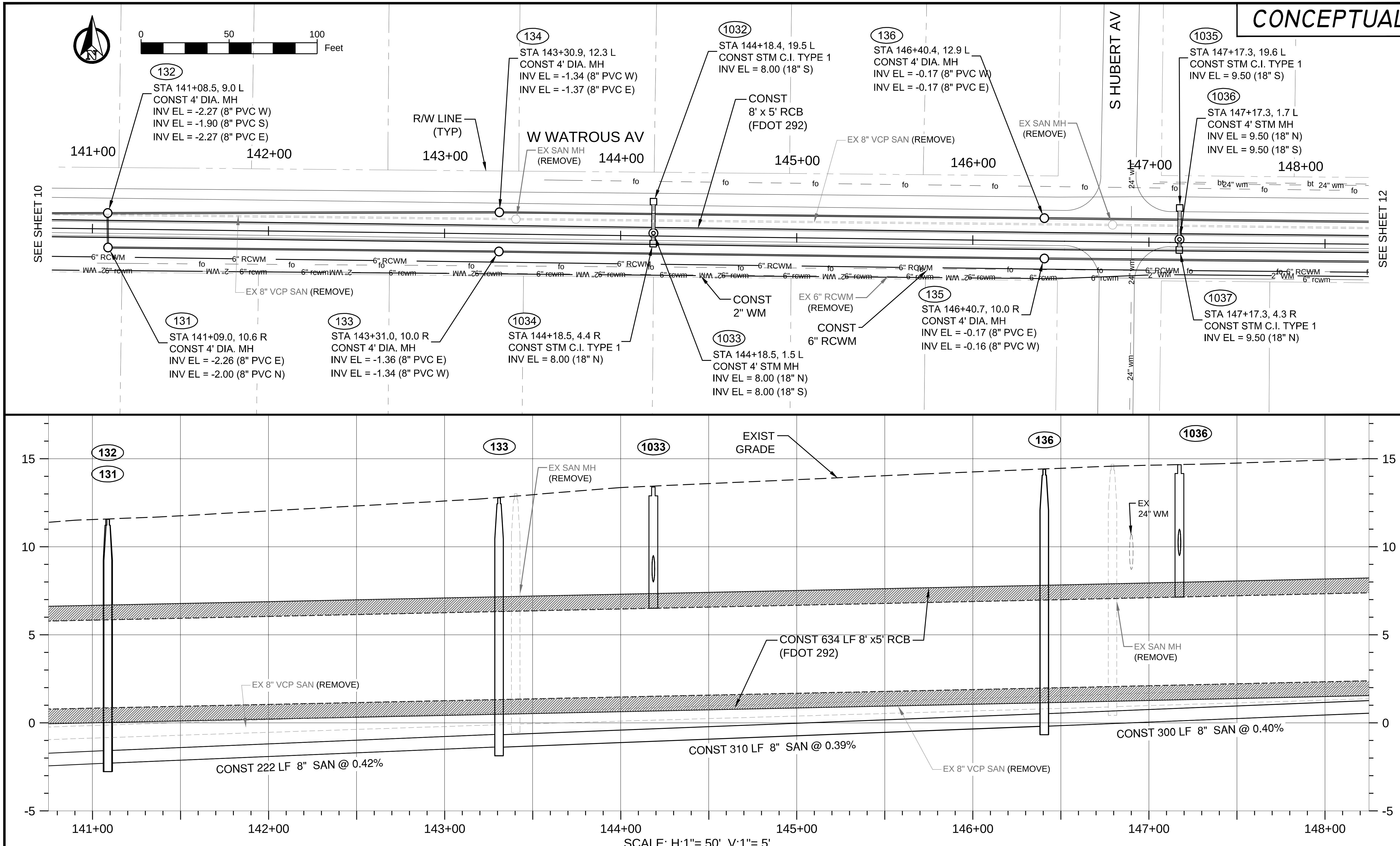

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W WATROUS AV

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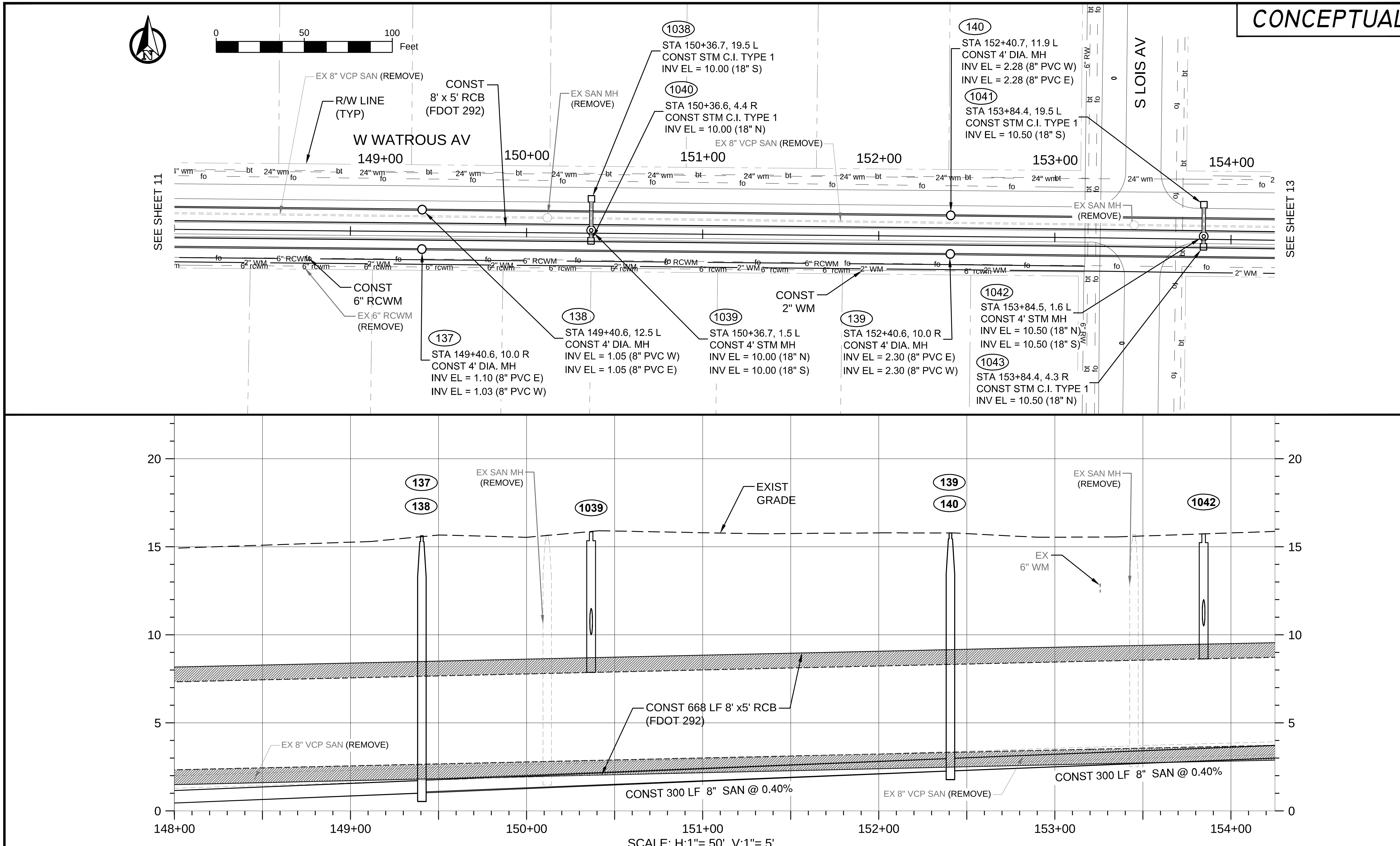

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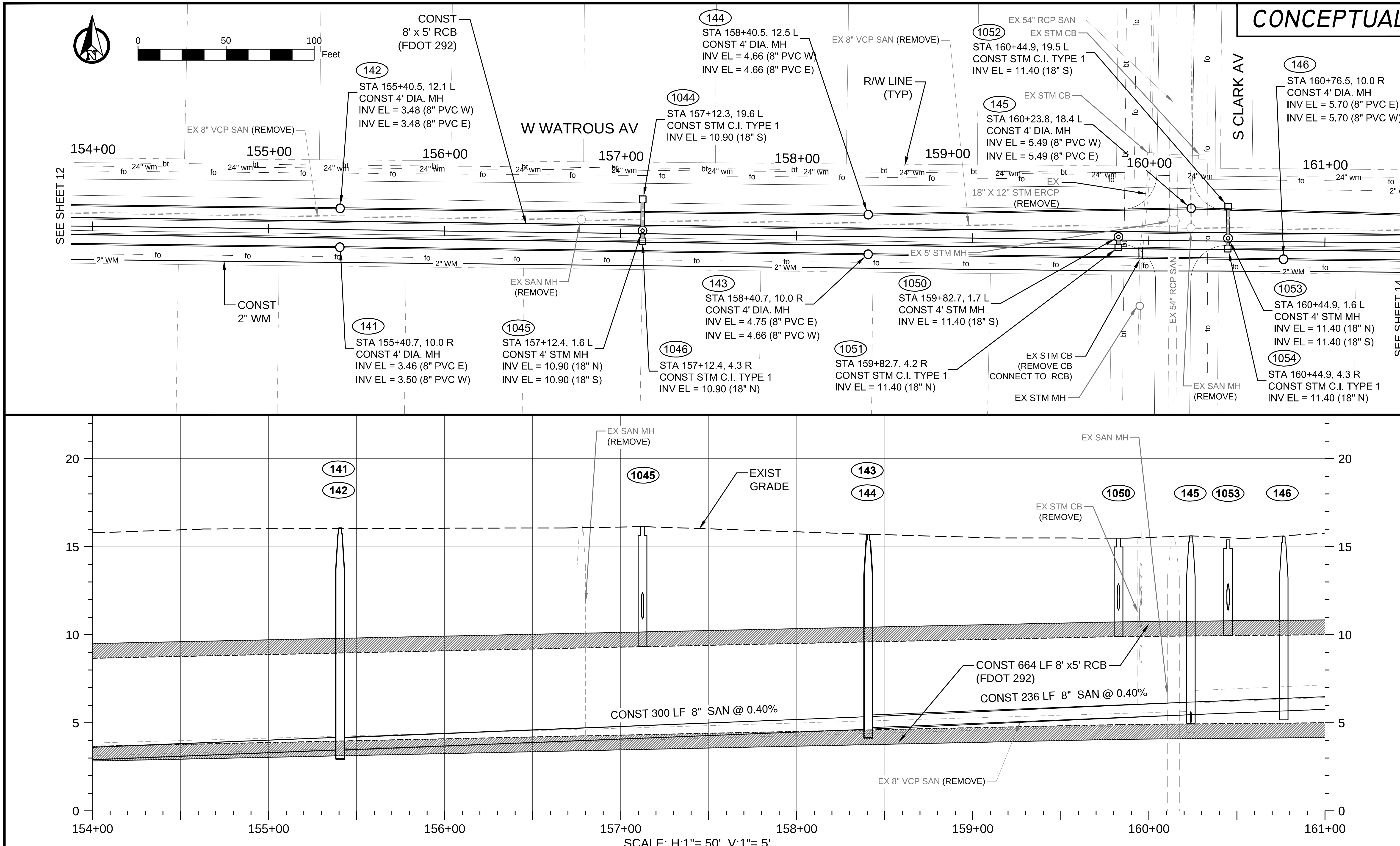

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Upper Peninsula Watershed Drainage Improvements - Dale Mabry/ Henderson Trunkline

W WATROUS AV

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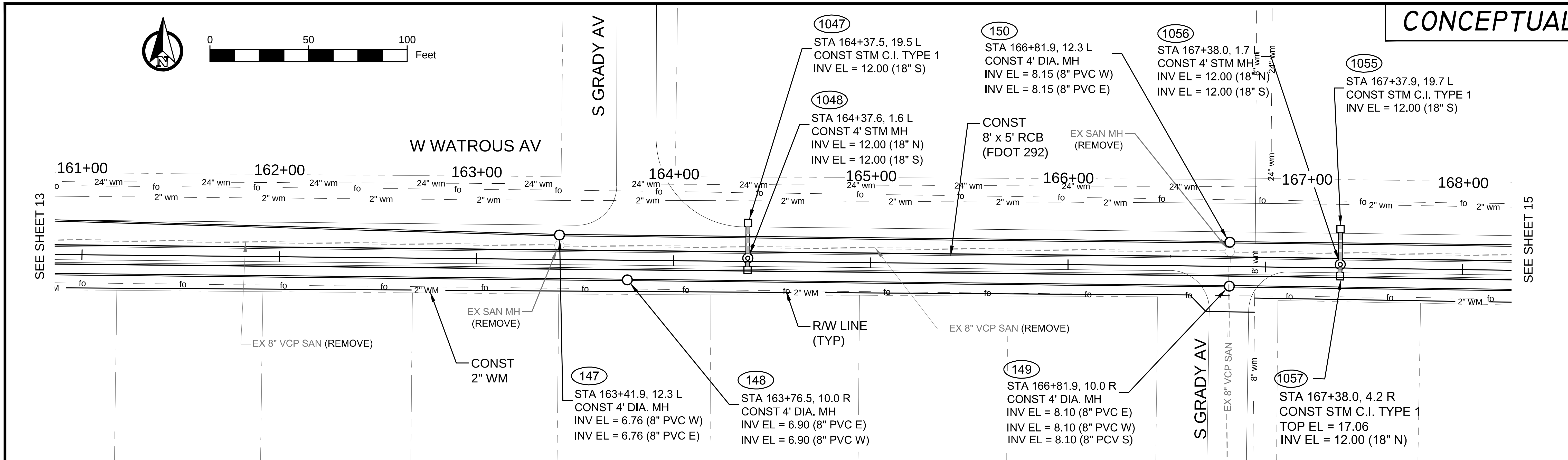

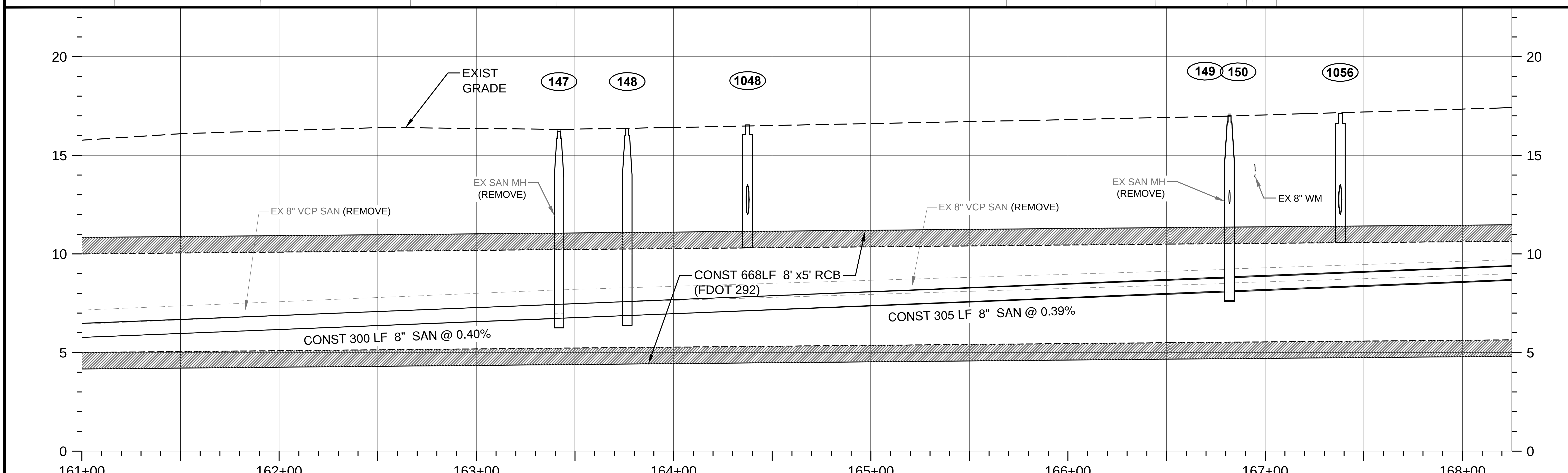

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Upper Peninsula Watershed Drainage Improvements - Dale Mabry/ Henderson Trunkline

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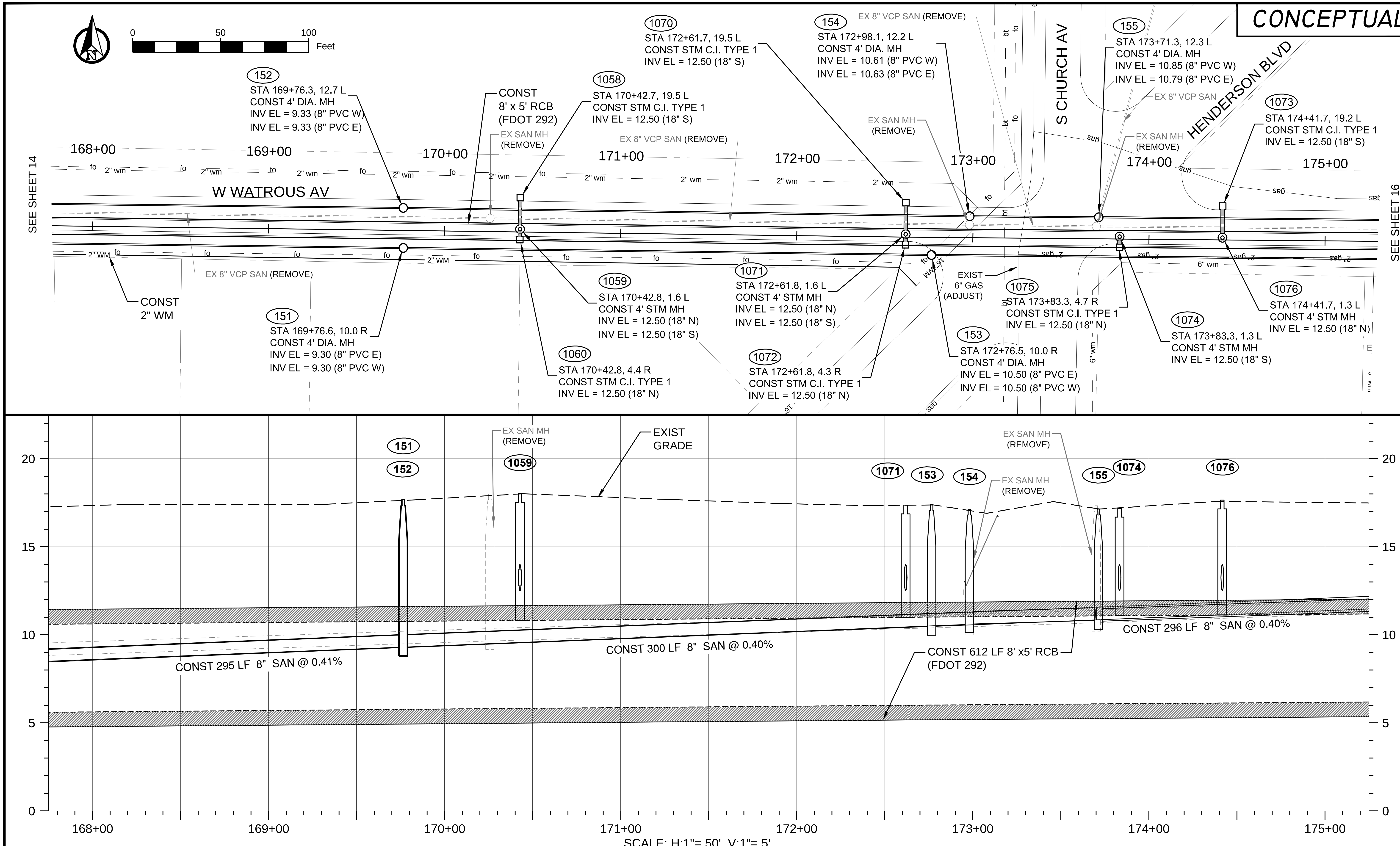

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Upper Peninsula Watershed Drainage Improvements - Dale Mabry/ Henderson Trunkline

W WATROUS AV

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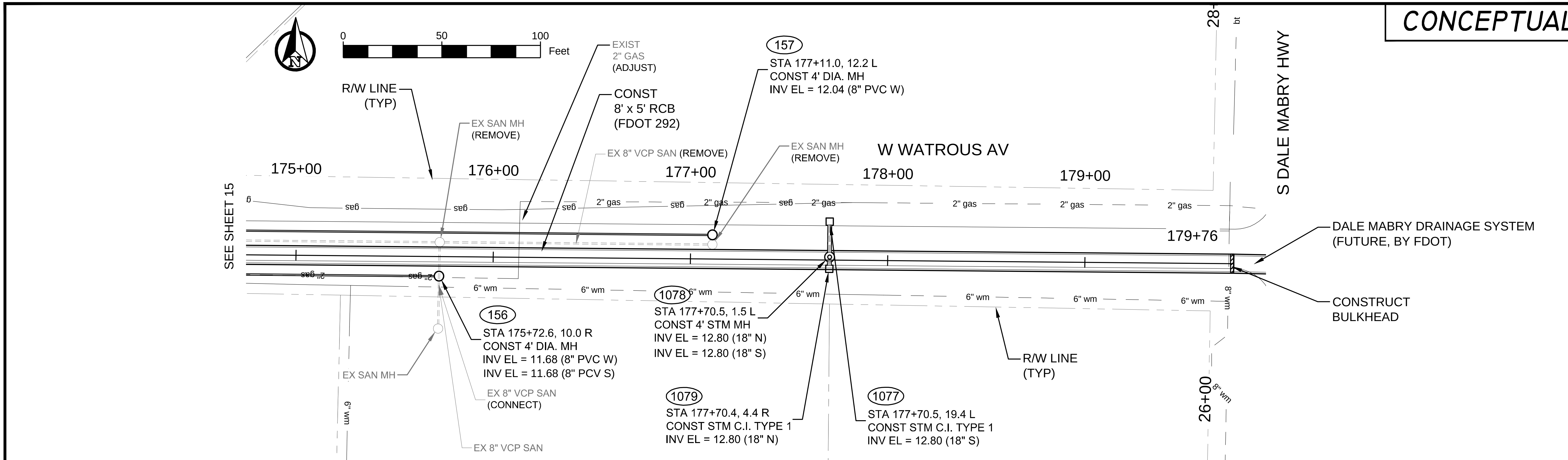
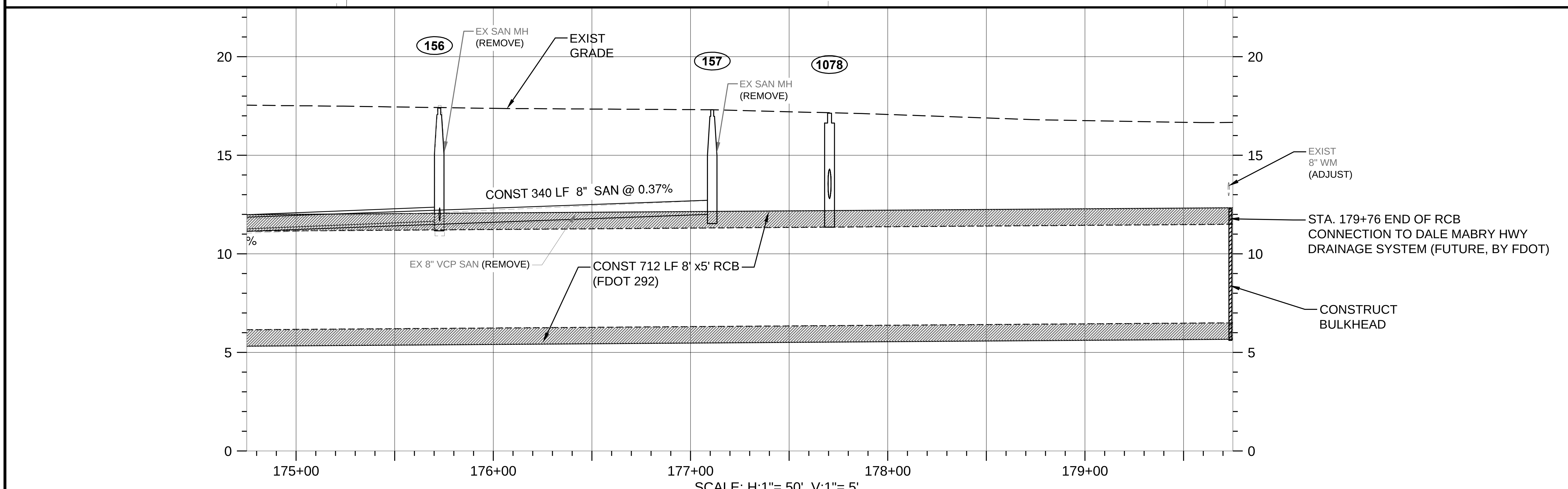
CONCEPTUAL





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- Dale Mabry/ Henderson Trunkline

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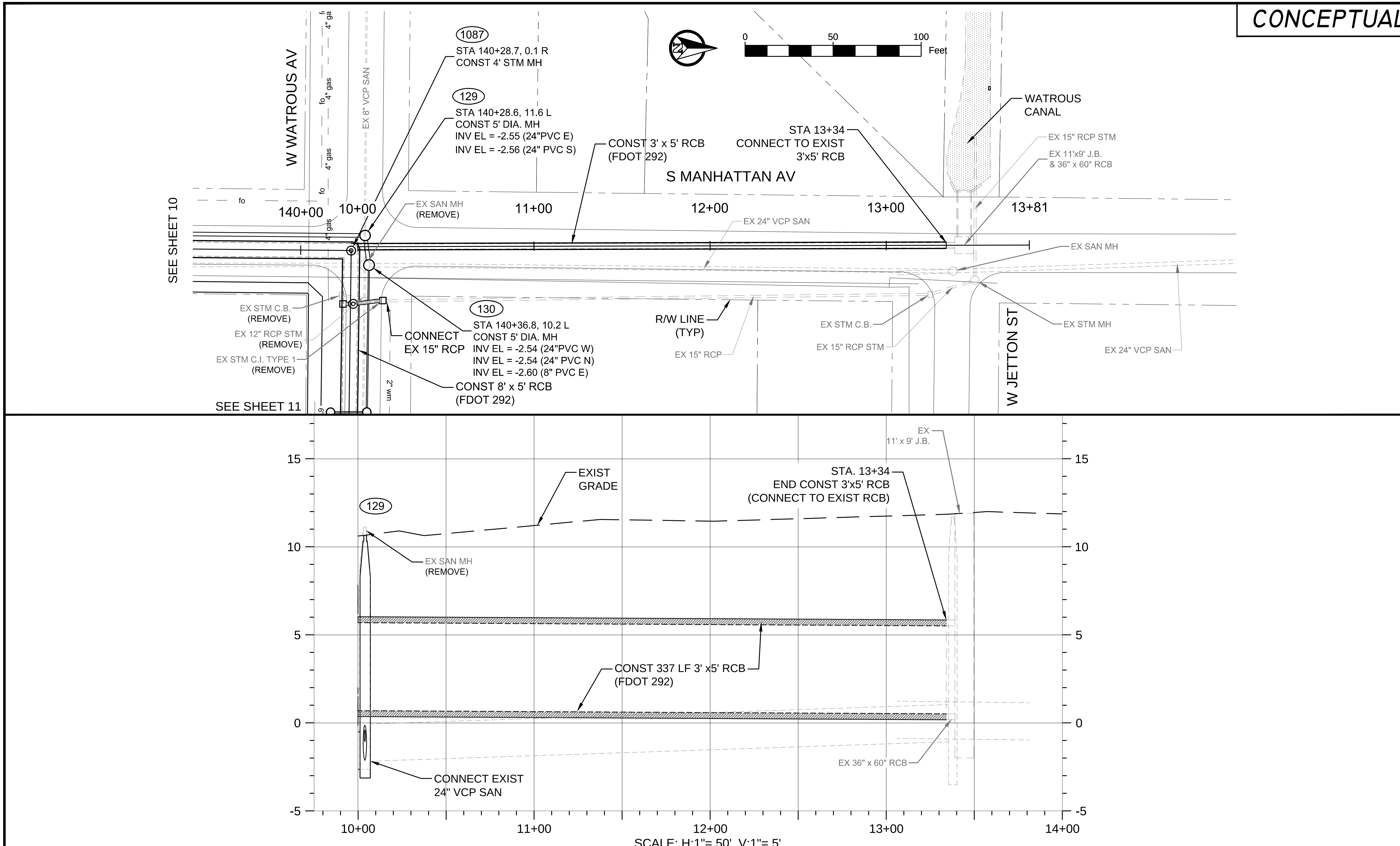

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Upper Peninsula Watershed Drainage Improvements
- Dale Mabry/ Henderson Trunkline

S MANHATTAN AV

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B. Engineer's Opinion of Probable Construction Cost

By Interflow Engineering LLC

INTERFLOW ENGINEERING, LLC
14499 North Dale Mabry Highway, Suite 290 ● Tampa, Florida 33618 ● (813) 969-6469 ● www.interfloweng.com

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

CLIENT:	DATE:	REVISION:
John A. Early, P.E. City of Tampa Stormwater Division 306 E. Jackson Street 6N Tampa, FL 33602 (813) 274-3257	3/27/2015	11/4/2016
	PROJECT: Upper Peninsula Watershed Drainage Improvements - Dale Mabry/ Henderson Trunkline	
	PHASE: PROJECT SUMMARY	

PHASE		SUBTOTAL
SEGMENT 1 - W. ESTRELLA ST	$	13,468,000
SEGMENT 2 - S. MANHATTAN AV and WATROUS (Manhattan to Lois)	$	12,043,000
SEGMENT 3 - W. WATROUS AV (Lois to Dale Mabry and Dale Mabry Hwy)	$	11,073,000
PROJECT TOTAL	**$**	**36,584,000**

PREPARED BY: John E. Loper, P.E.

SEGMENT 1 - W. ESTRELLA ST

ITEM DESCRIPTION	UNIT	UNIT COST	QTY	LINE TOTAL
Cofferdam	LS	$ 40,000	1	$ 40,000
Excavation, Trench box, & staging.	CY	$ 40	31500	$ 1,260,000
Excavation (Unsuitable Fill)	CY	$ 100	9500	$ 950,000
Dewatering Normal	DY	$ 100	180	$ 18,000
Additional Dewatering (Outfall to Occident)	DY	$ 2,000	60	$ 120,000
Seawall Removal & replacement	LF	$ 1,000	50	$ 50,000
18"-24" RCP	LF	$ 90	236	$ 21,240
8' x 5' RCB	LF	$ 1,000	2736	$ 2,736,000
8' x 5' RCB 45^0	LF	$ 2,000	16	$ 32,000
10' x 5' Junction Box w/Stop Logs	EA	$ 8,730	1	$ 8,730
12' x 8' Junction Box (Exist Storm tie-in)	EA	$ 12,000	1	$ 12,000
Storm Manhole 4' DIA	EA	$ 4,000	9	$ 36,000
Baffle Box BB-1	LS	$ 200,000	1	$ 200,000
City Type 1 Curb Inlet	EA	$ 6,500	15	$ 97,500
City Type T Grate Inlet	EA	$ 6,000	1	$ 6,000
City Type E Grate Inlet	EA	$ 6,500	1	$ 6,500
Concrete Headwall	EA	$ 1,500	1	$ 1,500
8" PVC Sanitary Main; Remove Exist & Install New	LF	$ 140	5070	$ 709,800
6" PVC Sanitary Lateral, Remove Exist & Install New	EA	$ 1,500	58	$ 87,000
Manhole Sanitary 4' DIA	EA	$ 5,000	21	$ 105,000
2" & 6" Water Main; Remove Exist & Install New	LF	$ 160	3518	$ 562,880
8" & 12" Water Main; Remove Exist & Install New	LF	$ 190	1316	$ 250,040
2" Water Service Per Resident	EA	$ 1,670	80	$ 133,600
Maintenance of Traffic	DY	$ 350	180	$ 63,000
Tree Removal	EA	$ 1,420	32	$ 45,440
Landscaping	LS	$ 200,000	1	$ 200,000
20ft Asphalt Roadway Complete; Remove & Replace	SY	$ 100	6400	$ 640,000
Miami Curb	LF	$ 32	5300	$ 169,600
SUBTOTAL				**$ 8,561,830**
Mobilization		10%		$ 856,183
Contingency		30%		$ 3,107,944
Geotechnical, Utility Locates, & Design		10%		$ 941,801.30
TOTAL				**$13,467,758.6**
ROUNDED TOTAL				**$ 13,468,000**

INTERFLOW ENGINEERING LLC

PREPARED BY: John E. Loper, P.E.

SEGMENT 2 - S. MANHATTAN AV

ITEM DESCRIPTION	UNIT	UNIT COST	QTY	LINE TOTAL
Excavation, Trench box, & staging.	CY	$ 40	29000	$ 1,160,000
Excavation (Unsuitable Fill)	CY	$ 100	4467	$ 446,700
Dewatering Normal	DY	$ 100	180	$ 18,000
8' x 5' RCB	LF	$ 1,000	2592	$ 2,592,000
3' x 5' RCB	LF	$ 600	337	$ 202,200
8' x 5' RCB 90^0 Junction	LF	$ 2,000	16	$ 32,000
18"-24" RCP	LF	$ 90	258	$ 23,220
30" RCP	LF	$ 120	97	$ 11,640
12' x 9' Junction Box (Exist Storm tie-in)	EA	$ 12,000	1	$ 12,000
City Type 1 Curb Inlet	EA	$ 6,500	18	$ 117,000
City Type E Grate Inlet	EA	$ 6,500	2	$ 13,000
Storm Manhole 4' DIA	EA	$ 4,000	10	$ 40,000
Storm Manhole 5' DIA	EA	$ 6,000	1	$ 6,000
Storm Manhole 5' x 5'	EA	$ 7,000	1	$ 7,000
Baffle Box	LS	$ 200,000	1	$ 200,000
8" PVC Sanitary Main; Remove Exist & Install New	LF	$ 140	2590	$ 362,600
6" PVC Sanitary Lateral, Remove Exist & Install New	EA	$ 1,500	32	$ 48,000
24"-27" Sanitary; retrofit existing system, & install new	LF	$ 180	1350	$ 243,000
Manhole Sanitary 4' DIA	EA	$ 5,000	12	$ 60,000
Manhole Sanitary 5' DIA	EA	$ 6,500	6	$ 39,000
6" Reclaim Main; Remove Exist & Install New	LF	$ 220	1591	$ 350,020
2" & 6" Water Main; Remove Exist & Install New	LF	$ 160	1540	$ 246,400
8" Water Main; Remove Exist & Install New	LF	$ 180	680	$ 122,400
2" Water Service Per Resident	EA	$ 1,670	34	$ 56,780
Maintenance of Traffic	DY	$ 350	180	$ 63,000
Tree Removal	EA	$ 1,420	5	$ 7,100
Landscaping	LS	$ 125,000	1	$ 125,000
Live Oak Quercus Virginiana, 25-30' Overall Height	EA	$ 4,000	4	$ 16,000
Sabal Palmetto, 25-30' Clear Trunk	EA	$ 1,200	1	$ 1,200
22ft Asphalt Roadway Complete; Remove & Replace	SY	$ 110	4900	$ 539,000
20ft Asphalt Roadway Complete; Remove & Replace	SY	$ 100	2959	$ 295,900
Type F Curb	LF	$ 32	2600	$ 83,200
Miami Curb	LF	$ 32	3650	$ 116,800
SUBTOTAL				**$ 7,656,160**
Mobilization		10%		$ 765,616
Contingency		30%		$ 2,779,186
Geotechnical, Utility Locates, & Design		10%		$ 842,178
TOTAL				**$ 12,043,140**
ROUNDED TOTAL				**$ 12,043,000**

INTERFLOW ENGINEERING LLC

PREPARED BY: John E. Loper, P.E.

SEGMENT 3 - W. WATROUS AV

ITEM DESCRIPTION	UNIT	UNIT COST	QTY	LINE TOTAL
Excavation, Trench box, & staging.	CY	$ 40	22500	$ 900,000
Excavation (Unsuitable Fill)	CY	$ 100	5933	$ 593,300
Dewatering Normal	DY	$ 100	540	$ 54,000
8' x 5' RCB	LF	$ 1,000	2656	$ 2,656,000
18"-24" RCP	LF	$ 90	247	$ 22,230
Bulkhead for 8' x 5' RCB	EA	$ 3,000	1	$ 3,000
City Type 1 Curb Inlet	EA	$ 6,500	19	$ 123,500
Storm Manhole 4' DIA	EA	$ 4,000	11	$ 44,000
8" PVC Sanitary Main; Remove Exist & Install New	LF	$ 140	4632	$ 648,480
6" PVC Sanitary Lateral, Remove Exist & Install New	EA	$ 1,500	31	$ 46,500
Manhole Sanitary 4' DIA	EA	$ 5,000	17	$ 85,000
2" & 6" Water Main; Remove Exist & Install New	LF	$ 160	1993	$ 318,880
8" Water Main; Remove Exist & Install New	LF	$ 180	2620	$ 471,600
2" Water Service Per Resident	EA	$ 1,670	31	$ 51,770
Maintenance of Traffic	DY	$ 350	180	$ 63,000
Tree Removal	EA	$ 1,420	4	$ 5,680
Landscaping	LS	$ 100,000	1	$ 100,000
Live Oak Quercus Virginiana, 25-30' Overall Height	EA	$ 4,000	3	$ 12,000
Sabal Palmetto, 25-30' Clear Trunk	EA	$ 1,200	1	$ 1,200
20ft Asphalt Roadway Complete; Remove & Replace	SY	$ 100	6741	$ 674,100
Type F Curb	LF	$ 32	5164	$ 165,248
SUBTOTAL				**$ 7,039,488**
Mobilization		10%		$ 703,949
Contingency		30%		$ 2,555,334
Geotechnical, Utility Locates, & Design		10%		$ 774,344
TOTAL				**$ 11,073,115**
ROUNDED TOTAL				**$ 11,073,000**

PREPARED BY: John E. Loper, P.E.

C. SUE Report

By George F. Young, Inc.

George F. Young, Inc.
Turning Vision Into Reality
Since 1919
299 Dr. Martin Luther King Jr. Street North
Saint Petersburg, Florida 33701
(727) 822-4317 Fax (727) 551-9395

Surveyor's Report
Project No. 15004200SU
Watrous to Estella Storm Drain

1. Specific Purpose Survey to record test hole information on specific subsurface utilities in the vicinity of Watrous Avenue, S. Manhattan Avenue, and Estella Street, City of Tampa, Hillsborough County, Florida.
2. Survey date: March 10, 2015.
3. Prepared for the exclusive benefit of: Interflow Engineering, LLC.
4. Horizontal and vertical location of these test holes is not provided. Test hole information collected includes: Type of utility, measure down (measurement from ground surface to the top of utility), size of utility and utility material composition.
5. Copies of field notes have been provided as a part of this submittal and must be utilized in conjunction with this report. George F. Young and the signing surveyor take no responsibility for utility line designation and VVH information surveyed by others. Field notes depicting the general orientation of subsurface utility designation and VVH information can be used to help verify the work of those surveying this information.
6. This report contains subsurface utilities physically exposed by vacuum excavation. Electronically designated lines, as marked in the field, may deviate from the actual utility location and should be considered approximate.
7. Subsurface storm drain and gravity sanitary sewer structures and their associated piping are specifically excluded from this survey.
8. Measure downs (depth of cover) are valid at the date of this survey only, as surface grade conditions may change over time.
9. Subsurface Utilities were located by utilizing the Vacmaster System for vacuum excavation with the benefit of electronic designation and ground penetrating radar (GPR).
10. Utilization of the above equipment and methods is the industry recognized procedure for finding and locating underground utilities. Although effective and reliable, there is the possibility that all utilities may not be detected due to environmental conditions, soil conditions, water table, excessive depth, and/or feature makeup.
11. Utility size reflects the approximate outside diameter unless otherwise specified.
12. Utility size and material composition were collected by field observation under adverse conditions and should be considered approximate.
13. Utility owners names used in this report reflect information obtained from field observations, field meetings and utility research.
14. Additions or deletions to survey maps or reports by other than the signing party or parties are prohibited without the written consent of the signing party or parties.
15. Not valid without the signature and the original raised seal of a Florida Licensed Surveyor and Mapper.

George F. Young, Inc., LB021
Michael J. Curley, PSM

____

Florida Professional Surveyor and Mapper
License No. LS6361

George F. Young, Inc.
Turning Vision Into Reality
Since 1919
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Saint Petersburg, Florida 33701
(727) 822-4317 Fax (727) 551-9395
■ ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ LANDSCAPE ARCHITECTURE ■ PLANNING ■ SURVEYING ■ UTILITIES

ABBREVIATION LEGEND

#	Number
A	Arc or Area
A/C	Air Conditioner
ACP	Asbestos Cement Pipe (Transite)
APPROX	Approximate
ASPH	Asphalt
ATMS	Automated Traffic Monitoring System
BCATV	Buried Cable Television
BE	Buried Electric
BFP	Backflow Preventor
BIP	Black Iron Pipe
BLDG	Building
BOB	Bottom Of Bank
BOC	Back of Curb
BT	Buried Telephone Cable
C	Chord
CALC	Calculated
CATV	Television Cable
CDS	Continuous Deflective Separation Unit
CFP	Corrugated Flex Pipe
CIP	Cast Iron Pipe
CL	Center Line
CLF	Chain Link Fence
COMM	Communication or Committee
CONC	Concrete
CORR	Corrugated
CORS	Continuously Operating Reference Station
COSP	City of St. Petersburg
CPVC	Chlorinated PVC
CSH	Core Sample Hole
CSL	Concrete Slab
CUE	Calculated Utility Elevation
DBC	Direct Buried Cable
DIA	Diameter
DIP	Ductile Iron Pipe
DIR	Direction
DIST	Distance or District
DWY	Driveway
E.D.	Electronic Depth
EDO	Electronic Depth Only
ELEC	Electric
ELEV	Elevation
EOD	End of Designation
EOP	Edge Of Pavement
ERCP	Elliptical Reinforced Concrete Pipe
ESMT	Easement
EXP	Exposed
FBK	Field Book
FBL	Fiber Light
FCM	Found Concrete Monument
FCP	Fiber Conduit Pipe
FDOT	Florida Department of Transportation
FGT	Florida Gas Transmission
FIP	Found Iron Pin
FIR	Found Iron Rod
FM	Force Main
FND	Found or Found Nail & Disk
FOC	Fiber Optic Cable
FOP	Found Open Pipe
FPC	Florida Power Corporation
FPID	Financial Project Identification
FPL	Florida Power and Light Inc.
FPP	Found Pinched Iron Pipe
FRD	Found Rivet & Disk
FS	Florida Statute
FTV	Failed to Verify
GALV	Galvanized
GAS	Gas Line
GPR	Ground Penetrating Radar
GPS	Global Positioning System
GRVL	Gravel
GSP	Galvanized Steel Pipe
GSS	Gravity Sanitary Sewer
GYA	Guy Anchor
HCAA	Hillsborough County Aviation Authority
HDPE	High Density Poly-Ethylene
ID	Inside Diameter or Identification
INV	Invert Elevation
IRR	Irrigation System
L3	Level 3 Communications
LB	Licensed Business
LP	Light Pole
LS	Land Surveyor
LT	Left
M	Meters
MD	Measure Down
MEAS	Measured
MES	Mitered End Section
MH	Manhole Cover
MHWL	Mean High Water Line
MISC	Miscellaneous
MOT	Maintenance of Traffic
MULTI	Multiple
MW	Water Meter
N/A	Not Available or Not Applicable
NAD	North American Datum
NAVD	North American Vertical Datum
NFV	Not Field Verified
NGS	National Geodetic Survey
NGVD	National Geodetic Vertical Datum
No.	Number
NPW	Non-Potable Water
NTS	Not To Scale
NUF	No Utility Found
O/S	Offset
OCC	Occupation
OHL	Overhead Line
P	Point or Platted Data
PC	Point Of Curvature
PCC	Point Of Compound Curvature
PCCP	Precast Concrete Pipe
PCP	Permanent Control Point
PE	Progress Energy
PED	Pedestrian or Pedestal
PET	Petroleum Pipeline
PG	Page
PI	Point of Intersection
PID	Permanent Identifier
PK	Parker-Kalon Nail
PK&D	PK Nail and Disk
PLS	Professional Land Surveyor
POLY	Polyethylene
POSS	Possible
PP	Power Pole
PRC	Point Of Reverse Curvature
PRCP	Pressurized Reinforced Concrete Pipe
PRM	Permanent Reference Monument
PSM	Professional Surveyor and Mapper
PVC	Polyvinyl Chloride
R	Record or Radius
R/W	Right of Way
RAD	Radius or Radian
RCP	Reinforced Concrete Pipe
RCW	Reclaimed Water Main
RNG	Range
ROW	Right of Way
RT	Right
RTK	Real Time Kinematic
SAN	Sanitary
SCM	Set Concrete Monument
SEC	Section
SEW	Sewer
SHP	Shared Pole
SIR	Set Iron Rod
SND	Set Nail Disk
SOP	Shot On Pipe
SR	State Road
SRD	Set Rivet and Disk
ST	Street
STA	Station
STMD	Stamped Disk
STORM	Storm Drainage
SUE	Subsurface Utility Engineering
SWK	Sidewalk
TBM	Temporary Bench Mark
TECO	Tampa Electric Company
TEL	Telephone
TEMP	Temporary
TOB	Top Of Bank
TOP	Top of Utility Elevation
TP	Traverse Point or Turning Point
TRAFF	Traffic Signalization Line
TRANS.	Transmission
TRNF	Transformer
TV	Television
TW	Time Warner
TWP	Township
UAO	Utility Agency Owner
UNK	Unknown
VCP	Vitrified Clay Pipe
VCW	Valve Cover Water
VRZ	Verizon Telephone
VVH	Verified Vertical and Horizontal Location
WDL	Woods Line
WF	Wood Fence
WL	Water Line
WM	Water Main
WPP	Wooden Power Pole

TEST HOLE SUMMARY REPORT
Watrous to Estella Storm Drain

Client: Interflow, Engineering, LLC
Address: 14499 N. Dale Mabry Hwy, Suite 290
City / State: Tampa, FL 33618
Requested By: John Loper, P.E.
Phone: 813-336-5169

GFY Project No.: 15004200SU
Project Name: Watrous to Estella Storm Drain
Project Location: Watrous Ave, S. Manhattan Ave, and Estella Street, Tampa, FL
Project Type: Subsurface Utility Excavation and Location
Field Book Number: SUE#: 402

TEST HOLE	MD	DESCRIPTION	UTILITY OWNER	NOTE
101	4.07'	CAST-IRON WATER MAIN (SIZE NFV)	CITY OF TAMPA	
102	2.46'	8" CAST-IRON WATER MAIN	CITY OF TAMPA	
103	2.57'	6" CAST-IRON WATER	CITY OF TAMPA	
104	3.78'	24" CAST-IRON WATER MAIN	CITY OF TAMPA	
105	2.20'	6" POLYETHYLENE JET FUEL (YELLOW)	TAMPA PIPELINE CORP.	
106	3.98'	8" WRAPPED STEEL WATER MAIN	CITY OF TAMPA	

D. Soils Information

By Natural Resources Conservation Service

United States Department of Agriculture

NRCS

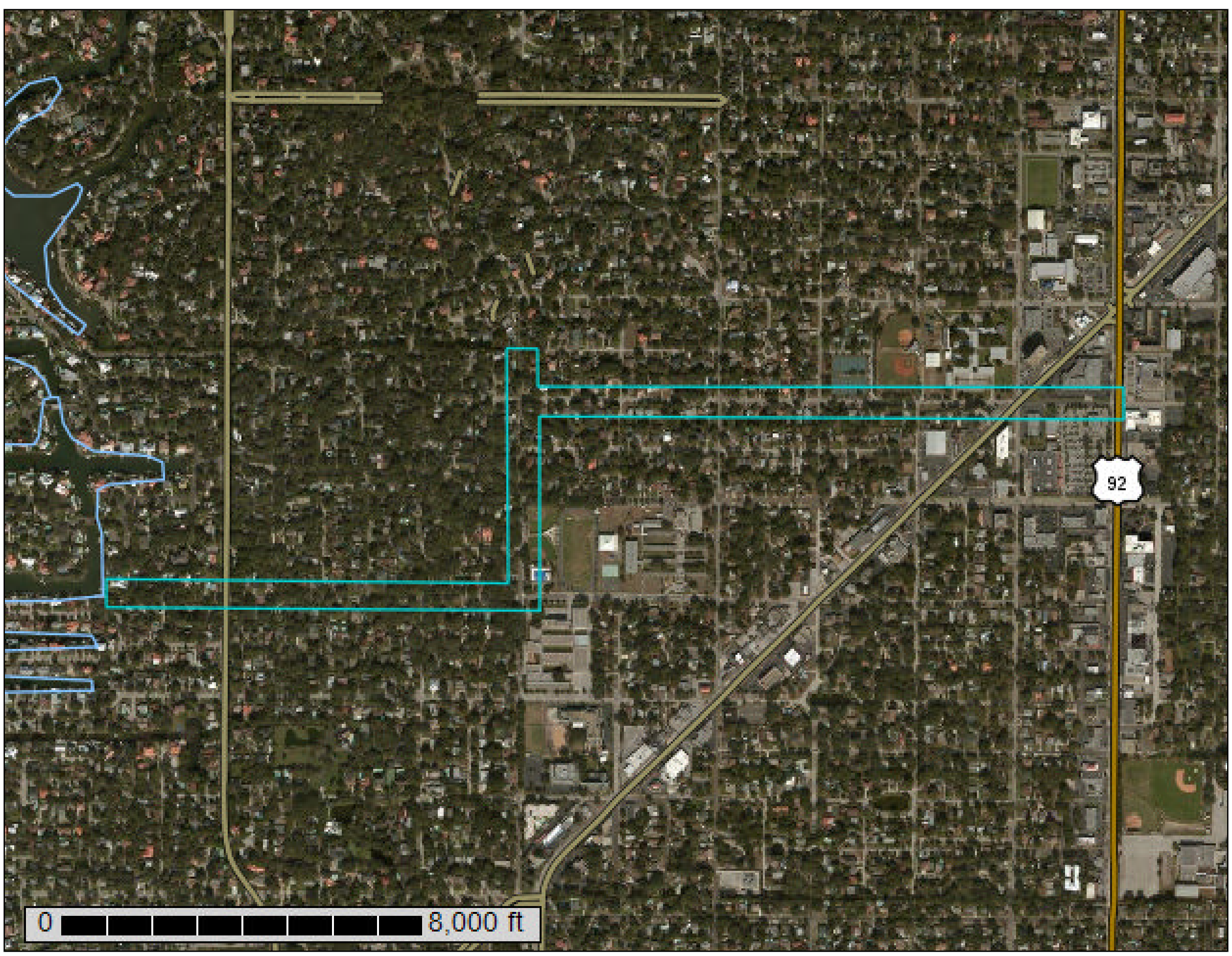
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Hillsborough County, Florida

Upper Peninsula Ph2 Corridor DMTL



October 14, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

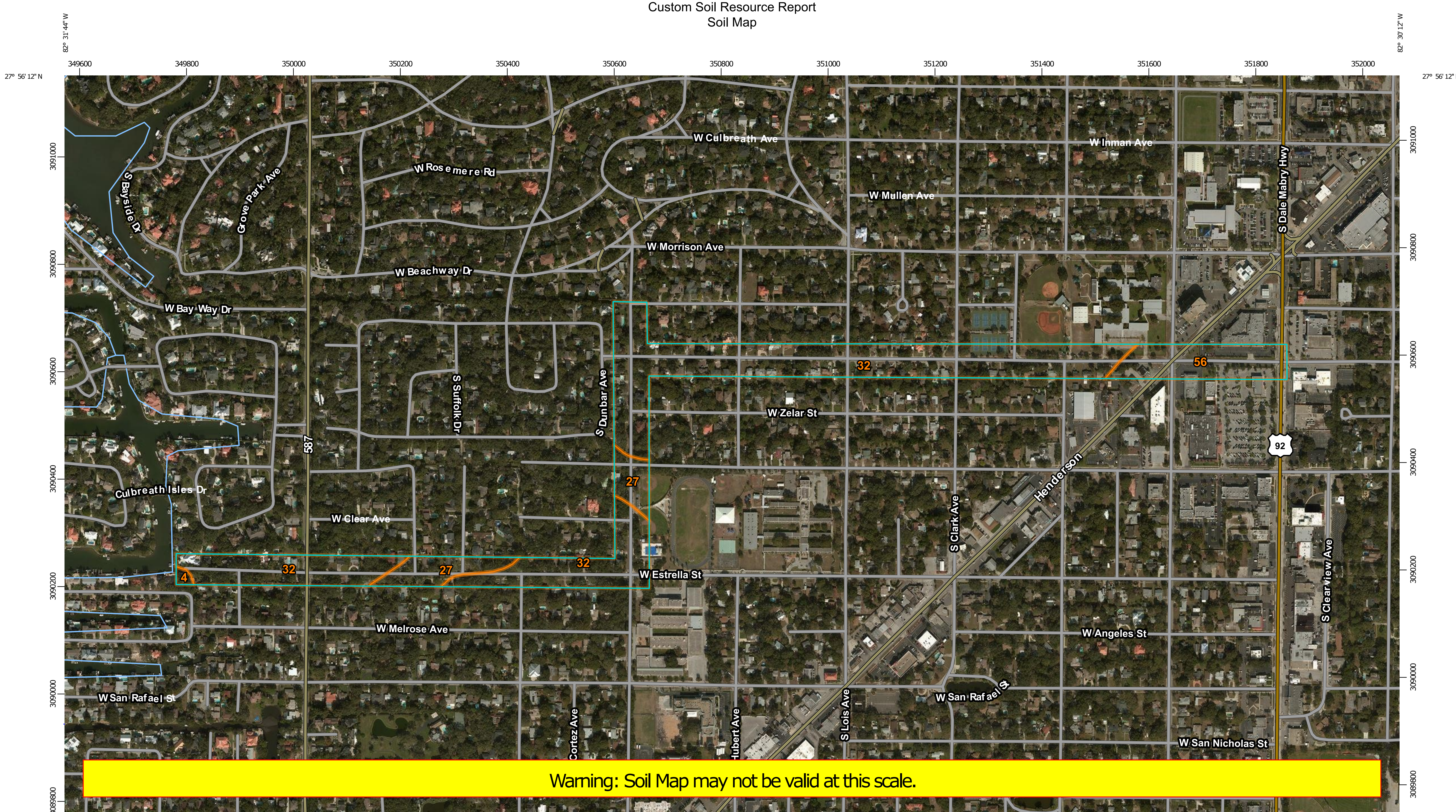
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:6,730 if printed on B landscape (17" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 300, 600, 1200, 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hillsborough County, Florida
Survey Area Data: Version 14, Nov 19, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 19, 2013—Jan 17, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Hillsborough County, Florida (FL057)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
4	Arents, nearly level	0.2	0.5%
27	Malabar fine sand	3.9	10.2%
32	Myakka-Urban land complex	29.5	76.4%
56	Urban land	5.0	12.9%
Totals for Area of Interest		**38.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Hillsborough County, Florida

4—Arents, nearly level

Map Unit Setting

National map unit symbol: 1j72s
Mean annual precipitation: 48 to 56 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 324 to 354 days
Farmland classification: Not prime farmland

Map Unit Composition

Arents and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arents

Setting

Landform: Rises on marine terraces
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Altered marine deposits

Typical profile

C1 - 0 to 10 inches: fine sand
C2 - 10 to 32 inches: fine sand
C3 - 32 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Other vegetative classification: Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: No

27—Malabar fine sand

Map Unit Setting

National map unit symbol: 1j72c
Elevation: 20 to 100 feet
Mean annual precipitation: 48 to 56 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 324 to 354 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Malabar and similar soils: 86 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Malabar

Setting

Landform: Drainageways on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Sandy and loamy marine deposits

Typical profile

A - 0 to 4 inches: fine sand
E - 4 to 14 inches: fine sand
Bw - 14 to 35 inches: fine sand
E' - 35 to 50 inches: fine sand
Btg - 50 to 66 inches: fine sandy loam
Cg - 66 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D

Other vegetative classification: Slough (R155XY011FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Minor Components

Basinger

Percent of map unit: 7 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Sandy soils on stream terraces, flood plains, or in depressions (G155XB145FL)
Hydric soil rating: Yes

Wabasso

Percent of map unit: 7 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

32—Myakka-Urban land complex

Map Unit Setting

National map unit symbol: 1j72j
Mean annual precipitation: 48 to 56 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 324 to 354 days
Farmland classification: Not prime farmland

Map Unit Composition

Myakka and similar soils: 50 percent
Urban land: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myakka

Setting

Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 5 inches: fine sand
E - 5 to 20 inches: fine sand
Bh - 20 to 30 inches: fine sand
C - 30 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Other vegetative classification: Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Marine terraces
Landform position (three-dimensional): Interfluve, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: No parent material

Interpretive groups

Land capability classification (irrigated): None specified
Other vegetative classification: Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: Unranked

Minor Components

Basinger

Percent of map unit: 4 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: Yes

Wabasso

Percent of map unit: 3 percent

Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: No

Zolfo

Percent of map unit: 3 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Upland Hardwood Hammock (R155XY008FL), Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: No

56—Urban land

Map Unit Setting

National map unit symbol: 1j738
Mean annual precipitation: 48 to 56 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 324 to 354 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Marine terraces
Landform position (three-dimensional): Interfluve, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: No parent material

Interpretive groups

Land capability classification (irrigated): None specified
Other vegetative classification: Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: Unranked

Minor Components

Arents

Percent of map unit: 10 percent
Landform: Rises on marine terraces
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Forage suitability group not assigned (G155XB999FL)
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf