HUMAN SERVICES CAMPUS UTILITY REHABILITATION

INVITATION FOR BID # PSUT-26-03

Issuance of Solicitation: Tuesday, May 12, 2026

Questions Due Date: Tuesday, June 2, 2026

Bid Submission Deadline: Tuesday, June 16, 2026

THE CITY OF PEMBROKE PINES
PROCUREMENT DEPARTMENT
8300 SOUTH PALM DRIVE
PEMBROKE PINES, FLORIDA 33025
(954) 518-9020

For more information, please visit our online supplier portal, located at
https://procurement.opengov.com/portal/pembrokepines

DRAFT DOCUMENT FOR COMMISSION REVIEW

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SECTION 1 - NOTICE

Notice is hereby given that the City Commission of the City of Pembroke Pines is seeking sealed proposals for:

IFB # PSUT-26-03

Human Services Campus Utility Rehabilitation

Solicitations may be found on the City of Pembroke Pines website under the Procurement Department at http://www.ppines.com/index.aspx?NID=667, and may be downloaded directly from the OpenGov platform at https://procurement.opengov.com/portal/pembrokepines.

For Technical Support, proposers can reach the OpenGov Service Desk between 7:00 am to 10:00 pm from Monday through Friday via the following methods:

- Chat (preferred method): Click the button in the lower right-hand corner of the portal.
- E-mail: procurement-support@opengov.com
- Phone: 1 (650) 336-7167

If additional help is needed with downloading the solicitation package please contact the Procurement Department at (954) 518-9020 or by email at purchasing@ppines.com. The Procurement Department hours are between 7:00 am to 6:00 pm on Monday through Thursday and is located at 8300 South Palm Drive, Pembroke Pines, FL 33025.

Bidders shall submit all questions regarding this bid via the City's e-Procurement Portal, located at https://procurement.opengov.com/portal/pembrokepines. Please note the deadline for submitting questions. All answers will be posted on the City's e-Procurement Portal. Bidders may also click "Follow" on this bid to receive an email notification when answers are posted. It is the bidder's responsibility to check the portal for updates. Only written responses issued through the OpenGov platform will be considered official for interpretations or clarifications.

Proposals will be accepted until 12:00 am on Tuesday, June 16, 2026, electronically at https://procurement.opengov.com/portal/pembrokepines/projects/258538.

Bid Opening: The sealed electronic proposals will be publicly opened at 2:30 pm, on the bid due date, by the City Clerk's Office, in the **City Clerk's Office Conference Room located on the 4th Floor in the Charles F. Dodge City Center/**City Hall Administration Building, located at 601 City Center Way, Pembroke Pines, Florida, 33025.

Virtual Bid Opening: In light of public health concerns and to ensure accessibility for all, the City encourages interested parties and the public to participate virtually via live streaming instead of attending the meeting in person. As a result, meetings may be a combination of in-person and virtual, all as provided by law. To virtually attend the bid opening, please use the Cisco Webex Meetings platform.

Virtual Meeting Details:

- WebEx Meeting Link: https://ppines.webex.com/meet/purchasing
- Cisco Webex Meeting Number: 717 019 586
- Join by Phone Number: +1-408-418-9388

The public may download the **Cisco Webex Meetings app** from https://www.webex.com/downloads.html/.

To ensure an efficient meeting process, participants are requested to mute their audio and camera during the meeting. While the public is welcome to attend the virtual bid opening, **please note that active participation and commenting will not be allowed during the proceedings.**

For further information about the bid opening or assistance in accessing the virtual meeting, please contact:

Daniel Deleon or other Procurement Staff in the Procurement Department
City of Pembroke Pines
8300 South Palm Drive,
Pembroke Pines, FL 33025
(954) 518-9061 Ext: 59021 or 954-518-9020
purchasing@ppines.com

SECTION 2 - GENERAL PROJECT INFORMATION & TIMELINE

2.1 Project Timeline

The work shall be completed within **9 months** from issuance of the City's Notice to Proceed (NTP), with an estimated start date of **September 2026**.

2.2 Tentative Schedule of Events

Issuance of Solicitation (Posting Date):	May 12, 2026
Pre-Bid Meeting (Non-Mandatory):	May 20, 2026, 10:00am Pembroke Pines Senator Howard C. Forman Human Services Campus 851 Poinciana Drive Pembroke Pines, FL 33025
Question Due Date:	June 2, 2026, 12:00am
Issuance of Final Answers to Questions:	June 8, 2026
Bid Submission Deadline:	June 16, 2026, 12:00am
Bid Opening:	Will be held at 2:30 pm on the day of bid submissions are due.
Evaluations by Staff:	To Be Determined (TBD)
Recommendation of Contractor to City Commission for Award:	August 5, 2026
Issuance of Notice to Proceed (NTP):	August 10, 2026

2.3 Non-Mandatory Pre-Bid Meeting/Site Visit

There will be a non-mandatory scheduled pre-bid meeting on **Wednesday, May 20, 2026 at 10:00 am.** Meeting location will be at the **Pembroke Pines Senator Howard C. Forman Human Services Campus, 851 Poinciana Drive Pembroke Pines, FL 33025.**

A. **Proof of Attendance: Contractor**s may be required to sign in at any of the meetings to show proof of attendance. It is the **Contractor**'s responsibility to make sure that they sign in at the meeting.

2.4 Follow-Up Pre-Bid Meeting(s)

Follow-Up Meetings: In the event that a **Contractor** cannot attend the scheduled pre-bid meeting, or if a **Contractor** would like a follow up visit to the site, they may request a site visit by contacting **Daniel Deleon** at **(954) 518-9061 Ext: 59021**. We urge all **Contractor**s to attend the scheduled meeting, as a separate or follow-up meeting may not be afforded to the requester due to scheduling and availability of staff to assist with any additional meetings. In addition, if making a request for a separate or follow-up meeting, **Contractor**s are urged to make these requests as early as possible.

2.5 Estimated Project Cost

$3,218,300

2.6 Liquidated Damages

Liquidated damages for this project shall be **ONE THOUSAND DOLLARS AND NO CENTS ($1,000.00)** per day.

2.7 Grant/Federal Funding

Yes, the City plans to utilize the following grant(s)/federal fund(s) for this project:

Florida Department of Environmental Protection (FDEP)

2.8 Proposal Security/Bid Bond

A Proposal Security shall not be required for this project.

2.9 Payment and Performance Bonds

Regardless of the awarded contract amount, two (2) separate bonds (Payment and Performance Bonds) are required, and both must be approved by the City. The penal sum stated in each bond shall be 100% of the contract price.

SECTION 3 - PURPOSE AND BACKGROUND

3.1 Purpose

The City of Pembroke Pines is seeking bids from qualified firms, hereinafter referred to as the Contractor, to rehabilitate the water and sewer infrastructure of the Pembroke Pines Senator Howard C. Forman Human Services Campus located at Poinciana Drive, Pembroke Pines, FL 33025. The Work shall include, but not be limited to, the abandonment of approximately 15,800 linear feet of potable water mains of various sizes; the installation of approximately 4,700 linear feet of potable water main varying from 8", 6" and 4" C900 PVC; the reconnection of water service lines and fire hydrant assemblies; the rehabilitation of approximately 17,200 linear feet of gravity sewer mains and laterals with services including internal closed-circuit television (CCTV) inspection, cleaning and inspection, sewage bypass pumping, cured-in-place piping lining; and all other work required for a complete project in accordance with the contract documents and drawings., in accordance with the terms, conditions, and specifications contained in this solicitation.

3.2 Background

Pembroke Pines, Florida, ranked as the eleventh largest city among the state's four hundred plus municipalities and the second largest in Broward County, maintains a welcoming small-town ambiance that resonates with its residents. Located conveniently in southwest Broward County, the city provides seamless access to major highways, employment centers, entertainment venues, parks, golf courses, and a diverse array of dining and shopping options.

With a population of approximately 170,000 residents spread across 32.68 square miles, Pembroke Pines is renowned as one of the best cities to live in America. The city boasts 28 superior parks, lush landscaping, and a distinctive South Florida charm that contributes to its natural beauty. Notably recognized as 2024's Best Place to Raise a Family in Florida, and 2024's Best City of Hispanic Entrepreneurs by WalletHub, Pembroke Pines also earned a place as the on Money Magazine's esteemed Best Places to Live list in 2014, as the sole Florida representative, ranking in at #32 in the nation.

Incorporated in 1960, Pembroke Pines is celebrated as a safe and desirable community, having received accolades such as the All-America City designation. The city's commitment to arts and culture, exceptional schools, diverse population, numerous parks, and forward-thinking approach in an ever-evolving world make it a standout destination.

Pembroke Pines is also the home to the largest municipal-run charter school system in the nation, serving over 6,000 students across five separate campuses. The City's award-winning charter school system is located in the Broward County School District, which is the sixth largest school district in the nation.

SECTION 4 - SCOPE OF WORK

4.1 Project Summary

The Project consists of rehabilitating the water and sewer infrastructure of the Pembroke Pines Senator Howard C. Forman Human Services Campus located at 851 Poinciana Drive, Pembroke Pines, FL 33025. The Work shall include, but not be limited to, the abandonment of approximately 15,800 linear feet of potable water mains of various sizes; the installation of approximately 4,700 linear feet of potable water main varying from 8", 6" and 4" C900 PVC; the reconnection of water service lines and fire hydrant assemblies; the rehabilitation of approximately 17,200 linear feet of gravity sewer mains and laterals with services including internal closed-circuit television (CCTV) inspection, cleaning and inspection, sewage bypass pumping, cured-in-place piping lining; and all other work required for a complete project in accordance with the contract documents and drawings.

Please refer to Attachment A - Bid_Specifications_02-13-26_(scope_of_work), and Attachment B - Bid_Set_03-03-26_S&S_(engineering_drawings) for full details.

SECTION 5 - PRICE PROPOSAL / BID TABLE

The vendor must provide their pricing electronically through the designated line items listed on the Bid Sheet/Pricing Table via the City's e-Procurement portal on OpenGov.

Vendor Notes: The bid tables includes a "Vendor Notes" column for any additional comments regarding the requested line item(s). A comment is preferred in the "Vendor Notes" column. If the vendor does not need to submit any comments, they may leave it blank or enter N/A or similar.

Payment & Performance Bonds: The table includes a section for the vendor to submit pricing for Payment & Performance Bonds. If the total cumulative base proposal amount does not exceed $200,000 and a Payment and Performance Bond is not required, please enter "0" on the "If Applicable, Cost for Payment and Performance Bond" column for each line item.

Primary Responses: The initial Bid Table is for the primary responses so that the vendors can submit the requested goods and/or services.

HUMAN SERVICES CAMPUS UTILITY REHABILITATION BID SCHEDULE

Line Item	Description	Quantity	Unit of Measure	Unit Cost	Total	Vendor Notes
1	Mobilization / Demobilization	1	LS			
2	Erosion and Sedimentation Control	1	LS			
3	Maintenance of Traffic (MOT)	1	LS			
4	Exploratory Excavation	70	EA			
5	Restoration	1	LS			
6	Abandon-in-Place Watermain 4" Watermain	1	LS			
7	Abandon-in-Place Watermain 6" Watermain	1	LS			
8	Abandon-in-Place Watermain 8" Watermain	1	LS			

Line Item	Description	Quantity	Unit of Measure	Unit Cost	Total	Vendor Notes
9	8" C900 PVC w/ DI Fittings	3,700	LF			
10	6" C900 PVC w/ DI Fittings	700	LF			
11	4" C900 PVC w/ DI Fittings	400	LF			
12	2" PE Poly Blue w/ DI Fittings	350	LF			
13	1" PE Poly Blue w/ DI Fittings	20	LF			
14	12" x 8" Tapping Sleeve and Valve	3	EA			
15	12" x 4" Tapping Sleeve and Valve	1	EA			
16	8" x 8" Tapping Sleeve and Valve	6	EA			
17	8" x 6" Tapping Sleeve and Valve	1	EA			
18	8" x 4" Tapping Sleeve and Valve	2	EA			
19	8" Gate Valve and Box	18	EA			
20	6" Gate Valve and Box	10	EA			
21	4" Gate Valve and Box	3	EA			
22	Reconnect Potable Water Service Lines	22	EA			
23	Reconnect Fire Hydrant Assembly	1	EA			
24	Clean and Inspection Sewer Lines	17,200	LF			

Line Item	Description	Quantity	Unit of Measure	Unit Cost	Total	Vendor Notes
25	CCTV for 15" Gravity Sewer	500	LF			
26	CCTV for 12" Gravity Sewer	2,700	LF			
27	CCTV for 10" Gravity Sewer	400	LF			
28	CCTV for 8" Gravity Sewer	9,600	LF			
29	CCTV for 6" Gravity Sewer	3,000	LF			
30	CCTV for 4" Gravity Sewer	200	LF			
31	CCTV for DIP Gravity Sewer	800	LF			
32	Root Removal	17,200	LF			
33	Sewer By-Passing	1	LS			
34	Manhole Lining	68	EA			
35	Cured in Place Pipe for 15" VCP	500	LF			
36	Cured in Place Pipe for 12" VCP	2,700	LF			
37	Cured in Place Pipe for 10" VCP	400	LF			
38	Cured in Place Pipe for 8" VCP	2,000	LF			
39	Cured in Place Pipe for 6" VCP	3,200	LF			
40	Cured in Place Pipe for 6" Unknown Material	1,100	LF			

Line Item	Description	Quantity	Unit of Measure	Unit Cost	Total	Vendor Notes
41	Reconnect Lateral Service Connections	20	EA			
42	Clean Out Repairment	20	EA			
TOTAL						

COST OF PAYMENT AND PERFORMANCE BONDS

Line Item	Description	Unit of Measure	Percentage	Vendor Notes
1	Cost of Payment & Performance Bond in the form of a percent	Percent		

SECTION 6 - SUBMITTAL DOCUMENTS

Bids must be submitted electronically at https://procurement.opengov.com/portal/pembrokepines on or before **12:00 am on Tuesday, June 16, 2026.** Please note vendors should be registered on OpenGov under the name of the organization that they are operating as and it should match the organization name on the documents that they are submitting and utilizing when responding to the solicitation. In addition, the vendor must complete the required documents in this section and provide any additional information requested throughout this solicitation. Any additional information requested in the solicitation should be scanned and uploaded. The City recommends for proposers to submit their proposals as soon as they are ready to do so. Please allow ample time to submit your proposals on the https://procurement.opengov.com/portal/pembrokepines website. Proposals may be modified or withdrawn prior to the deadline for submitting Proposals.

PLEASE DO NOT SUBMIT ANY PROPOSALS VIA MAIL, E-MAIL OR FAX.

Prospective proposers interested in responding to this solicitation are requested to provide all of the applicable information listed in this section. Submittals that do not respond completely to all of the requirements specified herein may be considered non-responsive and eliminated from the process. Brevity and clarity are encouraged.

1 CONFIRMATION TO BIND

1.1 I certify that I have read, understood and agree to the terms in this solicitation, and that I am authorized to submit this response on behalf of my company.*

☐ Please confirm

*Response required

2 CERTIFICATION OF INSURANCE COMPLIANCE AND INTENT TO PROCURE REQUIRED COVERAGE

NOTE: Vendors are not required to purchase any additional insurance in order to submit a bid. However, they must certify that they either currently hold, or are able and willing to obtain, all required insurance coverages, endorsements, and limits prior to award and execution of the contract.

2.1 I certify that, if awarded this contract, I will be required to obtain and maintain all insurance policies as detailed in the INSURANCE REQUIREMENTS Section of this solicitation before any work may commence, and throughout the life of the contract.*

☐ Please confirm

*Response required

2.2 Do you confirm that you will only use insurance carriers licensed to do business in the State of Florida and rated no less than "A" as to management, and no less than "Class VI" as to financial strength by A.M. Best, and that you understand all endorsements required (e.g., Additional Insured, Waiver of Subrogation, etc.) must be included?*

☐ Yes

☐ No

*Response required

2.3 Do you currently carry insurance policies that meet or exceed the minimum requirements outlined in the INSURANCE REQUIREMENTS section of this solicitation?*

☐ Yes

☐ No

*Response required

When equals "Yes"

2.3.1 Please upload your current certificate(s) of insurance that demonstrate compliance with the insurance requirements outlined in this solicitation.*
*Response required

When equals "No"

2.3.2 Please upload documentation showing that you have obtained a letter from your insurance broker or carrier, such as a Letter of Intent to Insure, Evidence of Insurability, or a Conditional Certificate of Insurance.*
Documentation should show that:

- You can obtain the required insurance.
- The limits and types of coverage will meet the INSURANCE REQUIREMENTS outlined in the solicitation.
- You will provide a COI upon contract award.

*Response required

When equals "No"

2.3.3 Please upload your current certificate(s) of insurance.*
*Response required

2.4 Do you believe you are exempt from one or more insurance requirements (e.g., Workers' Compensation)?*

☐ Yes

☐ No

*Response required

When equals "Yes"

2.4.1 Please upload written documentation requesting an exemption on your company letterhead, subject to City approval.*
*Response required

2.5 Do you plan on using subcontractors for this project?*

☐ Yes

☐ No

*Response required

When equals "Yes"

2.5.1 Do you acknowledge that all subcontractors must also carry the same insurance or be covered under your policy, and that proof of such coverage must be provided to the City?*

☐ Yes

☐ No

*Response required

3 REFERENCE # 1

The minimum experience for this project is **five (5) years**. Provide specific examples of similar experience conducting licensed work of equal or similar scope of work, preferably delivered by the proposed team members. A **minimum of 3** references should be from the last **five years** and should be capable of explaining and confirming your firm's capacity to successfully complete the scope of work outlined herein. As part of the proposal evaluation process, the City may conduct an investigation of references, including a record check or consumer affairs complaints. Proposers' submission of a proposal constitutes acknowledgment of the process and consent to investigate. The City is the sole judge in determining Proposers qualifications. In this section you will have the ability to enter information for 5 different references including their contact details and specific project information.

Please note that the City prefers references who are not current employees of the City of Pembroke Pines, as we generally do not contact our own employees for reference checks.

Proposers are advised to confirm that:

A. Each reference provided by the Respondent has up to date contact persons and contact information;

B. The contact person provided for each reference is someone who has personal knowledge of the Proposer's performance during the referenced project; and

C. The contact person for each reference has been contacted by the Proposer regarding this specific bid submittal and such person confirmed their willingness to serve as a reference.

3.1 Reference Contact Information - Name of Firm, City, County or Agency*
*Response required

3.2 Reference Contact Information - Reference's Business Address*
*Response required

3.3 Reference Contact Information - Reference's Contact Name & Title*
*Response required

3.4 Reference Contact Information - Reference's E-mail Address*
*Response required

3.5 Reference Contact Information - Reference's Phone Number*
*Response required

3.6 Project Information - Was your firm the prime contractor for the listed project?*
☐ Yes
☐ No

*Response required

3.7 Project Information - Name of Contactor Performing the Work*
*Response required

3.8 Project Information - Name and location of the project*
*Response required

3.9 Project Information - Nature of the firm's responsibility on the project and work for which staff was responsible for*
*Response required

3.10 Project Information - Project Duration*
*Response required

3.11 Project Information - Completion (Anticipated) Date*
*Response required

3.12 Project Information - Size of Project*
*Response required

3.13 Project Information - Cost of Project*
*Response required

4 REFERENCE # 2

4.1 Reference Contact Information - Name of Firm, City, County or Agency*
*Response required

4.2 Reference Contact Information - Reference's Business Address*
*Response required

4.3 Reference Contact Information - Reference's Contact Name & Title*
*Response required

4.4 Reference Contact Information - Reference's E-mail Address*
*Response required

4.5 Reference Contact Information - Reference's Phone Number*
*Response required

4.6 Project Information - Was your firm the prime contractor for the listed project?*
☐ Yes
☐ No

*Response required

4.7 Project Information - Name of Contactor Performing the Work*
*Response required

4.8 Project Information - Name and location of the project*
*Response required

4.9 Project Information - Nature of the firm's responsibility on the project and work for which staff was responsible for*
*Response required

4.10 Project Information - Project Duration*
*Response required

4.11 Project Information - Completion (Anticipated) Date*
*Response required

4.12 Project Information - Size of Project*
*Response required

4.13 Project Information - Cost of Project*
*Response required

5 REFERENCE # 3

5.1 Reference Contact Information - Name of Firm, City, County or Agency*
*Response required

5.2 Reference Contact Information - Reference's Business Address*
*Response required

5.3 Reference Contact Information - Reference's Contact Name & Title*
*Response required

5.4 Reference Contact Information - Reference's E-mail Address*
*Response required

5.5 Reference Contact Information - Reference's Phone Number*
*Response required

5.6 Project Information - Was your firm the prime contractor for the listed project?*
☐ Yes
☐ No

*Response required

5.7 Project Information - Name of Contactor Performing the Work*
*Response required

5.8 Project Information - Name and location of the project*
*Response required

5.9 Project Information - Nature of the firm's responsibility on the project and work for which staff was responsible for*
*Response required

5.10 Project Information - Project Duration*
*Response required

5.11 Project Information - Completion (Anticipated) Date*
*Response required

5.12 Project Information - Size of Project*
*Response required

5.13 Project Information - Cost of Project*
*Response required

6 REFERENCE # 4

6.1 Reference Contact Information - Name of Firm, City, County or Agency
6.2 Reference Contact Information - Reference's Business Address
6.3 Reference Contact Information - Reference's Contact Name & Title
6.4 Reference Contact Information - Reference's E-mail Address
6.5 Reference Contact Information - Reference's Phone Number
6.6 Project Information - Was your firm the prime contractor for the listed project?
☐ Yes
☐ No

6.7 Project Information - Name of Contactor Performing the Work
6.8 Project Information - Name and location of the project
6.9 Project Information - Nature of the firm's responsibility on the project and work for which staff was responsible for
6.10 Project Information - Project Duration
6.11 Project Information - Completion (Anticipated) Date
6.12 Project Information - Size of Project
6.13 Project Information - Cost of Project

7 REFERENCE # 5

7.1 Reference Contact Information - Name of Firm, City, County or Agency
7.2 Reference Contact Information - Reference's Business Address
7.3 Reference Contact Information - Reference's Contact Name & Title
7.4 Reference Contact Information - Reference's E-mail Address
7.5 Reference Contact Information - Reference's Phone Number
7.6 Project Information - Was your firm the prime contractor for the listed project?

☐ Yes
☐ No

7.7 Project Information - Name of Contactor Performing the Work
7.8 Project Information - Name and location of the project
7.9 Project Information - Nature of the firm's responsibility on the project and work for which staff was responsible for
7.10 Project Information - Project Duration
7.11 Project Information - Completion (Anticipated) Date
7.12 Project Information - Size of Project
7.13 Project Information - Cost of Project

8 PROJECT DOCUMENTS

8.1 PROPOSERS BACKGROUND INFORMATION FORM*

a. Please download the attached document, complete all required fields, and upload the completed form here.

- Proposers_Background_Inform...

*Response required

9 SWORN STATEMENT ON PUBLIC ENTITY CRIMES UNDER FLORIDA STATUTES CHAPTER 287.133(3)(a)

9.1 SWORN STATEMENT ON PUBLIC ENTITY CRIMES FORM*

a. Please download the attached document, complete all required fields, and upload the completed form here.

- Sworn_Statement_on_Public_E...

*Response required

9.2 Public Entity Crimes Status*

- Which option did you select on the Sworn Statement on Public Entity Crimes Form:
  - A) Neither the entity submitting this sworn statement, nor any officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, nor any affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989.

- B1) The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989, AND There has been a proceeding concerning the conviction before a hearing officer of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer did not place the person or affiliate on the convicted vendor list. (Please attach a copy of the final order.)
- B2) The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989, AND The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of Florida, Division of Administrative Hear¬ings. The final order entered by the hearing officer determined that it was in the public interest to remove the person or affiliate from the convicted vendor list. (Please attach a copy of the final order.)
- B3) The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989, AND The person or affiliate has not been placed on the convicted vendor list. (Please describe any action taken by or pending with the Department of General Services.)

☐ A) No convictions.
☐ B1) Convicted, final order did not place on the convicted vendor list.
☐ B2) Convicted, listed, then removed.
☐ B3) Convicted, not listed, action pending.
*Response required

9.3 Did you select option B1 or B2 above?*
☐ Yes
☐ No

*Response required

When equals "Yes"

9.3.1 Please upload a copy of the final order issued by the hearing officer of the State of Florida, Division of Administrative Hearings.*
*Response required

9.4 Did you select option B3 above?*
☐ Yes
☐ No

*Response required

When equals "Yes"

9.4.1 Please describe any action taken by or pending with the Department of General Services.*
*Response required

10 DRUG-FREE WORKPLACE CERTIFICATION

10.1 VENDOR DRUG FREE WORKPLACE CERTIFICATION FORM*

a. Please download the attached document, complete all required fields, and upload the completed form here.

- Vendor_Drug-Free_Workplace_...

*Response required

10.2 Drug-Free Status*
☐ Complies fully.
☐ Does not comply.
*Response required

11 STANDARD DOCUMENTS

The following documents are standard documents that the City generally requires for every solicitation. As a result, we recommend vendors to keep these documents updated and readily available so that they can be easily uploaded for each project that the vendor would like to participate in. In the event that the City does not have one of the forms or documents listed below for your company, the City may reach out to your company after the bid has closed to obtain the document(s).

11.1 NON-COLLUSIVE AFFIDAVIT*

a. Please download the attached document, complete all required fields, and upload the completed form here.

- Non-Collusive_Affidavit.pdf

*Response required

11.2 SCRUTINIZED COMPANY CERTIFICATION*

a. Please download the attached document, complete all required fields, and upload the completed form here.

- Scrutinized_Company_Certifi...

*Response required

11.3 E-VERIFY SYSTEM CERTIFICATION*

a. Please download the attached document, complete all required fields, and upload the completed form here.

b. Effective January 1, 2021, pursuant to Section 448.095. Florida Statues, the City may not enter into a contract with a vendor/contractor/subcontractor unless that vendor/contractor/subcontractor is registered with and uses the E- Verify system administered by the U.S. Department of Homeland Security ("DHS").

c. Contractor shall also require all subcontractors to provide an affidavit attesting that the subcontractor does not employ, contract with, or subcontract with, an unauthorized alien. The Contractor shall maintain a copy of such affidavit for the duration of the contract.

- E-Verify_System_Certificati...

*Response required

11.4 HUMAN TRAFFICKING AFFIDAVIT*

a. Please download the attached document, complete all required fields, and upload the completed form here.

- Human_Trafficking_Affidavit...

*Response required

12 VENDOR REGISTRATION

12.1 Do you currently have a City of Pembroke Pines Vendor Number registered in the PaymentWorks System?*

- The City of Pembroke Pines utilizes OpenGov as its e-Procurement platform for solicitation and bid submission purposes. However, please be advised that **vendor registration for onboarding and processing payments is handled separately** through the City's Accounts Payable Division using **PaymentWorks**, a secure online vendor management platform.

- All vendors that will be submitting invoices and requiring payments from the City are required to register on the PaymentWorks platform. If the vendor is not currently

registered with the City via PaymentWorks and does not have a Vendor Number, the City will have to invite the vendor to register.

- For formal solicitations such as this project, the Procurement Department will send PaymentWorks registration invitations to vendor(s) who are under active consideration for award. Please be aware that not all vendors who submit proposals will receive an invitation, in order to manage system usage and avoid onboarding vendors who are unlikely to receive payments from the City.
- Invitations will typically be sent to the contact listed on the submitted Vendor Information Form.

☐ Yes
☐ No

*Response required

When equals "Yes"

12.1.1 What is your Vendor Number?*
*Response required

12.2 VENDOR INFORMATION FORM*

a. Please download the attached document, complete all required fields, and upload the completed form here.

- Vendor_Information_Form.pdf

*Response required

12.3 FORM W-9 (REVISED MARCH 2024)*

a. Please download the attached document, complete all required fields, and upload the completed form here.

b. Note - Please use the March 2024 version of the form as previously dated versions of this form may delay the processing of any payments to the selected vendor.

- Form_W-9_(Rev_March_2024).pdf

*Response required

13 OPTIONAL DOCUMENTATION

13.1 TRADE SECRETS

a. The Proposer's response to this solicitation is a public record pursuant to Florida law, which is subject to disclosure by the City under the State of Florida Public Records Law, Florida Statutes Chapter 119.07 ("Public Records Law"). The City shall permit public access to all documents, papers, letters or other material submitted in

connection with this solicitation and the Contract to be executed for this solicitation, subject to the provisions of Chapter 119.07 of the Florida Statutes.

b. Any language contained in the Proposer's response to the solicitation purporting to require confidentiality of any portion of the Proposer's response to the solicitation, except to the extent that certain information is in the City's opinion a Trade Secret pursuant to Florida law, shall be void. If a Proposer submits any documents or other information to the City which the Proposer claims is Trade Secret information and exempt from Florida Statutes Chapter 119.07 ("Public Records Laws"), the Proposer shall clearly designate that it is a Trade Secret and that it is asserting that the document or information is exempt. The Proposer must specifically identify the exemption being claimed under Florida Statutes 119.07. The City shall be the final arbiter of whether any information contained in the Proposer's response to the solicitation constitutes a Trade Secret.

c. EXCEPT FOR CLEARLY MARKED PORTIONS THAT ARE BONA FIDE TRADE SECRETS PURSUANT TO FLORIDA LAW, DO NOT MARK YOUR RESPONSE TO THE SOLICITATION AS PROPRIETARY OR CONFIDENTIAL. DO NOT MARK YOUR RESPONSE TO THE SOLICITATION OR ANY PART THEREOF AS COPYRIGHTED. ALL DOCUMENTS THAT THE FIRM PURPORTS TO BE CONFIDENTIAL, PROPRIETARY OR A TRADE SECRET SHALL BE UPLOADED TO THE OPENGOV WEBSITE AS A SEPARATE ATTACHMENT, IN THIS SECTION, CLEARLY IDENTIFYING THE EXEMPTION BEING CLAIMED UNDER FLORIDA STATUTES 119.07.

d. The city's determination of whether an exemption applies shall be final, and the proposer agrees to defend, indemnify, and hold harmless the city and the city's officers, employees, and agent, against any loss or damages incurred by any person or entity as a result of the city's treatment of records as public records.

13.2 FINANCIAL STATEMENTS

a. The City is **NOT** requesting the vendor to submit any financial statements for this project and prefers if the vendor does not submit financial statements. In addition, if the City needs a copy of the vendor's financial statements, the City can contact the vendor after the bid due date to request those documents. However, if the vendor does submit the financial statements, they should be uploaded in this section.

b. Any claim of confidentiality on financial statements must be asserted at the time of submittal. The firm must identify the specific statute that authorizes the exemption from the Public Records Law. Please note that the financial statement exemption

provided for in Section 119.071(1)c, Florida Statutes only applies to submittals in response to a solicitation for a "public works" project.

13.3 ALTERNATIVES

a. If you are submitting an alternative product, please upload any related information in this section (such as specification sheets, etc.).

b. In addition, pursuant to the **"Brand Names"** Section included in the GENERAL TERMS AND CONDITIONS Section if and wherever in the specifications a brand name, make, name of manufacturer, trade name, or vendor catalog number is mentioned, it is for the purpose of establishing a grade or quality of material only. Since the City does not wish to rule out other competition and equal brands or makes, the phrase "OR EQUAL" is added. However, if a product other than that specified is bid, Proposers shall indicate on their proposal and clearly state the proposed substitution and deviation. It is the vendor's responsibility to provide any necessary documentation and samples within their bid submittal to prove that the product is equal to that specified. Such samples are to be furnished before the date of bid opening, unless otherwise specified. Additional evidence in the form of documentation and samples may be requested if the proposed brand is other than that specified. The City retains the right to determine if the proposed brand shall be considered as an approved equivalent or not.

13.4 ADDITIONAL INFORMATION

a. Please provide any additional information that you deem necessary to complete your proposal in this section, if it has not been requested in another section.

13.5 PROFESSIONAL LICENSES

a. If applicable, please upload any professional licenses that may be required to perform the services outlined in the solicitation. The following licensing requirements shall apply when the applicable Florida statute mandates specific licensing for Contractors engaged in the type of work covered by this solicitation.

1. State of Florida, Department of Professional Regulation, Construction Industries Licensing Board and licensed by other federal, state, regional, county or municipal agencies having jurisdiction over the specified construction work.

2. Said licenses shall be in the Firm's name as it appears on the OpenGov registration and as appropriately registered with the applicable licensing entity. Proposer shall supply appropriate license numbers, with expiration dates, as part of their bid. Failure to hold and provide proof of proper licensing, certification and registration may be grounds for rejection of the bid.

3. Subcontractors contracted by the Prime Contractor shall be licensed in their respective fields to obtain construction permits as necessary. Said licenses must be in the name of the subcontractor.

14 VENDOR CLASSIFICATION

14.1 Is your firm a Veteran Owned Small Business (VOSB)?*

a. The evaluation of competitive bids is subject to section 35.37 of the City's Procurement Procedures which, except where contrary to federal and state law, or any other funding source requirements, provides that preference be given to veteran owned small businesses. To satisfy this requirement, the vendor shall affirm in writing its compliance with the following objective criteria as of the bid or proposal submission date stated in the solicitation.

b. A preference of two and a half percent (2.5%) of the total evaluation point, or two and a half percent (2.5%) of the total price, shall be given to the Veteran Owned Small Business (VOSB).

☐ Yes
☐ No

*Response required

When equals "Yes"

14.1.1 Upload the "Determination Letter" from the United States Department of Veteran Affairs Center notifying the business that they have been approved as a Veteran Owned Small Business (VOSB)

When equals "Yes"

14.1.2 Upload Veteran Owned Small Business Certification(s) from any relevant agency(ies)

14.2 Is your firm a Minority-Owned Business Enterprise (MBE)?*

☐ Yes
☐ No

*Response required

When equals "Yes"

14.2.1 Please indicate the classification of your Minority-Owned Business Enterprise (MBE)*
Select all that apply

☐ African-American MBE
☐ Asian-American MBE
☐ Hispanic-American MBE
☐ Native-American MBE

☐ Other option not listed above
*Response required

When equals "Yes"
14.2.2 MBE Certification Documentation*
1. Upload your MBE Certification Documentation here, preferably with the State of Florida's Office of Supplier Diversity. If you have multiple MBE certifications, please combine them into one (1) document and upload.

*Response required

14.3 Is your firm a Woman-Owned Business Enterprise (WBE)?*
☐ Yes
☐ No

*Response required

When equals "Yes"
14.3.1 WMBE Certification Documentation*
1. Upload your WMBE Certification Documentation here, preferably with the State of Florida's Office of Supplier Diversity. If you have multiple WMBE certifications, please combine them into one (1) document and upload.

*Response required

14.4 Is your firm a HubZone Business / Labor Surplus Area Firm?*
☐ Yes
☐ No

*Response required

When equals "Yes"
14.4.1 HubZone Business / Labor Surplus Area Firm Certification Documentation*
1. Upload your HubZone Business / Labor Surplus Area Firm Certification Documentation, preferably with the U.S. Small Business Administration (SBA). If you have multiple certifications, please combine them into one (1) document and upload.

*Response required

14.5 Is your firm a Broward County Small Business Enterprise (SBE)?*
☐ Yes
☐ No

*Response required

When equals "Yes"

14.5.1 SBE Cerification Documentation*

1. Upload your SBE Certification Documentation from Broward County's Office of Economic and Small Business Development (OESBD). If you have multiple certifications, please combine them into one (1) document and upload.

*Response required

14.6 Is your firm a Broward County Business Enterprise (CBE)?*

☐ Yes

☐ No

*Response required

When equals "Yes"

14.6.1 CBE Certification Documentation*

1. Upload your CBE Certification Documentation from Broward County's Office of Economic and Small Business Development (OESBD). If you have multiple certifications, please combine them into one (1) document and upload.

*Response required

14.7 Is your firm a Broward County Disadvantaged Business Enterprise (DBE)?*

☐ Yes

☐ No

*Response required

When equals "Yes"

14.7.1 DBE Certification Documentation*

1. Upload your DBE Certification Documentation from Broward County's Office of Economic and Small Business Development (OESBD). If you have multiple certifications, please combine them into one (1) document and upload.

*Response required

14.8 Does your firm have a Vendor Classification that was not listed above?*

☐ Yes

☐ No

*Response required

When equals "Yes"

14.8.1 Other Vendor Classification Certification Documentation*

1. Upload your other Certification Documentation here. If you have multiple certifications, please combine them into one (1) document and upload.

*Response required

15 FEDERAL DOCUMENTS

15.1 Certification Regarding Lobbying; Debarment, Suspension and Other Responsibility Matters for Expenditure of Federal Funds*

a. **Lobbying:**

1. As required by 7 CFR Part 3018, for persons entering into a contract, grant or cooperative agreement over **$100,000** involving the expenditure of Federal funds, the Contractor must complete the **Certification Regarding Lobbying**.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress, in connection with this Federal contract, grant, loan, or cooperative agreement, the Contractor shall also complete and submit the **Standard Form - LLL, "Disclosure Form to Report Lobbying,"** in accordance with its instructions.

b. **Debarment, Suspension and Other Responsibility Matters:**

1. Where the Contractor is unable to certify to any of the statements in the certification for **Debarment, Suspension and Other Responsibility Matters**, he or she shall **provide an explanation**.

- Please download the below documents, complete, and upload.

- Federal_Certification_for_L...

*Response required

15.2 Are you currently registered as an active entity on SAM.gov (System for Award Management)?*

a. All vendors submitting bids for this project must be registered and active in the System for Award Management (SAM.gov) at the time of bid award. This is a federal requirement for entities receiving federal funds, including contracts, grants, or other financial assistance. Registration on SAM.gov ensures that vendors are eligible to do business with the U.S. government and are not suspended, debarred, or otherwise excluded from participation in federal programs. SAM registration is free and can be completed at https://sam.gov. Bidders must provide their Unique Entity ID (UEI) and proof of active registration as part of their proposal.

☐ Yes
☐ No

*Response required

When equals "Yes"

15.2.1 If yes, please provide your Unique Entity ID (UEI)*
*Response required

When equals "Yes"

15.2.2 What is the expiration date of your current SAM.gov registration? (MM/DD/YYYY)*
*Response required

When equals "Yes"

15.2.3 Proof of Registration Upload*

1. Please upload a PDF copy or screenshot of your entity's active registration status from SAM.gov that includes:

   A. Entity Name

   B. Unique Entity ID (UEI)

   C. DUNS (if applicable)

   D. Registration Status ("Active")

   E. Expiration Date

2. *This document must be downloaded from https://sam.gov and must show the current status at the time of bid submission.*

*Response required

15.3 Debarment Status - Is your entity currently debarred, suspended, or otherwise excluded from receiving federal contracts or financial assistance?*

☐ Yes
☐ No

*Response required

When equals "Yes"

15.3.1 If yes, please provide an explanation.*
*Response required

When equals "Yes"

15.3.2 If yes, please upload any relevant documentation, if applicable.

15.4 I certify that the information provided above is true and correct to the best of my knowledge. I understand that false or misleading statements may disqualify this bid and subject the entity to federal penalties.*

☐ Please confirm

*Response required

SECTION 7 - EVALUATION & SELECTION PROCESS

7.1 Qualifying & Selecting Firms

A. Staff will evaluate all responsive proposals received from proposers who meet or exceed the bid requirements contained in the solicitation. Evaluations shall be based upon the information and references contained in the proposals as submitted.

B. Staff will make a recommendation to the City Commission for award of contract.

C. The contract shall be awarded to the most responsive/responsible bidder whose bid is determined to be the most advantageous to the City taking into consideration the evaluation criteria.

DRAFT DOCUMENT FOR COMMISSION REVIEW

CITY OF PEMBROKE PINES

WORK ORDER NO. 01

HUMAN SERVICES CAMPUS UTILITY REHABILITATION

PROJECT SPECIFICATIONS

PROJECT MANUAL

Prepared for:

City of Pembroke Pines

Utility Department

8300 South Palm Drive

Pembroke Pines, FL 33025

Prepared by:

CPH Consulting, LLC.

1992 SW 1st St.

Miami FL, 33135

FEBRUARY 2026

DRAFT DOCUMENT FOR COMMISSION REVIEW

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City of Pembroke Pines Work Order NO. 01

Human Services Campus Utility Rehabilitation

February 2026

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DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01001
GENERAL WORK REQUIREMENTS

PART 1 - GENERAL

1.01 NOTICES

A. All notices or other papers required to be delivered by the Contractor to the City shall be delivered to the office of Utilities, 8300 South Palm Drive, Pembroke Pines FL 33025.

1.02 WORK TO BE DONE

A. The Contractor shall furnish all labor, materials, equipment, tools, services, and incidentals to complete all work required by these specifications and as shown on the Drawings, at a rate of progress which will ensure completion of the Work within the Contract Time stipulated.

B. The Contractor shall perform the Work complete, in place, and ready for continuous service, and shall include repairs, testing, permits, clean up, replacements, and restoration required as a result of damages caused during this construction.

C. The Contractor shall substantially complete the Work within the Contract Time identified in which is 270 calendar days. The Work shall be finally complete, ready for Final Payment in within 30 calendar days from the actual date of substantial completion.

D. The Contractor shall comply with all City, County, State, Federal, and other codes, which are applicable to the proposed Work.

E. All newly constructed Work shall be carefully protected from injury in any way. No wheeling, walking, or placing of heavy loads on it shall be allowed and all portions damaged shall be reconstructed by the Contractor at his own expense.

F. Scope of Work: See Section 01010 "Summary of Work" and the Bid Schedule for details.

1.03 DRAWINGS AND PROJECT MANUAL

A. The Work shall be performed in accordance with the Drawings and Specifications prepared by the City/Professional. All work and materials shall conform to the City Utilities Standards and Construction Specifications Manual, latest edition or as indicated in these Specifications or Drawings.

B. The Contractor shall verify all dimensions, quantities and details shown on the Drawings, Supplementary Drawings, Schedules, Specifications or other data received from the City/Professional, and shall notify same, in writing, of all errors, omissions, conflicts and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies

shall not relieve the Contractor of full responsibility for unsatisfactory Work, faulty construction or improper operation resulting there from, nor from rectifying such conditions at his own expense.

C. All schedules are given for the convenience of the City and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in the Work to be done under this Contract.

D. Intent:

1. All Work called for in the Specifications applicable to this Contract but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified either in the Drawings or in the Specifications but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.
2. Items of material, equipment, machinery, and the like may be specified on the Drawings and not in the Specifications. Such items shall be provided by the Contractor in accordance with the specification on the Drawings.
3. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

E. Refer to the Contract for the order of precedence of items and documents.

1.04 PROTECTION AND RESTORATION

A. The Contractor shall be responsible for the preservation of all public and private property and shall use every means of protection necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or the Contractor shall make good the damage in other manner acceptable to the City/Professional.

B. Protection of Trees and Shrubs

1. Protect with boxes or other barricades.
2. Do not place excavated material so as to injure trees or shrubs.
3. Install pipelines in short tunnels between and under root systems.
4. Support trees to prevent root disturbance during nearby excavation.

C. Tree and Limb Removal

1. Tree limbs, which interfere with equipment operation and are approved for pruning, shall be neatly trimmed and the tree cut coated with tree paint.
   The City may order the Contractor, for the convenience of the City, to remove trees

along the line or trench excavation. The Contractor shall obtain any permits required for removal of trees. Ordered tree removal shall be paid for under the appropriate Contract Items.

D. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by the Contractor with new stock of similar size and age, at the proper season and at the sole expense of the Contractor.

E. Lawn Areas: All lawn areas disturbed by construction shall be replaced with like kind to a condition similar or equal to that existing before construction. Where sod is to be removed, it shall be carefully removed, and the same re-sodded, or the area where sod has been removed shall be restored with new sod in the manner described in the applicable section.

F. Where fencing, walls, shrubbery, grass strips or area must be removed or damaged incident to the construction operation, the Contractor shall, after completion of the work, replace or restore to the original condition.

G. The cost of all labor, materials, equipment, and work for restoration shall be deemed included in the appropriate Contract Item or items, or if no specific item is provided therefore, as part of the overhead cost of the Work, and no additional payment will be made therefore.

1.05 PUBLIC NUISANCE

A. The Contractor shall not create a public nuisance including, but not limited to, encroachment on adjacent lands, flooding of adjacent lands, or excessive noise.

B. . It shall be unlawful between the hours of 6:00 p.m. of one day and 7:30 a.m. of the next day for any person to perform any construction or repair work on buildings, structures, or projects, at a noise level of more than ten dBA in excess of the ambient noise level, when measured at the property line of such project, except to perform emergency work. No extra charge may be made for time lost due to work stoppage resulting from the creation of a public nuisance. This shall not apply in cases of urgent necessity in the interest of the public health and safety, if a permit is granted by the Director of the Building and Zoning Department. Such a permit may be granted for a period not to exceed three days or less while the emergency continues, and may be renewed for periods of three days or less while the emergency continues; however, dewatering pumps and other equipment which is required to be operated 24 hours per day may be granted a permit to operate for a period of time in excess of three days if the operation of such equipment does not create a noise in excess of 80 dBA when measured at the property line.

1.06 MAINTENANCE OF SERVICE

A. Unless noted otherwise on the plans, the operation of the existing water, reclaimed water or wastewater facility on each of the respective locations shall remain in service until the transfer of service has been completed. The Contractor shall, prior to interrupting any utility service (water, sewer, etc.) for the purpose of making cut-ins to the existing lines or for any other purposes, contact the City and make arrangements for the interruption which will be satisfactory to the City.

B. Utility lines that are damaged during construction shall be repaired by the Contractor and service restored within 4-hours of the breakage. The City retains the option of repairing any damage to utility pipes in order to expedite service to the customers. The Contractor will remain responsible for all costs associated with the repair.

1.07 TRANSFER OF SERVICE

A. When the City has accepted a proposed facility and placed it into operation, the transfer of service is complete. The Contractor may begin the work of removing the existing or temporary facilities.

1.08 LABOR

A. Supervision: The Contractor shall supervise and direct the Work efficiently and with his best skills and attention. The Contractor shall have a competent, English-speaking superintendent or representative, who shall be on the site of the Project at all working hours, and who shall have full authority by the Contractor to direct the performance of the Work and make arrangements for all necessary materials, equipment, and labor without delay.

B. Jurisdictional Disputes: It shall be the responsibility of the Contractor to pay all costs that may be required to perform any of the Work shown on the Drawings or specified herein to avoid any work stoppages due to jurisdictional disputes. The basis for subletting work in question, if any, shall conform to precedent agreements and decisions on record with the Building and Construction Trades Department, AFL-CIO, dated June, 1973, including any amendments thereto.

C. Apprenticeship: The Contractor shall comply with all of the requirements of Section 446, Florida Statutes, for all contracts in excess of $25,000 excluding roadway, highway or bridge contracts and the Contractor agrees to insert in any subcontract under this Contract the requirements of this Article.

1.09 MATERIALS AND EQUIPMENT

A. MANUFACTURER

1. All transactions with the manufacturers or Subcontractors shall be through the Contractor, unless the Contractor and the City/Professional request that the manufacturer or Subcontractor communicate directly with the City/Professional. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.
2. All workmanship and materials shall be of the highest quality. The equipment shall be the product of manufacturers who are experienced and skilled in the field with an established record of research and development. No equipment will be considered unless the manufacturer has designed and manufactured equipment of comparable type and size and have demonstrated sufficient experience in such design and manufacture.
3. No material shall be delivered to the Site without prior approval of the

City/Professional.

4. All apparatus, mechanisms, equipment, machinery, and manufactured articles for incorporation into the Project shall be the new (most current production at time of bid) and unused standard products of recognized reputable manufacturers.
5. Manufactured and fabricated products:
   a. Design, fabricate and assemble in accord with the best engineering and shop practices.
   b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
   c. Any two or more pieces of material or equipment of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.
   d. Products shall be suitable for service conditions as specified and as stated by manufacturer.
   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
   f. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.10 MANUFACTURER'S SERVICE

A. Where service by the manufacturer is specified to be furnished as part of the cost of the item of equipment, the Work shall be at the Contractor's expense.

B. The services provided shall be by a qualified manufacturer's service representative to check and verify the completed installation, place the equipment in operation, and instruct the City's operators in the operation and maintenance procedures. Such services are to be for period of time and for the number of trips specified. A working day is defined as a normal 8-hour working day on the job and does not include travel time.

C. The services shall further demonstrate to the City/Professional's complete satisfaction that the equipment will satisfactorily perform the functions for which it has been installed.

1.11 INSPECTION AND TESTING

A. General

1. All materials and equipment furnished by the Contractor shall be subject to the inspection, review and acceptance of the City and meet the requirements as outlined in the City Utilities Standards and Construction Specifications Manual. If in the testing of any material or equipment it is ascertained by the City/Professional that the material or equipment does not comply with the Contract, the Contractor shall be notified thereof, and the Contractor will be directed to refrain from delivering said material or equipment, or to remove it promptly from the Site or from the Work and not accepted by the City shall be replaced with acceptable material, without cost to the City.
2. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEE, except as may otherwise be stated herein.

3. The Contractor shall give notice in writing to the City sufficiently in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the City shall arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials; or the City will notify the Contractor that the inspection will be made at a point other than the point of manufacture; or the City will notify the Contractor that inspection will be waived.
4. When inspection is waived or when the City/Professional so requires, the Contractor shall furnish to the City authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the Work have been manufactured and tested in conformity with the Contract Documents. These certificates shall be notarized and shall include five (5) copies of the results of physical tests and chemical analysis, where necessary, that have been made directly on the product or on similar products of the manufacturer.
5. The Contractor must comply with these provisions before shipping any material. Such inspections by the City shall not release the Contractor from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

B. Cost

1. City shall employ and pay for the services of an independent testing laboratory to perform testing indicated on the Contract Documents, or at the City's discretion to ensure conformity with the Contract Documents.
2. The cost of field leakage and pressure tests and shop tests of materials and equipment specifically called for in the Contract Documents shall be borne by the Contractor. Such costs shall be deemed to be included in the Contract price.
3. The Contractor shall notify the City laboratory a minimum of 48-hours in advance of operations for scheduling of tests. When tests or inspections cannot be performed after such notice, the Contractor shall reimburse City for expenses incurred.
4. The Contractor shall pay for all work required to uncover, remove, replace, retest, etc., any work not tested due to the Contractor's failure to provide the 48-hours advance notice or due to failed tests. The Contractor shall also provide compensation for the City/Professional's personnel for required re-testing due to failed or rescheduled testing.

C. Shop Testing

1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function or special requirements are specified shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents. No such equipment shall be shipped to the worksite until the City/Professional notifies the Contractor, in writing, that the results of such tests are acceptable.
2. The manufacturing company shall provide five (5) copies of the manufacturer's actual shop test data and interpreted results signed by a responsible official of the manufacturing company and notarized, showing conformity with the Contract

Documents as a prerequisite for the acceptance of any equipment. The cost of shop tests (excluding cost of City's representative) and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor and shall be included in the Contract price.

D. Field Testing:

1. The City shall employ and pay for services of an independent testing laboratory to perform testing specifically indicated in the Contract Documents. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract. The Contractor shall provide compensation for retesting of all failed tests.
2. The City may at any time during the progress of the Work, request additional testing beyond that which is specified in the Contract. This testing will be at the City's expense. Contractor shall:
   a. Cooperate with laboratory personnel, provide access to the Project.
   b. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
   c. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes, which require control by the testing laboratory.

E. Demonstration Tests: Upon completion of the Work and prior to final payment, all equipment and piping installed under this Contract shall be subjected to acceptance or demonstration tests as specified or required to provide compliance with the Contract Documents. The Contractor shall furnish all labor, fuel, energy, water and all other equipment necessary for the demonstration tests at no additional cost to the City.

F. Final Inspection: Prior to preparation of the final payment application, a final inspection will be performed by the City to determine if the Work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents. See also Section 01700 "Project Closeout."

G. Inspection by existing utility owners: The Contractor shall pay for all inspections during the progress of the work required and provided by the owner of all existing public utilities paralleling or crossing the Work, as shown on the Drawings. All such inspection fees shall be deemed included in the appropriate Contract Item or items, or if no specific item is provided therefore, as part of the overhead cost of the Work, and no additional payment will be made therefore.

H. Inspection by Other Agencies: The Florida Department of Transportation, the Florida Department of Environmental Protection, and other authorized governmental agencies shall have free access to the site for inspecting materials and work, and the Contractor shall afford them all necessary facilities and assistance for doing so. Any instructions to the Contractor resulting from these inspections shall be given through the City. These rights of inspections shall not be construed to create any contractual relationship between the Contractor and these agencies.

1.12 PROJECT SITE AND ACCESS

A. RIGHT-OF-WAY AND EASEMENTS

1. The use of public streets and alleys shall be such as to provide a minimum of inconvenience to the public and to other traffic. Any earth or other excavated material shall be removed by the Contractor and the streets cleaned to the satisfaction of the City.
2. The Contractor shall not enter or occupy private land outside of easements, except by written permission of the property owner.
3. At the time of the Pre-Construction meetings, the Contractor shall become fully acquainted with the status of all easements. Should easements not be acquired by the City in specific areas of the Work, the Contractor shall sequence and schedule his work therein so as not to interfere with the progress of work in other areas of the Project. Any rescheduling of work due to easement acquisitions shall be performed by the Contractor at no additional cost to the City. The City agrees that it will make every effort to acquire all remaining easements with all speed and diligence possible so as to allow the completion of the Work within the Contract time.

B. ACCESS

1. Neither the material excavated nor the materials or equipment used in the construction of the Work shall be so placed as to prevent free access to all fire hydrants, valves or manholes.
2. Access to businesses located adjacent to the project site must be maintained at all times. Contractor may prearrange the closing of business access with the business Owner. Such prearranged access closing shall not exceed two (2) hours. Property drainage and grading shall be restored and all construction debris removed within 48-hours of backfilling trench.
3. Contractor agrees that representatives of the City and any governmental agents will have access to the Work wherever it is in preparation or progress and that the Contractor shall provide facilities for such access and inspection.

1.13 UTILITIES

A. UTILITY CONSTRUCTION

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto, whether owned or controlled by governmental bodies or privately owned by individuals, firms or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage or water. Other public or private property, which may be affected by the Work, shall be deemed included hereunder.
2. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required.
3. The length of open trench will be controlled by the particular surrounding conditions, but shall always be confined to the limits described by the City. If any excavation becomes a hazard, or if it excessively restricts traffic at any point, the City may

require special construction procedures. As a minimum, the Contractor shall conform to the following restoration procedures:

a. Interim Restoration: All excavations shall be backfilled and compacted as specified by the end of each working day. For excavations within existing paved areas; limerock base or soil cement base (match existing) shall be spread and compacted to provide a relatively smooth surface free of loose aggregate material. At the end of each workweek, the S-I asphaltic surface course shall be completed and opened to traffic. Contractor shall coordinate his construction activity including density tests and inspections to allow sufficient time to achieve this requirement. All driveway cuts shall be backfilled, compacted, and limerock base spread and compacted immediately after installation. Contractor shall coordinate with the individual property owners prior to removing the driveway section. Any utility crossing an existing roadway, parking lot or other paved area shall be patched by the end of the working day.

b. All pipe and fittings shall be neatly stored in a location, which will cause the least disturbance to the public. All debris shall be removed and properly disposed of by the end of each working day.

c. Final Restoration Overlay: After completing all installations, and after testing of the pipe (but no sooner than 30-days after applying the S-I asphaltic surface), final restoration shall be performed. In no event shall final restoration begin after substantial completion. Final restoration shall provide an S-III asphaltic overlay as specified in an uninterrupted continuous operation until completion. Any additional restoration required after testing shall be repaired in a timely manner at no additional cost to the City.

d. Maintenance of all restored facilities shall be the Contractor's responsibility. This maintenance shall be performed on an on-going basis during the course of construction. The Contractor's Progress Schedule shall reflect the above restoration requirements.

e. Additional Restoration for Work in Business or Commercial Districts: The Contractor shall restore all private property, damaged by construction, to its original condition. Access to businesses located adjacent to the project site must be maintained at all times. Contractor may prearrange the closing of business accesses with the business owner. Such prearranged access closing shall not exceed two (2) hours. Property drainage and grading shall be restored within 24-hours of backfilling trench.

B. EXISTING UTILITIES

1. The locations of all existing underground piping, structures and other facilities are shown based on information received from the respective owner. The locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping, conduit and cables to be encountered. It is the Contractor's responsibility to verify all existing underground piping, structures and other facilities.
2. The Contractor shall, at all times, employ acceptable methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of existing utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, utility services; and shall cooperate fully with the owners thereof to that end.

3. When existing facilities are found to be in conflict with the Work, the City reserves the right to modify alignments to avoid interference with existing facilities.
4. All utilities, which do not interfere with the work, shall be carefully protected against damage. Any existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at his expense as directed by the City. Any existing facilities, which require operation to facilitate repairs, shall be operated only by the owner of the respective utility.
5. It is the responsibility of the Contractor to ensure that all utility and/or poles, the stability of which may be endangered by the proximity of excavation, be temporarily stayed and/or shored in position while work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice of any such excavation.

C. NOTICES

1. All governmental utility departments and other owners of public utilities, which may be affected by the Work, will be informed in writing by the Contractor two (2) weeks after the execution of the Contract or Contracts covering the Work. Such notice will be sent out in general, and directed to the attention of the governmental utility departments and other owners of public utilities for such installations and structures as may be affected by the Work.
2. The Contractor shall comply with Florida Statute 553.851 regarding protection of underground gas pipelines. Evidence of notification to the gas pipeline owner shall be furnished to the City within two (2) weeks after the execution of the Contract.
3. It shall be the Contractor's responsibility to contact utility companies at least 72-hours in advance of breaking ground in any area or on any unit of the work so maintenance personnel can locate and protect facilities, if required by the utility company.
4. The Contractor shall give a minimum five (5) working day notice to utility personnel prior to interrupting a utility service (water, sewer, etc.).

D. EXPLORATORY EXCAVATIONS

1. Exploratory excavations shall be conducted by the Contractor for the purpose of locating underground pipelines or structures in advance of the construction. Test pits shall be excavated in areas of potential conflicts between existing and proposed facilities and at piping connections to existing facilities a minimum of 48-hours or 1,000-feet in advance of work. If there is a potential conflict, the Contractor shall notify the City/Professional immediately. Information on the obstruction to be furnished by the Contractor shall include: Location, Elevation, Utility Type, Material and Size. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the City.

E. UTILITY CROSSINGS

1. It is intended that wherever existing utilities must be crossed, deflection of the pipe within specified limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated on the Drawings. However, when in the opinion of the City this procedure is not feasible, the City may direct the use of fittings for a utility crossing or conflict transition as detailed on the Drawings.

F. RELOCATIONS

1. Relocations shown on the Drawings: Public utility installations or structures, including but not limited to poles, signs, fences, piping, conduits and drains that interfere with the positioning of the work which are shown on the Drawings to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as part of the general cost of doing the Work and shall be included in the prices bid for the various contract items. No separate payment shall be made therefore.
2. Relocations not shown on the Drawings
   a. Where public utility installations or structures are encountered during the course of the work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the City, removal, relocation, replacement or rebuilding is necessary to complete the Work, such work shall be accomplished by the utility having jurisdiction, or such work may be ordered, in writing by the City, for the Contractor to accomplish.
   b. If such work is accomplished by the utility having jurisdiction, it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required.
   c. If such work is accomplished by the Contractor, it will be paid for as a Change Order.
3. All existing castings, including valve boxes, junction boxes, manholes, hand holes, pull boxes, inlets and similar structures in the areas of construction that are to remain in service and in areas of trench restoration and pavement replacement, shall be adjusted by the Contractor to bring them flush with the surface of the finished work.
4. All existing utility systems which conflict with the construction of the work herein, which can be temporarily removed and replaced, shall be accomplished at the expense of the Contractor. Work shall be done by the utility unless the utility approves in writing that the Work may be done by the Contractor.

1.14 RELATED CONSTRUCTION REQUIREMENTS

A. TRAFFIC MAINTENANCE

1. Refer to Section 01570 – Maintenance of Traffic

B. BARRIER AND LIGHTS

1. The Contractor shall exercise extreme care in the conduct of the Work to protect health and safety of the workmen and the public. The Contractor shall provide all protective measures and devices necessary, in conformance with applicable local, state and federal regulations. Protective measures shall include but are not limited to barricades, warning lights/flashers and safety ropes.
2. All equipment and vehicles operating within 10-feet of the roadway shall have flashing strobe lights attached.

C. DEWATERING AND FLOTATION

1. The Contractor, with his own equipment, shall do all pumping necessary to dewater any part of the work area during construction operations to insure dry working conditions. The Contractor shall take the necessary steps to protect on-site and off-site structures. Damage to any structures due to dewatering shall be repaired or the structures replaced at the Contractor's expense.

2. The Contractor shall be completely responsible for any tanks, wetwells or similar structures that may become buoyant during the construction and modification operations due to the ground water or floods and before the structure is put into operation. The proposed final structures have been designed to account for buoyancy; however, the Contractor may employ methods, means and techniques during construction which may affect the buoyancy of structures. The Contractor shall take the necessary steps to protect structures. Damage to any structures due to floating or flooding shall be repaired or the structures replaced at the Contractor's expense.
3. Contractor shall be responsible for any required permits for the discharge of ground water.

D. DUST AND EROSION CONTROL

1. The Contractor shall prevent dust nuisance from his operations or from traffic.
2. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.
3. Temporary erosion controls include, but are not limited to, grassing, mulching, netting, watering and reseeding on-site surfaces and soil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the City, FDEP and any other agency having jurisdiction.
4. Temporary sedimentation controls include, but are not limited to; silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the City, FDEP and any other agency having jurisdiction.
5. The construction of temporary erosion and sedimentation control facilities shall be in accordance with the technical provision of section 104 “Prevention, Control, and Abatement of Erosion and Water Pollution” of the FDOT Standard Specifications for Road and Bridge Construction, latest edition.

E. LINES AND GRADES

1. All Work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as given by the City/Professional.
2. When the location of the Work is dimensioned on the Drawings, it shall be installed in that location; when the location of the Work is shown on a scaled drawing, without dimensions, the Work shall be installed in the scaled location unless the City approves an alternate location for the piping. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve the Contractor from laying and jointing different or additional items where required. The City/Professional may require detailed pipe laying drawings and schedules for project control.
3. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the project control points set by the City, and shall be solely responsible for the accuracy thereof.
4. Water main and forcemain shall be installed to provide long uniform gradient or slope to pipe to minimize air pockets and air release valves. The stationing shown on the Drawings for air and vacuum release valve assemblies are approximate and the

Contractor shall field adjust these locations to locate these valves at the highest point in the pipeline installed. All locations must be accepted by the City.

5. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed using the following control techniques as a minimum:
   a. Gravity lines; continuous control, using laser beam technology.
   b. Pressure lines; control stakes set at 50-foot intervals using surveyors' level instrument.

F. TEMPORARY CONSTRUCTION

1. Temporary fences: If, during the course of the Work, it is necessary to remove or disturb any fencing, the Contractor shall at his own expense, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced.
2. Responsibility for Temporary Structures: In accepting the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or work and for any damage which may result from their failure or their improper construction, maintenance or operation.

G. DAILY REPORTS

1. The Contractor shall submit to the City's Representative daily reports of construction activities including non-workdays. The reports shall be complete in detail and shall include the following information:
   a. Days from Notice to Proceed; Days remaining to substantial and final completion.
   b. Weather information
   c. Work activities with reference to the Critical Path Method (CPM) schedule activity numbers (including manpower, equipment and daily production quantities for each individual activity).
   d. Major deliveries
   e. Visitors to site
   f. Test records
   g. New problems, and
   h. Other pertinent information
2. A similar report shall be submitted for/by each Subcontractor.
3. The report(s) shall be submitted to the City Representative within 2 days of the respective report date. Each report shall be signed by the Contractor's Superintendent or Project Manager. Pay request will not be processed unless daily reports are current.
4. If a report is incomplete, in error, or contains misinformation, a copy of the report shall be returned by the City Representative to the Contractor's Superintendent or Project Manager with corrections noted. When chronic errors or omissions occur, the Contractor shall correct the procedures by which the reports are produced.

H. CLEANING

1. During Construction
   a. During construction of the Work, the Contractor shall, at all times, keep the Site free from material, debris and rubbish as practicable and shall remove the same from any portion of the Site if, in the opinion of the City, such material, debris, or rubbish constitutes a nuisance or is objectionable.

b. Provide on-site containers for the collection of waste materials, debris and rubbish and remove such from the Site periodically by disposal at a legal disposal area away from the Site.

c. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished. Use cleaning materials which will not create hazards to health or property, and which will not damage surfaces. Use only those cleaning materials and methods recommended by the manufacturer of the surface material. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

d. The Contractor shall remove from the site all surplus materials and temporary structures when no longer necessary to the Work at the direction of the City.

2. Final Cleaning

a. At the conclusion of the Work, all equipment, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and the Contractor shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances. Employ skilled workmen for final cleaning. Thoroughly clean all installed equipment and materials to a bright, clean, polished and new appearing condition. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

b. The Work shall be left in a condition as shown on the Drawings and the remainder of the site shall be restored to a condition equal or better than what existed before the Work.

c. Prior to final completion, or City occupancy, Contractor shall conduct an inspection of interior and exterior surfaces, and all work areas to verify that the entire Work is clean. The City will determine if the final cleaning is acceptable.

1.15 HURRICANE PREPAREDNESS

A. CONTRACTOR REQUIREMENTS

1. The Contractor shall develop and maintain a Hurricane Preparedness and Response Plan throughout the duration of the project. This plan shall outline measures to secure equipment, materials, and partially completed work in the event of a hurricane watch or warning issued by the National Weather Service. Upon notification of a tropical storm or hurricane threat, the Contractor shall promptly secure all job sites, remove or anchor loose materials, and ensure that all erosion control measures are in place to prevent environmental contamination. The Contractor shall also coordinate with the City for emergency access routes and maintain contact information for key personnel for rapid mobilization. Failure to implement adequate storm preparation may result in the suspension of work and the Contractor shall be liable for any resulting damage or delays.

1.16 CONSTRUCTION NOT PERMITTED

A. USE OF EXPLOSIVES

1. No blasting shall be done except as approved by the City and the governmental

agency or political subdivision having jurisdiction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Summary of work, other contracts, work sequence, working hours, operation of existing facilities, use of premises, OWNER furnished products, coordination, cutting and patching.

1.02 SUMMARY OF WORK

A. The proposed work consists of rehabilitating the water and sewer infrastructure of the Pembroke Pines Senator Howard C. Forman Human Services Campus located at Poinciana Drive Pembroke Pines, FL 33025. The Work shall include, but not be limited to, the abandonment of approximately 15,800 linear feet of potable water mains of various sizes; the installation of approximately 4,700 linear feet of potable water main varying from 8", 6" and 4" C900 PVC; the reconnection of water service lines and fire hydrant assemblies; the rehabilitation of approximately 17,200 linear feet of gravity sewer mains and laterals with services including internal closed-circuit television (CCTV) inspection, cleaning and inspection, sewage bypass pumping, cured-in-place piping lining; and all other work required for a complete project in accordance with the contract documents and drawings.

B. The work associated with this project involves active water mains and gravity sewer lines that are within the Rights-Of-Way (ROW) or property owned by the City. All work activities shall be required to be in accordance with the permits issued by the respective agencies. All work performed will be required to be done while maintaining the functional operation of the utility lines.

C. All materials, equipment, skills, tools, and labor which is reasonably and properly inferable and necessary for the proper completion of the Work and in compliance with the requirements stated or implied by these Specifications or Drawings shall be furnished and installed by the CONTRACTOR without additional compensation, whether specifically indicated in the Contract Documents or not.

D. Repair, replace, or otherwise settle with the OWNER or OWNER'S Representative, if damage to property or existing facilities occurs, including damage to pavements, utilities, lawns, structures, etc.

E. Construct the Project under a Unit Price Contract.

F. The CONTRACTOR shall perform the work complete, in place, and ready for

continuous service, and shall include repairs, testing, permits, clean up, replacements, and restoration required as a result of disruptions caused during this construction.

F. Any damage that occurs through the fault of the CONTRACTOR, shall be completely restored at the expense of the CONTRACTOR, based upon current City standards.

G. Pipe Manufacturer shall provide training for CONTRACTOR's personnel on the proper methods of handling, installing, joining and backfilling of all mains.

H. Contractor shall verify location and depth of existing utilities there proposed storm will be installed to determine actual need for utility line transitions. If existing mains are not in conflict with proposed storm lines, then the transitions will not be required.

1.03 WORK SEQUENCE

A. The CONTRACTOR's sequence of work may be of his choosing in order to complete the work in the allowed time frame and in conjunction with all Work Activities. The CONTRACTOR shall submit a schedule and work sequence to the OWNER at least five (5) days prior to the Notice to Proceed. Due to the critical nature of the utilities systems in this area, shutdowns of any existing City utility systems will not be allowed. Contractor shall be responsible for keeping all utility services to customers active throughout the duration of the project. See Special Project Procedures in this section for Suggested Sequence of Construction.

1.04 CITY WORKING HOURS

A. Normal working hours for the project shall be an eight (8) hour period between the hours of 7:00 a.m. – 7:00 p.m., Monday through Friday. Should the CONTRACTOR request, and the City approve the CONTRACTOR to work periods greater than 8 hours a day, he shall make such requests in writing a minimum of 48 hours prior to such work periods. The CONTRACTOR shall pay the cost of $50.00 per hour for inspection by the City's inspection representatives for any hours worked in excess of 8 hours per day or 40 hours per week worked outside the normal work hours for the project.

B. The CONTRACTOR may be required to perform certain work at times of the day or night when system flows, vehicular traffic and pedestrian traffic are at diminished levels and at times appropriate to other activities which are occurring that may affect the project. The CONTRACTOR shall comply with requirements to alter his schedule of work as requested or required by City without change to the contract price or time.

1.05 OPERATION OF EXISTING FACILITIES

A. The proposed work for this project involves the installation of new water mains as well as the removal/abandonment and replacement of operating water mains in Rights-Of-Way with both vehicular and pedestrian traffic. The CONTRACTOR shall perform their work taking all proper precautions and safety measures to insure a safe work area. The work shall be so conducted to maintain existing utility systems in operation. All utilities that occupy or are adjacent to the subject construction site are to remain in operation. The CONTRACTOR shall coordinate all construction activities with the City Resident Inspectors.

1.06 CONTRACTOR USE OF PREMISES

A. Confine operations at the site to areas permitted by applicable laws, ordinances, permits, and by the Contract Documents. Do not unreasonably encumber the site with materials or equipment. The CONTRACTOR shall assume full responsibility for protection and safekeeping of products stored on the job site.

1.07 COORDINATION

A. The CONTRACTOR shall be fully responsible for the coordination of his work and the work of his employees, subcontractors, and suppliers and to assure compliance with schedules.

B. The coordination requirements of this Section are in addition to the requirements of this Specification Document.

C. It is the CONTRACTOR's responsibility to coordinate with all the utilities regarding locates, protection of existing facilities, testing, or relocations.

1.08 CUTTING AND PATCHING

A. Cutting and patching for inspection and testing and the payment therefore shall be as specified in the General Conditions and Supplementary Conditions.

B. The CONTRACTOR shall, at no additional expense to the OWNER, perform cutting and patching necessary for the completion of the Project. Perform cutting and patching in a manner to prevent damage to the facilities or previously completed work.

C. Refinish surfaces as necessary to provide an even finish. Refinish continuous surfaces to the nearest intersection.

1.09 DRAWINGS AND PROJECT MANUAL

A. The Utility Work associated with the rehabilitation of water and sewer infrastructure in the Human Services Campus shall be performed in accordance with the Drawings and Specifications prepared by CPH, LLC.

B. The CONTRACTOR shall verify all dimensions, quantities and details shown on the Utility Drawings and Roadway Drawings, Supplementary Drawings, Schedules, Specifications or other data received from the ENGINEER, and shall notify the same, in writing, of all errors, omissions, conflicts and discrepancies found therein with adequate notice. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the CONTRACTOR of full responsibility for unsatisfactory Work, faulty construction or improper operation resulting there from, nor from rectifying such conditions at his own expense.

C. All schedules are given for the convenience of the ENGINEER and the CONTRACTOR and are not guaranteed to be complete. The CONTRACTOR shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in the Work to be done under this Contract.

D. Intent:

1. All work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Drawings or in the Specifications, but involved in carrying out their implied intent, or in the complete and proper execution of the Work, is required and shall be performed by the CONTRACTOR as though it were specifically delineated or described.

2. Items of material, equipment, machinery, and the like may be specified on the Drawings and not in the Specifications. Such items shall be provided by the CONTRACTOR in accordance with the specification on the Drawings.

3. The apparent silence of the Specifications to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

1.11 WEATHER

A. During inclement weather, all work which might be damaged or rendered inferior by such weather conditions shall be suspended. The orders and decisions of the ENGINEER as to suspensions shall be final and binding. During suspension of the Work from any cause, the Work shall be suitably covered and protected so as to preserve it from injury by the weather or otherwise; and, if the ENGINEER will so direct, the rubbish and surplus materials shall be removed.

1.12 PROTECTION AND RESTORATION

A. The CONTRACTOR shall be responsible for the preservation of all public and private property, and shall use every means of protection necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the CONTRACTOR, such property shall be restored by the CONTRACTOR, at his expense, to a condition equal to or better than that existing before the damage was done, or he shall make good the damage in other manner acceptable to the ENGINEER.

B. Protection of Trees and Shrubs

1. Protect with boxes or other barricades.
2. Do not place excavated material so as to injure trees or shrubs.
3. Support trees to prevent root disturbances during nearby excavation.

C. Tree and Limb Removal

1. Tree limbs that interfere with equipment operation and are approved for pruning shall be neatly trimmed and the tree cut coated with tree paint. Trimming and removal of tree limbs shall be incidental.

2. The OWNER may order the CONTRACTOR, for the convenience of the OWNER, to remove trees along the line or trench excavation. The CONTRACTOR shall obtain any permits required for removal of trees. Ordered tree removal shall be paid for under the appropriate Contract Items.

D. Trees or shrubs destroyed by negligence of the CONTRACTOR or his employees shall be replaced by him with new stock of similar size and age, at the proper season and at the sole expense of the CONTRACTOR.

E. Lawn Areas – All lawn areas disturbed by construction shall be replaced with like kind to a condition similar or equal to that existing before construction. Where sod is to be removed, it shall be carefully removed, and the same re-sodded, or the area where sod has been removed shall be restored with new sod in the manner described in the applicable section.

F. The CONTRACTOR shall be responsible for locating and protecting and/or relocating all utilities lines, including irrigation lines, in the areas of the construction activities. If any existing lines are broken or damaged as a result of construction activities, the CONTRACTOR shall be responsible for repairing the lines at no additional cost to the OWNER.

1.13 DELIVERY AND STORAGE

A. General

1. The CONTRACTOR shall be responsible for all material, equipment and supplies sold and delivered to the OWNER under this Contract until final inspection of the Work and acceptance thereof by the OWNER.

2. All materials and equipment to be incorporated in the Work shall be handled and stored by the CONTRACTOR before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.

3. Any materials that, in the opinion of the ENGINEER, become damaged to a point where they are unfit for their intended or specified use shall be promptly removed from the site of the Work, and the CONTRACTOR shall receive no compensation for the damaged material or its removal.

4. In the event any such material, equipment or supplies are lost, stolen, damaged or destroyed prior to final inspection and acceptance, the CONTRACTOR shall replace the same without additional cost to the OWNER.

B. Delivery – The CONTRACTOR shall

1. Deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.

2. Coordinate deliveries in order to avoid delay in or impediment of, the progress of the Work of any related CONTRACTOR.

3. Schedule deliveries to the site not more than one month prior to scheduled installation without written authorization from the ENGINEER.

4. Arrange deliveries of products in accordance with construction schedules coordinated to avoid conflict with work and conditions at the site.

5. Deliver products in undamaged condition, in manufacturer’s original containers or packaging, with identifying labels intact and legible.

6. Immediately upon delivery, inspect shipments with the OWNER’S field representative to ensure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

7. Provide equipment and personnel to handle products by methods recommended by the manufacturer to prevent soiling or damage to

products or packaging.

8. Submit operation and maintenance data to the ENGINEER for review prior to shipment of equipment.

C. Storage

1. The CONTRACTOR shall be responsible for securing a location for on-site storage of all material and equipment necessary for completion of this project.

2. All material delivered to the job site shall be protected from dirt, dust, dampness, water and any other condition detrimental to the life of the material from the date of delivery to the time of installation of the material and acceptance by the OWNER.

3. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.

4. When required or recommended by the manufacturer, the CONTRACTOR shall furnish a covered, weather protected storage structure providing a clean, dry, non-corrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project.

5. The CONTRACTOR shall arrange the storage area in a manner to provide easy access for inspection. Periodic inspections of stored products shall be done to assure that products are maintained under specified conditions and free from damage or deterioration.

6. The CONTRACTOR shall carefully review and comply with the manufacturer's storage instructions. These instructions shall be carefully followed and a written record of this kept by the CONTRACTOR.

7. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding".

8. Mechanical equipment to be used in the Work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and start-up, at no extra cost to the OWNER.

D. Specific Material Storage Requirements

1. Loose Granular Materials: Store in a well-drained area on solid surfaces to prevent mixing with foreign matter.

2. Cement, Sand and Lime: Stored under a roof and off the ground and kept completely dry at all times.

3. Brick, Block and Similar Masonry Products: Handle and store in a manner to reduce breakage, chipping, cracking and spilling to a minimum.

4. All structural and miscellaneous steel and reinforcing steel: Store off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting.

Should the CONTRACTOR fail to take proper action on storage and handling of equipment supplied under this Contract, within seven days after written notice to correct the deficiencies, the OWNER retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the CONTRACTOR's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, and Engineering and any other costs associated with making the necessary corrections. In any event, equipment and materials not properly stored will not be included in a payment estimate. Any materials not suitable for use will be removed from the site and replaced with new materials.

1.14 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

A. Comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to all parties involved in the installation, including two copies for the ENGINEER's use. Maintain one set of complete instructions at the job site during installation and until completion. Copies of all instructions shall also be included in the Operation and Maintenance Manuals, which are provided to the OWNER at the close of the contract.

B. Contractor shall install all pipes per manufacturer's requirements. The pipe manufacturer will provide at no cost to the Contractor a preconstruction meeting to go over the general assembly requirements and provide certification of training to Contractors personnel. The Contractor must provide proof of the workers certification to the City that all crews installing pipe have been trained and that all pipe has been installed as instructed by the manufacturer.

C. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements. Should job conditions or specified requirements conflict with the manufacturer's instructions, consult with the ENGINEER for further instructions. Do not proceed with Work without clear instructions.

D. Perform Work in strict accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

E. The CONTRACTOR shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the installation of the Work and to handle all emergencies normally encountered in Work of this character.

F. Equipment shall be installed in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise in writing by the ENGINEER during installation.

G. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.

H. The CONTRACTOR shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the ENGINEER and made of ample size and strength for the purposes intended. The manufacturer shall furnish substantial templates and working drawings for installation.

1.15 CONSTRUCTION FIELD ENGINEERING

A. Registered Land Surveyor: The CONTRACTOR shall retain the services of a registered land surveyor licensed in the State of Florida for the following specific services as applicable to the Work:

1. Identify existing rights-of-ways and property lines along or adjacent to the Work;

2. Locate all existing utilities and structures as may be affected by the Work;

3. Locate control points prior to starting the Work;

4. Replace control points or reference points which may be lost or destroyed.

5. CONTRACTOR is to provide a preliminary set of Record Drawings that reflect any changes to the alignment or connections to existing facilities for the purpose of Certification of Construction Completion to FDEP for clearance of the lines. This As-built information is to be provided to the City prior to the pressure testing of the new line.

6. Prepare a certified survey of the actually constructed facilities based on information concurrent with the construction progress. This site survey shall be in accordance with Section 01720.

B. CONTRACTOR shall protect control points prior to starting the Work and shall preserve all permanent reference points during construction. Report to the OWNER when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

The CONTRACTOR shall bear the cost of re-establishing project control points if disturbed, and bear the entire expense of rectifying Work improperly installed due

to not maintaining or protecting and removing without authorization such established points, stakes, and marks.

C. Submittals

1. Certificate signed by a Registered Surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

2. Certified, signed and sealed drawings, including a PDF file of the signed drawings, showing locations of all structures, piping conduits and other improvements. These drawings are referenced as the Project Record Drawings and shall be included with the Project Record Documents.

3. Completed Record Drawing Tables.

4. Documentation to verify accuracy of field engineering work when requested by the ENGINEER.

5. Electronic version of record drawing survey in the latest version of AutoCAD.

1.16 UTILITIES

A. Utility Construction

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto, whether owned or controlled by governmental bodies or privately owned by individuals, firms or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage or water. Other public or private property, which may be affected by the work shall be deemed included hereunder.

2. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The CONTRACTOR shall, at their own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required.

3. The length of open trench will be controlled by the particular surrounding conditions but shall always be no more than 300 feet. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the OWNER may require special construction procedures. As a minimum, the CONTRACTOR shall conform to the following restoration procedures:

a. Interim Restoration: All excavations shall be backfilled and compacted as specified by the end of each working day. For excavations within existing paved areas, concrete base or soil cement base shall be spread and compacted to provide a relatively smooth surface free of loose aggregate material.

All pipe and fittings shall be stored in a location inside the easement area, which will cause the least disturbance to the public. All debris shall be removed and properly disposed of by the end of each working day.

b. Maintenance of all restored facilities shall be the CONTRACTOR's responsibility. This maintenance shall be performed on an on-going basis during the course of construction.

The CONTRACTOR's Progress Schedule shall reflect the above restoration requirements.

B. Existing Utilities

1. The locations of all existing underground piping, structures and utilities have been taken from information received from the respective OWNER. The locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered.

2. The CONTRACTOR shall, at all times in performance of the Work, employ approved methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of existing public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services; and shall cooperate fully with the Owners thereof to that end.

3. Pipelines shall be located substantially as indicated on the Drawings, but the OWNER reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. When the location of piping is dimensioned on the Drawings, it shall be installed in that location; when the location of piping is shown on a scaled drawing, without dimensions, the piping shall be installed in the scaled location unless the OWNER approves an alternate location for the piping. Where fittings are noted on the Drawings, such notation is for the CONTRACTOR's convenience and does not relieve him from laying and jointing different or additional items where required. The ENGINEER may require detailed pipe laying drawings and schedules for project control.

4. The CONTRACTOR shall exercise care in any excavation to locate all existing piping and utilities. All utilities, which do not interfere with the completed work shall be carefully protected against damage. Any existing utilities damaged in any way by the CONTRACTOR shall be restored or replaced by the CONTRACTOR at his expense as directed by the OWNER. Any existing facilities that require operation to facilitate repairs shall be performed only by the OWNER of the respective utility.

5. It is the responsibility of the CONTRACTOR to ensure that all utility or other poles, the stability of which may be endangered by the proximity of excavation, be temporarily stayed and/or shored in position while Work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice of any such excavation by the CONTRACTOR.

C. Notices

1. All governmental utility departments and other owners of public utilities which, may be affected by the Work will be informed in writing by the CONTRACTOR within two weeks after the execution of the Contract or Contracts covering the Work. Such notice will be sent out in general, and directed to the attention of the governmental utility departments and other owners of public utilities for such installations and structures as may be affected by the Work.

2. The CONTRACTOR shall also comply with Florida Statute 553.851 regarding notification of existing gas and oil pipeline company owners. Evidence of such notice shall be furnished to the OWNER within two weeks after the execution of the Contract.

3. It shall be the CONTRACTOR's responsibility to contact utility companies at least 48 hours in advance of breaking ground in any area or on any unit of the Work so maintenance personnel can locate and protect facilities, if required by the utility company.

4. The CONTRACTOR shall, not be allowed to interrupt a utility service (water, sewer, etc.) for the purpose of making cut-ins to the existing lines or for any other purposes.

D. Exploratory Excavations

Exploratory excavations shall be conducted by the CONTRACTOR for the purpose of locating underground pipelines, other utilities or structures in advance of the construction. The CONTRACTOR shall schedule and perform all required Exploratory Excavations sufficiently in advance to allow for the identification of unknown utilities and resolution of potential conflicts without delaying the

progress of the WORK. Test pits shall be excavated in areas of potential conflicts between existing and proposed facilities and at piping connections to existing facilities a minimum of 48 hours or 1,000 feet in advance of Work. If there is a potential conflict, the CONTRACTOR is to notify the ENGINEER immediately. Information on the obstruction to be furnished by the CONTRACTOR shall include: Location, Elevation, Utility Type, Material and Size. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the ENGINEER.

E. Utility Crossings

It is intended that whatever existing utilities must be crossed, deflection of the pipe within specified limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated on the Drawings. However, when in the opinion of the OWNER this procedure is not feasible, he may direct the use of fittings for a utility crossing or conflict transition as detailed on the Drawings, at no additional cost to the owner.

F. Relocations

1. Relocations shown on the Drawings – Public utility installations or structures, including but not limited to light poles, signs, fences, piping, conduits and drains that interfere with the positioning of the Work which are shown on the Drawings to be removed, relocated, replaced or rebuilt by the CONTRACTOR shall be considered as part of the general cost of doing the Work and shall be included in the prices bid for the various contract items. No separate payment shall be made therefore.

2. Relocation not shown on the Drawings

   a. Where public utility installations or structures are encountered during the course of the Work, and <u>are not</u> indicated on the Drawings or in the Specifications, and when, in the opinion of the OWNER, removal, relocation, replacement or rebuilding is necessary to complete the Work under this contract, such Work shall be accomplished by the utility having jurisdiction, or such Work may be ordered, in writing by the OWNER, for the CONTRACTOR to accomplish.

   b. If such Work is accomplished by the utility having jurisdiction, it will be carried out expeditiously and the CONTRACTOR shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such Work is accomplished by the CONTRACTOR, it will be paid for as a Change Order.

3. All existing utility castings, including valve boxes, junction boxes,

manholes, hand holes, pull boxes, inlets and similar structures in the areas of construction that are to remain in service and in areas of trench restoration and pavement replacement, shall be adjusted by the CONTRACTOR to bring them flush with the surface of the finished Work.

4. All existing utility systems which conflict with the construction of the Work herein, which can be temporarily removed and replaced, shall be accomplished at the expense of the CONTRACTOR. Work shall be done by the utility unless the utility approves in writing that the Work may be done by the CONTRACTOR.

G. Lines and Grades

1. All Work under this Contract shall be constructed in accordance with the line and grades shown on the Drawings, or as given by the ENGINEER. The full responsibility for keeping alignment and grade shall rest upon the CONTRACTOR.

2. The CONTRACTOR shall, at his own expense, establish all working or construction lines and grades as required from the project control points set by the OWNER, and shall be solely responsible for the accuracy thereof.

3. Force mains shall have a minimum of 48-inches of cover over the top of the pipe. Cover shall vary to provide long uniform gradient or slope to pipe to minimize air pockets and air release valves. The stationing shown on the Drawings for air and vacuum release valve assemblies are approximate and the CONTRACTOR shall field adjust these locations to locate these valves at the highest point in the pipeline installed. All locations must be approved by the OWNER.

4. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed using the following control techniques as a minimum:

a. Gravity Lines: continuous control, using laser beam technology.

b. Pressure Lines: control stakes set at 50 ft intervals using surveyors level instrument.

1.17 SPECIAL PROJECT PROCEDURES

A. Maintenance of Traffic

1. CONTRACTOR shall provide MOT in accordance with FDOT Standards. CONTRACTOR shall adjust the schedule and/or MOT to provide for utility installations at no additional cost to City.

2. The CONTRACTOR shall provide an FDOT certified MOT sub-contractor to apply for and obtain an MOT permit from the City Engineering Division.

3. Fourteen (14) days prior to closing a lane, the permittee shall notify the respective City, City of Pembroke Pines PM, and EOR.

B. Operation of existing Utility Systems

Due to the utility systems providing service to residents and businesses, all City Utility systems shall be required to remain in service and not be shut down to accommodate construction activities. Contractor to sequence all work so that water and sewer service is maintained at all times.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01025
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. This Section specifies administrative and procedural requirements to define pay items and determine payable amounts, and includes but is not limited to:
   1. General Provisions
   2. Cash Allowances
   3. Work Not Paid for Separately
   4. Measurement for Payment
   5. Partial Payment for Stored Materials and Equipment

1.02 GENERAL PROVISIONS

A. This specification includes standard descriptions for all bid items. This Contract's specific bid items are listed in the Bid Schedule.

B. The total Contract Amount shall cover the Work required by the Contract Documents. All costs in connection with the successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.

C. If used, all estimated quantities stipulated in the Bid Schedule or other Contract Documents are approximate and are to be used only (a) for the purpose of comparing the bids submitted for the Work, and (b) as a basis for determining an initial Contract Amount. The actual amounts of Work completed, and materials furnished under unit price items may differ from the estimated quantities. The City does not expressly or by implication represent that the actual quantities involved will correspond exactly to the quantities stated in the Bid Schedule; nor shall the Contractor plead misunderstanding or deception because of such estimate or quantities or of the character, location or other conditions pertaining to the Work. Payment to the Contractor will be made only for the actual quantities of work performed or material furnished in accordance with the Drawings and other Contract Documents, and it is understood that the quantities may be increased or decreased as provided in the General Conditions.

D. If used, the unit prices listed in the Bid Schedule shall include all services, obligations, responsibilities, labor, materials, devices, equipment, royalties and license fees, supervision, temporary facilities, construction equipment, bonds, insurance, taxes, clean up, traffic control, control surveys, field offices, close out, overhead and profit and all connections, appurtenances and any other incidental items of any kind or nature, as are necessary to complete the Work in accordance with the Contract Documents.

E. Except for mobilization/demobilization and project record documents, payment for Work will be based on the percent of completed work of each item in the Schedule of Values, including stored materials, as determined by the City. Progress of work in each item of the Schedule of Values will be determined separately by the City. However, the City will issue a single payment certificate for progress on the Contract.

F. The Contractor agrees that it will make no claim for damages, anticipated profits, or otherwise because of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts, therefore.

G. Where payment by scale weight is specified under certain items, the Contractor shall provide suitable weighing equipment which shall be kept in accurate adjustment at all times and certified. The weighing of all material shall be performed by the Contractor in the presence and under the supervision of the City.

H. All schedules included in the Contract Documents are given for convenience and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in work to be done under this Contract.

I. Where pipe fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve the Contractor from laying and jointing different or additional items where required.

J. All contracts shall be subject to 10% minimum retainage as defined in the General Conditions and the Agreement.

1.03 CASH ALLOWANCES

A. The Contractor shall include in the Total Bid Amount, all cash allowances stated in the Contract Documents. Items covered by these allowances shall be supplied for such amounts and by such persons as the City may direct.

B. The Contractor will obtain the City’s written acceptance before providing equipment, materials or other Work under a cash allowance. Payments under a cash allowance will be made based on actual costs, excluding costs of general conditions, handling, unloading, storage, installation, testing, etc., which will be considered to be included within the Contract Price. Payments within the limits of any Allowance will exclude overhead and profit and bond and insurance premiums, since those costs will be

considered to be included within the Contract Amount. The Contractor shall submit appropriate documentation to validate the actual cost of the item.

C. The amount of the allowance shall be adjusted accordingly by Change Order to recognize the allowable cost incurred by the Contractor.

1.04 WORK NOT PAID FOR SEPARATELY

A. Delivery: Payment for equipment delivery, storage or freight shall be included in the pay items including their installation and no other separate payment will be made, therefore.

B. Bonds: Payment for bonds required by the Contract shall be included in the pay items for the Work covered by the required bonds and no separate payment will be made.

C. Preparation of Site: Payment for preparation of site shall be included in pay items proposed for the various items of Work and no separate payment will be made, therefore. Preparation of site includes setting up construction plant, offices, shops, storage areas, sanitary and other facilities required by the specifications or state law or regulations; providing access to the site; obtaining necessary permits and licenses; payments of fees; general protection, temporary heat and utilities including electrical power; providing shop and working drawings, certificates and schedules; providing required insurance; preconstruction photographs and videos; clearing and grubbing; removal of existing pavements, sidewalks and curbs; trench excavation, sheeting, shoring and bracing; dewatering and disposal of surplus water; structural fill, backfill, compaction and grading; testing materials and apparatus; maintenance of drainage systems; appurtenant work; record drawing and close-out documentation; cleaning up; and all other work regardless of its nature which may not be specifically referred to in a Bid Item but is necessary for the complete construction of the project set forth by the Contract.

D. Sanitary Sewer Overflows:

1. The contractor shall be liable for any and all sanitary sewer overflows associated with the Contract, regardless of fault. The Contractor shall be liable for all City personnel labor and equipment costs, penalties and fines resulting from sanitary sewer overflows. Such occurrences may be considered violations of Florida Statutes or administrative rules and may result in additional liability beyond that outlined below for damages and restoration, and the judicial imposition of civil penalties, pursuant to Sections 403.121 and 403.161 Fla Stat. Contractor will be assessed the following penalties for any and each Sanitary Sewer Overflow:

    i. For a domestic or industrial wastewater violation not involving a surface water or groundwater quality violation, City shall assess a penalty of $2,000 for each unpermitted or unauthorized event or occurrence.

ii. For an unpermitted or unauthorized discharge that resulted in a surface water or groundwater quality violation, City shall assess a penalty of $5,000 for each unpermitted or unauthorized event or occurrence.

iii. In addition, for any and all unpermitted or unauthorized discharge, City shall assess a penalty in the amount of $1.00 per gallon of sanitary sewer overflow, up to a maximum amount of $100,000 per each Sanitary Sewer Overflow.

E. Permitting & Permit Fees.

1. City will waive all City related permit, license, impact or inspection fees (including the Building Department and Engineering Department Permit Fees) related to this project. Any related State or County fees, for the aforementioned permits, will be paid by the City. In addition, the City shall cover the cost for any other permit fees related to external entities through the City's Owner's Contingency for this project**, therefore proposers should not include permit costs in their total proposal price.**

F. The City reserves the right to delete any item included in the Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

1.05 MEASUREMENT FOR PAYMENT

A. Methods of Measurement - Generally:

1. Units of measurement shall be defined in general terms as follows:
   a. Linear Feet (LF)
   b. Square Feet (SF)
   c. Square Yards (SY)
   d. Cubic Yards (CY)
   e. Each (EA)
   f. Sacks (SK)
   g. Lump Sum (LS)
2. Unit Price Contracts/Items:
   a. Linear Feet (LF) shall be measured along the horizontal length of the centerline of the installed material, unless otherwise specified. Pipe shall be measured along the length of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves or fittings. Pipe included within the limits of lump sum items will not be measured.
   b. Square Feet (SF), Square Yards (SY), Cubic Yards (CY), Each (EA) and Sacks (SK) shall be measured as the amount of the unit of measure installed and compacted within the limits specified and shown in the Specifications and Drawings. Slope angles and elevations shall be measured using land-surveying equipment. Contractor shall provide supporting documentation (i.e. drawings, delivery tickets, invoices, survey calculations, etc.) to verify actual installed quantities.

B. Lump Sum Contracts/Items - Generally:
   1. Quantities provided in the Schedule of Values are for the purpose of estimating the completion status for progress payments. Payment will be made for each individual item on a percentage of completion basis as estimated by the Contractor and approved by the City.
   2. Adjustments to costs provided in the accepted Schedule of Values may be made only by Change Order.
   3. The City reserves the right to delete any item included in the Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

1.06 MEASUREMENT AND PAYMENT ITEMS

A. Measurement: Measurement for all items shall be based on units outlined in the bid tabulation and on satisfactory progress of the Contractor to provide Project Record Documents in accordance with the City requirements.

B. Payment: Payment of the applicable sum expressed as lump sum or unit price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to create the Project Record Drawings, including the certified as-built survey, in accordance with the City requirements and specifications. Payment will be made monthly upon submittal and acceptance of pay application and relevant backup materials.

Table A

BID ITEM	MEASUREMENT AND PAYMENT ITEMS
1	**Mobilization/Demobilization**
	a. Measurement: Measurement of various items for Mobilization and Demobilization shall not be made for payment, and all items shall be included in the lump sum price. <u>This lump sum price shall not exceed 5% of the total of all bid items except bid items 2 and 3</u>. b. Payment: Payment of 75 percent of the applicable lump sum price for the item shall be full compensation for the Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplies and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations. The costs of General Requirements (Section 01001), permits, project signs, and any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials, shall also be included. This Work also consist of the general project management of the Work including,

	but not limited to, field supervision and office management, as well as other incidental cost for management of the Work during the duration of the Contract. This Work also includes maintenance of the field offices for the duration of the Contract. Payment of the remaining 25 percent of the applicable lump sum price for this item also consists of demobilization or the operations normally involved in ending Work on the project including, but not limited to, termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of Contractor storage areas; disposal of trash and rubbish, and any other post-construction work necessary for the proper conclusion of the Work.
2	**Insurance and Bonds**
	a. Measurement: Measurement for various items covered under Insurance and Bonds will not be made for payment, and all items shall be included in the lump sum. b. Payment: Payment for the Insurance and Bonds shall include all insurance requirement cost, the costs of all bonds, and all administrative costs associated with acquiring and maintaining the necessary coverage as described in the Contract Documents. The appropriate percentage of this item will be paid upon each payment request made by the CONTRACTOR.
3	**Erosion and Sedimentation Control**
	a. Measurement: Measurement for Erosion Control throughout the site will not be made for payment, and all items shall be included in the lump sum price. b. Payment: Payment for Erosion Control throughout the site will be made at the Contract lump sum price for the item. All erosion control measures shall be in accordance with FDEP, FDOT, SFWMD, local jurisdictional regulations, laws and ordinances. CONTRACTOR shall be responsible to maintain flowage of the local drainage system during the contract period. All costs associated with placement and removal of the various erosion control devices and maintaining drainage flow within the project limits shall be included in Bid Item.
4	**Maintenance of Traffic (MOT)**
	a. Measurement: Measurement shall be based on satisfactory Maintenance of Traffic (MOT) in accordance with City requirements and Florida Department of Transportation (FDOT) standards. b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to maintain public roadway and pedestrian traffic including flag men, barricades, warning lights/flashers, and safety ropes. Also included is furnishing, installing and maintaining a Traffic Control Plan, control and safety devices, control of dust, temporary crossing structures over trenches, any necessary detour facilities, and other special

	requirements for the safe and expeditious movements of traffic.
5	**Exploratory Excavation**
	a. Measurement: Measurement for Exploratory Excavations shall be based on the total locations where exploratory excavations are anticipated and approved by the City. b. Payment: Payment for Exploratory Excavation will be made at the Contract EACH unit price for the item, which price shall constitute full compensation for all labor, materials and equipment required to successfully expose the existing forcemain system and all unknown utilities in conflict with the work to exactly determine the layout of pipeline and to ensure that the proposed new piping, fittings, and valves will meet the design intent and provide the City with photographs and sketches of the existing layout. The work also includes backfilling the excavation and protecting the area until the actual new piping is installed at this location. Any damage to the existing piping, valves, etc. shall be repaired and/or replaced at no expense to the City.
6	**Restoration**
	a. Measurement: Measurement for payment for Restoration shall be based on the satisfactory restoration of all affected areas to equal or better conditions, in full compliance with the requirements of the Contract Documents. b. Payment: Payment for Restoration will be made at the Contract lump sum price for the item, which price shall constitute full compensation for restoring all areas disturbed by construction to equal or better conditions, subject to approval by the Engineer and Owner. Restoration includes, but is not limited to, full lane-width asphalt restoration, temporary asphalt restoration surface, sidewalks, driveways, curbs, and gutters, as well as sod, landscaping, irrigation systems, paver areas, and pavement markings. Any impacted fencing, mailboxes, signs, or other surface features shall be reset or replaced in kind. All work shall meet applicable City, County, or agency standards and must be completed to the satisfaction of the Engineer and Owner prior to final acceptance.
7 8 9	**Abandon-in-Place Watermain (4")** **Abandon-in-Place Watermain (6")** **Abandon-in-Place Watermain (8")**
	a. Measurement: Measurement for various items covered under Abandon-in-Place Watermain of various sizes will not be made for payment, and all items shall be included in the lump sum. b. Payment: Payment for Abandon-in-Place Watermain of various sizes will be made at the Contract lump sum price for the item, which price and payment shall be full compensation for all labor, materials and equipment necessary to decommission, use of line stops, plug, cap and abandon all pipe, pipe bend section and all other appurtenance, and of dewatering, trenching, excavation and backfill, removal, transportation and disposal and all material or work

	necessary to properly abandon the pipe as indicated on the plans or discovered in the field, following FDEP clearance of the proposed water main system. All removed items, debris, and structures shall be disposed of by CONTRACTOR unless otherwise directed by City.
10 11 12 13 14	**8" C900 PVC w/ DI Fittings** **6" C900 PVC w/ DI Fittings** **4" C900 PVC w/ DI Fittings** **2" PE Poly Blue w/ DI Fittings** **1" PE Poly Blue w/ DI Fittings**
	a. Measurement: Measurement for this item shall be based per Linear Feet (LF) of furnished and installed C900 PVC and PE Poly pipe per Specification Section 02660 – Potable Water System, Section 15065 – Polyvinyl Chloride (PVC) Pipe and Fittings, Section 15062 – Ductile Iron Pipe and Fittings. b. Payment: Payment will be made at the contract unit price bid per Linear Feet (LF) as stated in the proposal for all C900 PVC pipe. Payment is full compensation for all labor, equipment, and materials for the completed pipeline, ready for service, and shall include, but not limited to: exploratory excavation; excavation; sheeting and shoring, if necessary; complying with Florida Statutes "Trench Safety Act"; dewatering; transporting and unloading the pipe, and all other materials not specified in other bid items from delivery trucks at the job site and placing them into position in the trench; installation C900 PVC pipe (varied diameter); solid sleeves and specials; installing joint materials; installing joint restraints; installing tie rods and eyebolts; cutting and installing nipples; making all connections within the lines themselves; tapping the main for corporation stops for testing and chlorination; cleaning, testing and disinfecting the pipe and fittings; sheeting and shoring as required; dewatering; placing and compacting backfill material; for removal, salvage, cleaning, transport, unloading and storage of valve boxes and covers, manhole frames and covers, and castings, on existing mains that are to be placed out of service; saw cutting pavement; demolition and modification work, and legal disposal of debris; for 12" Type B Stabilization (LBR 40), bedding, backfilling, compacting, and restoration of area (not included in another bid item) where existing valve boxes, manhole frames, and castings have been removed, if required; removal and disposal of excess or unsuitable fill material, where required; protecting existing utilities along the route of the main; making temporary paving repairs; complying with work hour restrictions by the city and other governmental agencies; satisfying permit requirements and conditions; preparation and submittal of the Contractor's Daily Reports, Contractor's PSM survey field book notes and monthly partial as-built record drawings of the work that has been performed to date; moving and replacing utilities, fences, trees (including trimming), landscaping, shrubs, mailboxes, sprinkler systems, shoulders, asphalt paths (not included in another bid item), curb and gutter, traffic separators and all other similar items, to original locations and to equal or better than original conditions; furnishing bends,

	tees, reducers, MJ adapters, plugs, thrust blocks as shown on the Plans and per City details; fully restrained bedding and backfilling materials; temporary pavement materials; transportation and handling costs; and all other appurtenant and miscellaneous items and work (not included in another bid item) including final cleanup for a complete, satisfactory and functional installation. Removal of existing pipe within the same trench shall be included in this bid item. c. The quantity for payment shall be the horizontal projection of the center line of the permanently installed and accepted pipe (of the particular bid item), including the length of fittings along the run, measured to the nearest one-tenth of a foot from P.I. to P.I. of bends and to the seat of the bell at the end of any particular line. d. Submittal of monthly partial as-built record drawings shall be condition for approval of monthly progress payment requests for all required trench excavation.
15 16 17 18 19	**12”x8” Tapping Sleeve and Valve** **12”x4” Tapping Sleeve and Valve** **8”x8” Tapping Sleeve and Valve** **8”x6” Tapping Sleeve and Valve** **8”x4” Tapping Sleeve and Valve**
	a. Measurement: Measurement for Tapping Sleeve and Valve to facilitate connection to existing water mains will be based on the size and number of connections completed and accepted. b. Payment: Payment for Tapping Sleeve and Valves shall be paid for at the Contract unit price per each of the items, which price and payment shall be full compensation for all labor, materials and equipment necessary to construct the final connection to the existing water mains along the project route. The unit price item shall include clearing and grubbing, excavation, trenching, use of trench box, pipe bedding, backfill, compaction, identification of pipe material being connected too, purchase and installation of wet tapping saddles and valves; installation, activation and removal of line stops; pressure testing, cutting and removal of existing pipe, removal of existing plugs or caps, installation of thrust block restraints, form work and concrete, rebar, #57 crushed stone, additional fittings, mechanical joint restraints, tie rods, bolts, nuts, gland gaskets, pipe identification tape and locator wire, all coordination to make the final connection, materials and equipment and all other work necessary to complete the installations as specified in the drawings.
20 21 22	**8” Gate Valve and Box** **6” Gate Valve and Box** **4” Gate Valve and Box**
	a. Measurement: Measurement of Gate Valves and Boxes will be based on the number and size installed and accepted per Specification Section 15110

	Valves and Appurtenances. b. Payment: Payment for gate valves and boxes shall be paid for at the Contract unit price per each of the items, which price and payment shall be full compensation for furnishing, installing and testing the connections to the mains, excavation, sheeting and shoring, additional dewatering, pipe bedding, backfill and compaction, pipe identification tape, insulating conducting wire, pipe supports, pipe restraint mechanisms, valve box and cover, brass ID disk, tracer wire access plug, concrete pad, #4 reinforcement bars, #57 crushed stone, debris cap, filter fabric, riser extensions and all labor, materials and equipment and all other work necessary to complete the installation as specified in the drawings.
23	**Reconnect Potable Water Service Lines**
	a. Measurement: Measurement for Reconnecting Potable Water Service Lines shall be made per the actual number of water services to be reconnected to provide a complete and functional unit. b. Payment: Payment for reconnecting water service connections shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to reconnect the water service lines to the potable water mains per City details.
24	**Reconnect Fire Hydrant Assembly**
	a. Measurement: Measurement of Reconnection of Fire Hydrant Assembly will be based on the number of Fire Hydrant Assemblies needing reconnection to the new system. b. Payment: Payment for Reconnect Fire Hydrant Assembly shall be paid for at the Contract unit price per each of the items, which price and payment shall be full compensation for all excavation, protection of existing utilities, fittings, testing, disinfecting, backfilling and compaction and density testing when backfilling, required to re-install the fire hydrant as located in the contract plans. The assembly is to include gate valve, fire hydrant assembly, hydrant extension (if required), main line tee, restrained joints and 6” water main pipe stub leading to new fire hydrant, additional fittings and joint restraints. All nuts and bolts furnished and installed as part of the new fire hydrant assembly shall be 316 SS.
25	**Clean and Inspection Sewer Lines**
	a. Measurement: Clean and Inspection Sewer Lines shall be measured in actual linear feet of sanitary sewer main satisfactorily cleaned with a cleaning nozzle and/or removing roots from the interior of the main and de-scaling the main. Measurement shall be along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with City

	requirements and specifications (Section 02761). b. Payment: Payment will be made at the contract unit price bid per linear feet and shall include all labor, materials, and equipment necessary to satisfactorily clean a sanitary sewer main to an acceptable condition for CCTV inspection and ready for any and all repairs with a cleaning nozzle and/or removing roots from the interior of the main and de-scaling the main including water, hoses, and nozzles, mechanical methods of root removal, all herbicides or chemical treatment, protection of property, restoration and clean-up.
26 27 28 29 30 31 32	**CCTV for 15" Gravity Sewer** **CCTV for 12" Gravity Sewer** **CCTV for 10" Gravity Sewer** **CCTV for 8" Gravity Sewer** **CCTV for 6" Gravity Sewer** **CCTV for 4" Gravity Sewer** **CCTV for DIP Gravity Sewer**
	a. Measurement: CCTV for 15", 12", 10", 8", 6", 4" DIP Gravity Sewer shall be measured in actual linear feet of satisfactory visual inspection completed utilizing closed-circuit television in accordance with the City requirements and specifications (Section 02762). CCTV inspection shall be measured along the length of the centerline of the inspected sanitary sewer. b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for CCTV Inspection Sanitary Sewer and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete CCTV visual inspection of the sanitary sewer and subsequent report including qualified personnel, DVD, and all incidentals related to sewer main inspection.
33	**Root Removal**
	a. Measurement: Root Removal shall be measured in actual linear feet of sanitary sewer mains satisfactorily cleaned by removing roots from the interior of the main and de-scaling the main as determined on a section-by-section basis after review of the CCTV report and City approval. Measurement shall be along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with City requirements and specifications (Section 02761). b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Root Removal and shall include all labor, materials, and equipment necessary to satisfactorily remove roots from the interior of the main and de-greasing the main including water, hoses, and nozzles; mechanical methods of root removal and grease removal, all herbicides or chemical treatment, protection of property, restoration and

	clean-up.
34	**Sewer By-Passing**
	a. Measurement: Measurement for this item shall be based on the complete bypass operation and contingency plan in accordance with the City requirements and specifications. b. Payment: Payment of the applicable Contract lump sum price shall be full compensation for furnishing all labor, materials, equipment as necessary for bypass operations and contingency plan as required, including pumps, piping, and hoses; tankers; temporary bypass and service piping; hauling and proper disposal of wastewater; plugging; gasoline/diesel fuel; protection of existing facilities, utilities, and property; traffic maintenance; signs and barriers; and all incidental work required to satisfactorily complete this item.
35	**Manhole Lining**
	a. Measurement: Measurement for this item shall be made per the actual number of sanitary manholes of each type and depth satisfactorily sealed and recoated in accordance with the City requirements and specifications. b. Payment: Payment will be made at the contract unit price bid per each manhole as stated in the proposal for Lining and shall include, but is not necessarily limited to, all labor, equipment, services, supervisions and materials for coating existing manholes as described in the project drawings and specifications. This work shall include installation of the coating in accordance with the manufacturer's recommendations, and inspection of the finished coating system.
36 37 38 39 40 41	**Cured in Place Pipe for 15" VCP** **Cured in Place Pipe for 12" VCP** **Cured in Place Pipe for 10" VCP** **Cured in Place Pipe for 8" VCP** **Cured in Place Pipe for 6" VCP** **Cured in Place Pipe for 6" Unknown Material**
	a. Measurement: CIPP Liner shall be measured in actual linear feet of furnished and satisfactorily installed cured-in-place liner in the sanitary sewer main from center of manhole to center of manhole, regardless of depth, in accordance with the City requirements and specifications (Section 02771). CIPP liner installation shall be measured along the length of the centerline of the rehabilitated sanitary sewer. Measurement shall be measured in actual linear feet of furnished and satisfactorily installed cured-in-place liners in the existing sanitary sewer laterals measured from the sewer main to the property clean-out, regardless of depth, to determine if they are less than or equal or greater than 30' and in accordance with the City requirement, drawings, and specifications (Section 02772). b. Contractor must ensure all service line laterals are to be lined up to the

	property cleanout and all lateral wye connections to be lined with full circumference lateral liners. c. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the Bid Schedule for CIPP Liner and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete CIPP liner installation including pre and post CCTV inspection, sanitary sewer cleaning (medium cleaning), qualified personnel, providing and processing of liner material, service connection and manhole/wall interface sealing, all costs associated with providing cured CIPP samples for testing, blocking or plugging of incoming lines, grouting, leakage testing, reinstate service laterals, protection of existing utilities, structures, and property, restoration and clean-up.
42	**Reconnect Lateral Service Connections**
	a. Measurement: Measurement for reconnecting Service Connections shall be made per the actual number of lateral services to be reconnected to provide a complete and functional unit. b. Payment: Payment for reconnecting service connections shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to reconnect the sewer lateral to the sewer mains.
43	**Clean Out Repair**
	a. Measurement for Cleanout Repair shall be made on a per each basis for each cleanout replaced in accordance with the Contract Documents. Measurement shall include all work necessary to remove the existing cleanout, install the new cleanout, and restore the surrounding area to its original or better condition. b. Payment for Cleanout Repair, measured as provided above, shall be made at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all labor, materials, equipment, tools, and incidentals necessary to complete the work, including but not limited to: removal and disposal of the existing cleanout and associated piping as required; furnishing and installing new cleanout assembly, cover, and piping; excavation and backfill; compaction; surface restoration (pavement, sidewalk, sod, etc.); and compliance with all applicable regulatory requirements.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01027
APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENT

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1.02 FORMAT

A. Format and Content: Use the accepted Schedule of Values.
   1. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
      a. Generic name
      b. Related specification section
      c. Name of subcontractor
      d. Name of manufacturer or fabricator
      e. Name of supplier
      f. Dollar value
   2. Round amounts off to the nearest whole dollar. The total shall equal the Contract Amount.

1.03 PREPARATION OF APPLICATION

A. Each Application for Payment shall be consistent with previous applications for payments as certified and paid for by the City.

B. Payment Application Times: As stated in the General Conditions, Payment Applications shall be submitted monthly on a day of the month established by the City at the Pre-Construction Conference.

C. Application Preparation: Contractor shall complete every entry on the Pay Application form. The form shall be executed by a person authorized to sign legal documents on behalf of the Contractor and the signature notarized. Incomplete applications will be returned without action. The following procedure shall be followed by the Contractor:
   1. Submit applications typed on forms provided by the City.
   2. Use data on Bid Form and approved Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for stored products.
   3. List each authorized Change Order and use additional sheets if necessary, list Change Order number and dollar amount for the original item of work.
   4. Each item shall have an assigned dollar value for the current pay period and a cumulative value for the project to-date.

5. Submit stored material log, partial waivers of claims and mechanic liens, and Consent of Surety with each application, as further explained below.

D. Contractor shall submit a stored material log with each application for payment that identifies the type, quantity, and value of all stored material that tracks when the stored materials were installed and deducts the installed material from the stored quantity at that time. Include original invoices for all stored materials for which payment is requested.

E. Waivers of Claims and Mechanics Lien (Waivers): With each Application for Payment the Contactor shall submit waivers of claims and mechanic liens from Subcontractors, Sub-subcontractors, and suppliers for the construction period covered by the previous application.
   1. The Contractor shall submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
   2. When an application shows completion of an item, the Contractor shall submit final or full waivers.
   3. The Contractor shall submit the final Application for Payment with, if not already submitted, the final waivers from every entity involved with performance of work covered by the Application that could lawfully be entitled to a payment claim or lien.
   4. Format of Waiver Forms: The Contractor shall submit executed waivers of claims and liens on forms acceptable to the City.
   5. The City reserves the right to designate which entities involved in the Work must submit waivers.

F. Transmittal of Pay Applications: Contractor shall submit four (4) executed copies of each Application for Payment to the City. One (1) copy shall include all waivers of lien and similar attachments.
   1. The Contractor shall transmit each Pay Application package with a transmittal form that lists attachments and all appropriate information related to the application. The transmittal form shall be acceptable to the City.
   2. The Contractor shall include a certification with each application stating that all previous payments received from the City under the Contract have been applied by the Contractor to discharge, in full, all obligations of the Contractor in connection with the Work covered by prior applications for payment. The Contractor shall also certify that all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest, and encumbrances.

G. Initial Application for Payment Submittal: Administrative actions and submittals that must precede or coincide with submittal of the initial Application for Payment include the following:
   1. List of Subcontractors
   2. List of principal suppliers and fabricators
   3. Schedule of Values
   4. Contractor's Construction Progress Schedule (accepted)
   5. List of Contractor's staff assignments
   6. Copies of building permits

7. Copies of authorizations and licenses from governing authorities for performance of the Work
8. Certificates of insurance and insurance polices
9. Performance and Payment bonds (if required)
10. Data needed to acquire City's insurance

H. Monthly Application for Partial Payment Submittals: Administrative actions and submittals that must precede or coincide with submittal of Monthly Applications for Partial Payment include the following, as applicable:
1. Relevant tests
2. Progressive As-builts (one (1) paper copy and electronic copy)
3. Table 01050-2 Asset Attribute Data Form Examples (one (1) paper copy and electronic copy)
4. Table 01050-3 Pipe Deflection Table (one (1) paper copy and electronic copy)
5. Table 01050-4 Gravity Main Table (one (1) paper copy and electronic copy)
6. An electronic copy of all survey field notes
7. Partial Release of Lien
8. Partial Consent of Surety
9. Site photographs
10. Updated Progress Schedule: submit one (1) electronic copy and five (5) copies
11. Summary of Values
12. Pay Request
13. On-Site Storage of materials

I. Substantial Completion Application for Payment Submittal: Following issuance of the Certificate of Substantial Completion, Contractor shall submit an Application for Payment. This Application shall reflect any Certificates of Partial Substantial Completion issued previously for the City’s occupancy of designated portions of the Work.
1. Administrative actions and submittals that shall precede or coincide with this application include:
    a. Occupancy permits and similar approvals
    b. Warranties (guarantees) and maintenance agreements
    c. Test/adjust/balance records
    d. Maintenance instructions
    e. Meter readings
    f. Start-up performance reports
    g. Change-over information related to the City's occupancy, use, operation and maintenance
    h. Final Cleaning
    i. Application for reduction of retainage and consent of surety
    j. Advice on shifting insurance coverage
    k. List of incomplete Work, recognized as exceptions to City’s Certificate of Substantial Completion

J. Final Completion Application for Payment Submittal: Administrative actions and

submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. Prior to submitting a request for final payment or the City issuing a Certificate of Completion for the Work, the Contractor shall submit the final Record Documents to the City for approval. Retainage funds will be withheld at the City's discretion based on the quality and accuracy of the final Record Documents.
2. Written signed statements by the Contractor
   a. Completion of project close-out requirements
   b. Completion of items specified for completion after Substantial Completion
   c. Assurance that unsettled claims are settled
   d. Assurance that work not complete and accepted is now completed
3. Transmittal of Record Documents to the City
4. Proof that taxes, fees, and similar obligations have been paid
5. Removal of temporary facilities and services has been completed
6. Removal of surplus materials, rubbish, and similar elements
7. Prepare Application for Final Payment as required in General Conditions

1.04 PAY APPLICATION SUBSTANTIATING DATA

A. When the City requires substantiating data for a Pay Application, submit data justifying Pay Application line item amounts in question.

B. Provide one (1) copy of data with a transmittal letter for each copy of Pay Application submittal. The Pay Application number, date, and line item by number and description shall be clearly stated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01050
SURVEYING AND FIELD ENGINEERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Professional Surveyor: Provide professional surveying and mapping work required for the execution of the Contract, including verification of existing survey data, construction layout, and production of the As-Built Drawings. This Work shall be performed by a Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.

B. Professional Engineer: The Contractor shall provide the services of a Registered Professional Engineer currently licensed in the State of Florida for the required field engineering services as applicable to the work.

1.02 REQUIREMENTS

A. Survey Services
   1. The Contractor shall retain the services of a registered Surveyor and Mapper licensed in the State of Florida to provide professional surveying and mapping services necessary for the construction including a control survey and an as-built survey during construction. The Surveyor will identify control points (monuments and benchmarks noted on the Drawings). The construction layout survey shall be established from the control points shown on the Construction Drawings. The control points shall be confirmed by the contractor prior to start of construction. The accuracy of any method of staking shall be the responsibility of Surveyor. All staking shall be done to provide for easy verification of the work by the City.

B. Field Engineering Services
   1. The Engineer shall be of the discipline required for the work.
   2. The Engineer shall be responsible for duties during Construction to include, but not limited to:
      a. Inspections, testing, witnessing requiring a licensed Professional Engineer.
      b. Design of temporary shoring, bridging, scaffolding or other temporary construction, formwork and protection of existing structures.
      c. Other requirements as specified herein.
   3. Engineering related designs and inspections shall be signed by the licensed Professional Engineer as required by the City.

1.03 SUBMITTALS

A. Provide qualifications of the Surveyor or Engineer.
   1. A Florida Registered Professional Engineer or Registered Surveyor and Mapper, who is proposed by the Contractor to provide services for the work, shall be acceptable to

the City prior to field services being performed.

2. Submit name, address and telephone number of the Surveyor and/or Engineer, as appropriate to the City for acceptance before starting survey or engineering work.
3. Submit written acknowledgement from the Surveyor stating that he has the hardware, software and adequate scope of services in his agreement with the Contractor to fully comply with the requirements of this specification.

B. On request, submit documentation verifying accuracy of survey work.

C. Surveyor shall submit certified Tables 01050 – 2, 3 and 4.

PART 2 - PRODUCTS

2.01 SURVEY DOCUMENTS

A. Survey documents shall comply with the Minimum Technical Standards of Chapter 5J-17 of the Florida Administrative Code (FAC) and Table 01050-1 Minimum Survey Accuracies, whichever are more stringent. All coordinates shall be geographically registered in the Florida State Plane Coordinate System using the contract Drawings control points for horizontal and vertical controls.

B. The Surveyor shall not copyright any of their work related to this project.

C. For ease of calculating pipe deflections in Table 01050-3, begin by providing a unique asset ID for each utility (water, wastewater or reclaimed water) type, numbered sequentially along the pipe run (including changes in direction) from start to finish of the pipe in Table 01050-2 (Pipe Worksheet). Then branches and services of the same utility type can be numbered. It is recommended that each utility numbering format be distinguishable from the other. This will allow organization and convenient sorting after the individual asset table worksheet tabs are combined in the spreadsheet program prior to copying and pasting to the deflection table spreadsheet. The Microsoft Excel spreadsheet template shall be provided by the City. The numbering system shall be approved by the City before commencing with production of the spreadsheet.

Table 01050-1
Minimum Survey Accuracies

Type	Horizontal Accuracy (feet)	Elevation Accuracy (feet)	Location: Horizontal Center and Vertical Top, unless otherwise specified
Bench Marks	0.01	0.01	Point
Baseline Control Locational Accuracy	0.01	N/A	Point
Tract and Easement Corners	*	N/A	Survey Monuments
Pipe, at 100-feet maximum intervals	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Pipe, (PVC) >16-inch at every pipe joint	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Fittings, Sleeves, Tapping Saddle, Service Saddles, Cap or Plugs.	0.1	0.1	
Pipe, Restrained	0.1	0.1	Restrained Joint Limits
Connections	0.1	0.1	Pipe
Bore & Jack Casing	0.1	0.1	Top of Casing at the Casing Limits
Directional Drill	0.1	0.1	10-foot intervals during the directional drill operation or intervals not to exceed the drilling rod length
Hydrants	0.1	0.1	Operating Nut
Valves (Operating Nut)	0.1	0.1	Operating Nut
Valve (Pipe Location)	0.1	0.1	Top of Pipe at Valve location
Air Release, Blow off, and Backflow Valves	0.1	0.1	Valve Enclosure
Master Meters, Deduct Meters & Wastewater Meters	0.1	0.1	Register
Meter Box	0.1	0.1	
Clean out -	0.1	0.1	
Manhole Rim	0.1	0.1	Manhole – top of rim
Manhole Inverts	N/A	0.01	Pipe Inverts
Pump Station (Public & Private)	0.1	0.01	Wetwell top of slab and Pipe Inverts
Production Well or Monitoring Well	0.1	0.1	Well – top of casing
Grease Interceptor	0.1	0.1	
Oil / Water Separators	0.1	0.1	
Pipe, abandoned in place or removed	0.1	0.1	Limits of Abandoned or Removed Pipe
Existing Utilities and appurtenant structures**	0.1	0.1	underground feature or structure

* Shall conform to the requirements of the "Chapter 5J-17, 'Minimum Technical Standards', FAC", certified by a SURVEYOR.

** Existing utilities including but not limited to water, wastewater, reclaimed water, stormwater, fiber optic cable, electric, gas and structures within the limits of construction.

*** Fittings rotated in X,Y,Z plane or vertical shall be shot to maintain flowline for the horizontal and vertical locations of the coordinate

Note: All survey values to be reported to second decimal point (x.xx)

TABLE 01050-2
Asset Attribute Data Examples

Valves Worksheet

Asset Attribute Table Examples

	A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Valve Type	Main Type	Valve Size	Valve Manufacturer	Valve Model #	# of Turns to Close	Gear Actuator	Gear Ratio	Side Actuator	Actuator Manufacturer	Comments
2	ARV-1	C300	518060.09	1483231.33	81.72	ARV - Combination	Water Main	2	Brand H	100XT						
3	ARV-1	C303	518083.55	1483280.50	81.15	ARV - Vacuum	Force Main	4	Brand G	1000						
4	BFP-1	C303	518086.00	1483282.88	78.21	Backflow Preventer	Reclaimed Water Main	8	Brand F	2000 fgs						
5	BO-9	C405	518088.83	1483289.43	78.20	Blowoff	Water Main	2	Brand E	14 turbo						
6	BFV-1	C405	518088.11	1483295.00	81.95	Butterfly	Water Main	30	Brand D	230 xls	200	Yes	3 to 1	Yes	Brand C	
7	GV-3	C405	518132.54	1483372.75	81.23	Gate	Water Main	16	Brand C	2225846	300	Yes	3 to 1	NO		
8	LS-W1	C405	576779.36	1539706.97	64.30	Line Stop	Water Main	16	Brand B	7r6r44						
9	PV-22	C405	576880.60	1539718.32	64.52		Force Main	12	Brand A	Z100	200	Yes	3 to 1	Yes	Brand A	
10																

General Info | Hydrant | **Valve** | Manhole | Meter | Fitting | Cleanout | Pipe | Pumpstation | Well | Property or

Fitting Worksheet

Asset Attribute Table Examples

	A	C	D	E	F	G	H	I
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Fitting Type	Comments
2	FM-1	C-3	572399.28	1539339.13	46.27	Force Main	Bend 11 1/4°	
3	FM-2	C-3	574840.74	1539856.91	51.73	Force Main	Bend 22-1/2°	
4	RW-1	C-4	574887.22	1539849.64	51.75	Reclaimed Water Main	Cross	
5	RW-2	C-4	574904.30	1539849.56	48.98	Reclaimed Water Main	Reducer	
6	WM-1	C-5	572532.38	1539848.16	54.42	Water Main	Tapping Saddle	
7	WM-2	C-5	572631.00	1539337.10	45.27	Water Main	Tee	
8								

General Info | Hydrant | Valve | Manhole | Meter | **Fitting** | Cleanout | Pipe | Pumpstation | Well | Property or Easeme

Pipes Worksheet

Asset Attribute Table Examples

	A	C	D	E	F	G	H	I	J	K	L	M
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Type of Shot	Construction Method	Material	Pressure Class	Manufacturer	Comments
2	CSNG-1	C-4	517827.57	1482195.46	78.83	Force Main	Bore & Jack (Casing)		PVC	DR18	Brand A	
3	CSNG-2	C-4	517848.20	1482195.31	78.38	Force Main	Bore & Jack (Casing)		PVC	DR18	Brand A	
4	RW-1	C-7	517731.98	1482237.24	80.42	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
5	RW-2	C-7	517732.85	1482338.10	80.94	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
6	WM-1	C-9	573309.07	1539372.90	56.10	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
7	WM-2	C-9	573308.75	1539375.00	54.66	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
8	FMDD-1	C-4	504345.94	1488969.20	114.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
9	FMDD-2	C-4	504360.86	1488970.50	112.74	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
10	FMDD-3	C-4	504377.19	1488971.20	106.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
11	FM-9	C-4	504480.47	1488952.90	105.24	Force Main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
12												

General Info | Hydrant | Valve | Manhole | Meter | Fitting | Cleanout | **Pipe** | Pumpstation | Well | Property or Easeme

Easements Worksheet

Asset Attribute Table Examples

	A	C	D	E	F	G	H
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Boundary Corner Type	Comments
2	Corner-1	C-8	463484.59	1511029.72		Pump Station Tract	N.W. CORNER
3	Corner-2	C-8	463523.24	1511040.01		Pump Station Tract	N.E. CORNER
4	Corner-3	C-8	463480.45	1511015.23		Pump Station Tract	S.W. CORNER
5	Corner-4	C-8	463526.97	1511025.49		Pump Station Tract	S.E. CORNER
6						Easement	
7						Property	
8							

Meter | Fitting | Cleanout | Pipe | Pumpstation | Well | **Property or Easement Corner** | Existing OC Utility Crossing | Grease Interceptor

Existing Utility Crossing

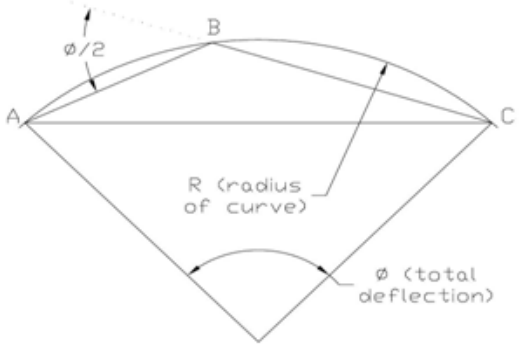
Asset Attribute Table Examples

	A	C	D	E	F	G	H	I
1	ID Number	Plan Sheet #	Easting	Northing	Existing Pipe Elevation	Proposed Crossing Elevation	Existing Main Type	Comments
2								
3	CR-02	AT-1	474767.95	1500585.09	98.20	106.20	Force Main	
4	CR-03	AT-1	475239.63	1500596.35	99.10	113.88	Force Main	
5	CR-04	AT-1	475239.61	1500588.49	94.30	112.45	Reclaimed Water Main	
6	Conf-1	C-750	463464.47	1511013.75	100.54	104.88	Water main	
7	Conf-2	C-750	463163.91	1510693.49	98.32	103.57	Storm Main	
8								

Pipe | Pumpstation | Well | Property or Easement Corner | **Existing OC Utility Crossing** | Grease Interceptor

TABLE 01050-3
Pipe Deflection Data EXAMPLE

Project:			
Contractor:			
Progress Mtg Date:			
Contract #			
Dwg Sheet #			
Utility Type		FM	
Pipe Manufacturer		National Pipe	
Pipe size & material		16" PVC C905	
PVC Manufacturer Deflection		6	inches
County Allowable Deflection	75%	4.5	inches
Allowable Angle of Offset		1.5	degrees
Allowable Radius of Curvature		764	feet
Laying Length of Pipe		20	feet



ID	Size and Type	Northing	Easting	Elev.	Calculations Including Elevation (XYZ)						
					Distance between points AB	Distance between points BC	Distance between points AC	Total Deflection Ø'	Radius of Curve**	Average Offset Angle***	Average Offset****
					Length AB	Length BC	Length AC	XYZ (w/ elevation)	XYZ (w/ elevation)	per laying length	per laying length
					ft	ft	ft	degrees	ft	degrees	inches
14041	16" FM	1505131.50	468948.53	107.68	-	-	-	-	-	-	-
7000	16" FM	1505059.60	468932.08	108.15	73.76	38.93	112.66	5.48	1,178.35	0.97	4.07
2128	16" FM	1505022.11	468921.60	108.55	38.93	39.61	78.54	2.29	1,961.65	0.58	2.45
2127	16" FM	1504983.85	468911.35	108.29	39.61	38.35	77.96	1.78	2,505.50	0.46	1.92
2126	16" FM	1504946.67	468901.96	107.81	38.35	39.13	77.42	8.79	505.16	2.27	9.51
2125	16" FM	1504908.11	468895.31	107.48							

Data that has be inputted

Values in yelloware over spec

*Uses law of cosines to determine angle ABC and Ø.
angle ABC = arccos((AB²+BC²-AC²)/(2*AB*BC))
180-Ø/2 = angle ABC
Calculate the total deflection Ø.
to the outer point (A or C) is equal in angle to
the approach from the next point along the

** Uses law of sines, using the chord length AC and radius R.
Since sin((Ø/2)*(PI/180))=(Chord/2)/R and length AC=Chord
R=AC/(2*sin(Ø*PI/360)
This calculation assumes an average radius over the bend between three points.

*** Adds the lengths of AB + BC / 20ft to get an approximate number of bends over the span.
This value is divided by the total deflection
angle to calculate the average bend angle of
This assumes that the bend angle consistent across the entire length.

**** Uses average offset angle and laying length of pipe.

PART 3 - EXECUTION

3.01 SURVEY FIELD WORK

A. Locate, reference, and preserve existing horizontal and vertical control points and property corners shown on the Drawings prior to starting any construction. If the Surveyor performing the work discovers any discrepancies that will affect the Project, the Contractor must immediately report these findings to the City. All survey work shall meet the requirements as defined in Florida Administrative Code 5J-17. Reference and preserve all survey pins/monuments during Construction. If survey pins/monuments are disturbed, it is the responsibility of the Surveyor to reset the pins/monuments at the Contractor's expense. If the monuments are disturbed, any Work that is governed by these monuments shall be held in abeyance until the monuments are reestablished by the Surveyor and approved by the City. The accuracy of all the Contractor's stakes, alignments and grades is the responsibility of the Contractor. However, the City has the discretionary right to check the Contractor's stakes, alignments, and grades at any time. Copies of the Surveyor's field notes and/or electronic files for point replacement shall be provided to the City.

B. The construction layout shall be established from the reference points shown or listed on the Drawings. The accuracy of any method of staking shall be the responsibility of the Contractor. All construction layout staking shall be done such as to provide for easy verification of the Work.

C. The Surveyor shall locate all improvements for the project As-Built Asset Attribute Data using State Plane Coordinates as the horizontal datum and the benchmark referenced on the Drawings as the vertical datum. The City will provide electronic files of the Drawings to be used by the Surveyor.

D. Use survey control points to layout such work tasks including but not limited to:
   1. Clearing, grubbing, work limits, right-of-way lines and easements
   2. Locations for pipelines and all associated structures and appurtenances

E. The Surveyor shall reference and replace any project control points, boundary corners, benchmarks, section corners, and right-of-way monuments that may be lost or destroyed, at no additional cost to the City based on the original survey control.

3.02 SURVEY DOCUMENTS DELIVERABLES

A. All survey documents required under Section 01720 Project Record Documents, Part 2 – Products, paragraphs 2.01 and 2.02.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01065
PERMITS AND FEES

PART 1 - GENERAL

1.01 REQUIREMENT

A. General
1. Upon Notice of Award, obtain and pay for all appropriate and applicable permits and licenses as provided for in the General Conditions, except as otherwise provided herein.
2. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.
3. Strictly adhere to the specific requirements of the governmental unit(s) or agency(cies) having jurisdiction over the Work. Whenever there is a difference in the requirements of a jurisdictional body and the Contract Documents, the more stringent shall apply.
4. A copy of the permits obtained by the City are furnished in Appendix A "Permits Obtained by City" of these specifications.
5. Unless otherwise specified, the cost of work specified in the various sections of Division 1, will not be paid for separately but the cost therefore shall be considered incidental to and included in the bid prices of the various Contract items.

B. Local Permits
1. City will waive all City related permit, license, impact or inspection fees (including the Building Department and Engineering Department Permit Fees) related to this project. Any related State or County fees, for the aforementioned permits, will be paid by the City. In addition, the City shall cover the cost for any other permit fees related to external entities through the City’s Owner’s Contingency for this project, therefore proposers should not include permit costs in their total proposal price.
2. The Contractor shall apply for and obtain local permits from the City and schedule and obtain final approval from the inspectors (as applicable).
3. Information on City Building Department fees are available online.
4. The Contractor shall be responsible for scheduling all permit inspections and obtaining inspection approval from the City, as required by the building and sub-discipline construction permits.

C. Construction Dewatering Permit

The Contractor shall apply and pay for all fees associated with obtaining Florida Department of Environmental Protection District Office construction dewatering permits, if required. The Contractor shall provide all materials and equipment to comply with the permit requirements at no additional cost to the City.

DRAFT DOCUMENT FOR COMMISSION REVIEW

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01070
ABBREVIATIONS AND SYMBOLS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. Reference to the following standards of any technical society, organization or body shall be construed to mean the latest standard, code or specification or tentative specification adopted and published at the date of advertisement for bids, even though reference has been made to an earlier standard. Such reference is hereby made a part of the Contract the same as if herein repeated in full and in the event of any conflict between any of these specifications, standard codes or tentative specifications and the Contract Documents, the most stringent shall govern.

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ABPA	Acoustical and Board Products Association
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	American Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASA	American Standards Association (now ANSI)
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSCBC	American Standard Safety Code for Building Construction
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWBP	American Wood Preservers Board
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute

CS	Commercial Standard
DOT Spec	Standard Specification for Road and Bridge Construction –
FDOT	Florida Department of Transportation
FAC	Florida Administrative Code
FS	Federal Standard
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
NACE	National Association of Corrosion Engineers
NASSCO	National Association of Sewer Service Companies
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electrical Code
NECA	National Electrical Contractor's Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPT	National Pipe Threads
NSF	National Science Foundation
OSHA	U.S. Department of Labor, Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	United States Products Standards
SAE	Society of Automotive Engineers
SDI	Steel Decks Institute
SJI	Steel Joists Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Structural Steel Painting Council
UL	Underwriter's Laboratories, Inc.
USASI	United States of American Standards Institute (Now ANSI)

UNITS OF MEASUREMENT

CU FT	cubic feet
CU IN	cubic inch(es)
CY	cubic yard(s)
DegC	degree(s) Centigrade
DegF	degree(s) Fahrenheit
F	Fahrenheit
FT	feet, foot
G	gram(s)
GA	gage
GAL	gallon(s)
GPH	gallon(s) per hour
GPM	gallon(s) per minute
GPS	gallon(s) per second

HR	hour(s)
IN	inch(es)
IPS	iron pipe size
KG	kilogram(s)
L	liter(s)
LB	pound(s)
LBF-IN	pound (force) inch
LF	linear foot, linear feet
MIN. min.	minute(s), minimum
ml	milliliter
MO	month(s)
OZ	ounce(s)
QT	quart
RH	relative humidity
SF	square foot, square feet
SQ IN	square inch(es)
YD	yard(s)
YR	year(s)

TERMINOLOGY

@	at
AB	anchor bolt
ADJ	adjust, adjustable
ADMIN	administration
AFG	above finished grade
AGGR	aggregate
AL	aluminum
ALT	alternate
APPX	appendix
APX	approximate
ART	article
ASPH	asphalt
ASSY	assembly
AUTO	automatic
AUX	auxiliary
AVE	avenue
AVG	average
AWG	American Wire Gauge
BAR	barrier
BCCMP	bituminous coated corrugated metal pipe
BL	base line
BLDG	building
BLKG	blocking
BM	beam

C to C	center to center
CCB	concrete block, masonry
CEM	cement
CIP	cast iron pipe, cast in place
CJ	construction joint
CL	center line, clearance
CM	Construction Manager
CMP	corrugated metal pipe
CO	cleanout
CONC	concrete
CONN	connection
CONST	construction
CONT	continuous
CONTR	contractor
CU, COP	copper
ORR	corridor
CRIT	critical
CTD	coated
CTR	center
CULV	culvert
d	delta
DBL	double
DEM	demolition, demolish
DEPT	department
DET	detail
DIA, D	diameter
DIAG	diagonal
DIM	dimension
DWG	drawing
FEM	female
FUT	future
FV	field verify
FM	force main
FH, HYD	fire hydrant
ID	inside diameter
MAS	masonry
MATL	material
MAX	maximum
MFD	manufactured
MFG	manufacturing
MFR	manufacturer
MH	manhole, metal hallide
MIN	minimum
MISC	miscellaneous
MTL	material

NAT	natural
NATL	national
NOM	nominal
NTS	not to scale
OD	outside diameter
PP	power pole
R	radius
Rd	road
REIN	reinforce
REL A	relief air
REQD	required
REV	revision
RR	railroad
R/W	right-of-way
RWM	reclaimed water main
RY	railway
SAN	sanitary
SCH	schedule
SECT	section
SLV	sleeve
SQ	square
SST	stainless steel
ST	street
STA	station
STD	standard
SURF	surface
SUSP	suspend(ed)
SYM	Symbol, symmetrical
SYS	system
TEMP	Temperature, temporary
TYP	typical
UTIL	utility
W	West
WLD	welded
WM	water main
W/O	without
WT	weight
YD	yard
YR	year
Y W	wye

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01091
REFERENCE SPECIFICATIONS

PART 1 - GENERAL

1.01 GENERAL

A. Applicable Publications: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of or omission from said standards or requirements.

B. Assignment of Specialists: In certain instances, specification test requires (or implies) that specific work is to be assigned to specialist or expert entities who must be engaged for the performance of the Work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work. They are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of Work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of Contract requirements remains with the Contractor.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all Work specified herein shall conform to or exceed the requirements of such referenced documents which are not in conflict with the requirements of these Specifications or applicable codes.

B. References herein to "Building Code" shall mean the Florida Building Code. The latest edition of the code shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. In case of conflict between codes, reference standards, Drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.

D. Applicable Standard Specifications: The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01101

SPECIAL REQUIREMENTS (GRAVITY INSPECTION ONLY)

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The Contractor shall meet these minimum qualifications for closed circuit televising (CCTV) inspections, manhole inspections and smoke testing of gravity sewers. Attend coordination meeting, provide proper notifications, and maintain an accurate weekly schedule. Contractor shall abide by the causes for rejection of Work in this section and other provisions described in other sections.

1.02 MINIMUM CONTRACTOR QUALIFICATIONS

A. The following requirements shall be met to qualify for the CCTV project.
   1. Company
      a. A minimum total of 500,000 LF shall be previously completed within the previous 10-years.
      b. Documented company QA/QC plan and procedures
   2. Company equipment
      a. At least one (1) pan and tilt CCTV camera with rotating lights
      b. At least one (1) push type lateral cameras with footage counter and ability to display footage on screen and/or lateral launch type lateral camera with footage counter and ability to display footage on screen
      c. Digital video capture system capable of capturing MPEG or Windows Media Video files on board the camera truck
      d. PACP compliant inspection data logging software
      e. At least one (1) jetter/vacuum truck

B. The following requirements shall be met to qualify for the manhole inspection project:
   1. Company
      a. Five (5) reference manhole inspection projects with a minimum total of 1,000 manholes
      b. Documented company QA/QC plan and procedures
      c. Listing of management personnel (minimum of two (2) certified personnel with PACP certifications)
         (1) Minimum of one (1) person with PACP certification that will lead or supervise each field manhole inspection crew and a minimum of 2-years in the role of lead person or supervisor
         (2) Minimum of one (1) person with PACP certification serving in the role as a QA/QC management supervisor

2. Company equipment
   a. At least one - 2 Mega Pixel digital camera with strobe flash
   b. Camera attached to pole
   c. Traffic control equipment
   d. Confined space entry equipment

C. The following requirements shall be met to qualify for the smoke testing project.
   1. Company
      a. Five (5) reference smoke testing projects with a minimum of 500,000 LF of smoke testing performed for wastewater gravity mains
      b. Documented company QA/QC plan and procedures
      c. Listing of management personnel (minimum of two (2) certified personnel with PACP certifications)
         (1) Minimum of one (1) person with PACP certification that will lead or supervise each field manhole inspection crew and a minimum of 2-years in the role of lead person or supervisor
         (2) Minimum of one (1) person with PACP certification serving in the role as a QA/QC management supervisor
   2. Company equipment
      a. At least one - 2 Mega Pixel digital camera
      b. At least one (1) self contained portable 4,500 cubic feet per minute blower designed for smoke testing with smoke fluid
      c. At least one (1) hand held Geographic Positioning System (GPS) unit, Trimble Model GeoXH, or equal with sub-meter accuracy

1.03 SUBMITTALS

A. The CCTV Inspection Contractor shall submit a completed qualification form with the required information (see Table A - CCTV Inspection Contractor Qualification Form).

B. Previous Work Products: The Contractor shall submit one (1) example of previous closed circuit televising (CCTV) inspections, manhole inspections and smoke testing of gravity sewers work for approval. The submitted example shall be the work of the field supervisor or foreman to be used on this Project.

TABLE - A
CCTV INSPECTION CONTRACTOR
QUALIFICATION FORM

Company Reference Projects	*Total Footage*	*Project Completed*	*Client Company*	*Contact Name*	*Contact (Phone Number and/or E-mail Address)*

Listing of Company Management Personnel	*PACP (Certification #)*	*MACP (Certification #)*	*Years of Experience in CCTV*	*Years of Experience as Supervisor*	*QA/QC Mgmt Supervisor (Y or N)*	*Position Title*

Company Equipment Item	*Manufacturer*	*Model No.*	*Description*
Main Line CCTV Camera			
Lateral Camera (push type)			
Lateral Camera (launch type)			
Video Capture System			
PACP-Compliant Inspection Data Logging System			
Combination Jetter/Vacuum Truck			

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONTRACT COORDINATION MEETING

A. Prior to commencing field activities, the Contractor shall attend a Coordination Meeting with the City. Contractor shall be prepared to discuss the following agenda items:
   1. Project contacts
   2. City notification procedures
   3. Public notification requirements
   4. Inspection QA/QC
   5. Deliverables
   6. Schedule

3.02 GENERAL PROGRESSION OF WORK

A. Contractor shall submit an updated schedule of inspection activities on a weekly basis.

B. Contractor shall notify the City a minimum of 48-hours prior to any inspection work.

C. All work shall be performed in an orderly, organized fashion, progressing through the project area(s) in a systematic manner. Contractor shall adhere to submitted and communicated schedules.

3.03 QUALITY ASSURANCE

A. The Contractor shall have a QA/QC plan and procedures to ensure accurate data collection, documentation and submittal.

B. The City has adopted the NASSCO PACP quality control procedures as the minimum standard to be applied to all submitted CCTV and Manhole Inspection data. All submitted data shall be quality checked in accordance with these procedures.

C. The City will perform QA/QC checks on a minimum 5% of submitted inspection data.

D. All submitted data will be subject to City QA/QC following the same procedures set forth herein following in paragraph 3.04 "CCTV and Manhole Inspection QA/QC Procedures."

3.04 CCTV AND MANHOLE INSPECTION QA/QC PROCEDURES

A. The Contractor shall determine the approximate number of inspections performed by each inspection field supervisor/foreman that submitted data on a weekly basis to determine the quality control sampling population. A review of a minimum of 5% of the total inspections is required.

B. The Contractor shall number the inspection reports in the order they were inspected.

C. The Contractor shall utilize a random number generator to determine the inspection report numbers for review.

D. Each inspection report that corresponds to the random numbers will be marked for review, the inspection report printed and the video copied to the QA/QC directory.

E. Each selected inspection report will be reviewed in detail against the inspection digital video.

F. Each field that is populated and those that should have been populated will be counted to produce a "number of fields checked" for the required header information and detailed inspection information. The fields with errors, or missing data, regardless of the error will be totaled to determine the "error count". The accuracy level will then be calculated as follows: 100-((error count/number of fields checked)*100) = accuracy percentage.

G. The percentage accuracy shall be entered onto a graph so that the on-going accuracy of each supervisor (operator) can be seen.

H. The accuracy of each field supervisor/foreman's data shall exceed 90%.

I. The Contractor shall submit, along with the inspection deliverables, quality control forms that include a hard copy print out of the inspection reports checked with errors and omissions clearly marked.

J. The Contractor shall enter the accuracy level calculations in each supervisor (operator) quality control log.

3.05 SMOKE TESTING QUALITY ASSURANCE - N/A

3.06 REJECTION OF WORK

A. Failure of City QA/QC checks will result in a "quality deficiency" notification to request from the Contractor how the rejected Work shall be addressed.

B. Failure to notify City prior to field work being performed in accordance with the City notification procedures may constitute rejection of Work that was performed without notification.

C. Payment shall be withheld for inspection work not passing the City QA/QC check, until such time that the data is re-submitted and verified accurate.

D. Subsequent failures of City QA/QC checks may result in the City requiring a change in field supervisor.

END OF SECTION

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SECTION 01200
PROJECT MEETINGS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Contractor participation in pre-construction conferences, progress meetings and specially called meetings.

1.02 MEETINGS CALLED BY THE CITY

A. The City will schedule and administer a pre-construction conference, periodic progress meetings and specific topic meetings throughout the progress of the Work. The City will:
   1. Prepare and distribute a notification of the meeting to required attendees.
   2. Establish, prepare and distribute an agenda with the notification.
   3. Make physical arrangements for the meetings.
   4. Preside at meetings.
   5. Prepare and distribute minutes of meetings including significant proceedings and decisions, within 15 working days after each meeting. Minutes will be forwarded to all participants and to parties affected by decisions made at the meeting.

B. Representatives of the Contractor, Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. The meeting location will generally be a central site, convenient for all parties, designated by the City.

D. All meetings shall be digitally recorded with files provided to all requesting parties.

1.03 PRE-CONSTRUCTION CONFERENCE

A. Attendance:
   1. City
   2. Contractor and superintendent
   3. Subcontractors as appropriate to the agenda
   4. Representatives of suppliers and manufacturers as appropriate to the agenda
   5. City MBE/WBE representative
   6. Other agency representatives (FDEP, EPA, City, etc.)
   7. Surveyor – recommended but required if Surveyor has not previously performed work for the City
   8. Others as requested by the City or Contractor

B. Suggested Agenda:
   1. Distribution and discussion of:
      a. List of major Subcontractors and suppliers
      b. Construction schedules
      c. Contact information
   2. Organizational arrangement of Contractor's forces and personnel, and those of Subcontractors, material and equipment suppliers, and the City
   3. Critical work sequencing
   4. Major equipment deliveries
   5. Project coordination
      a. Designation of responsible personnel
      b. Channels and procedures for communication
   6. Procedures and processing of:
      a. Field decisions
      b. Proposal requests
      c. Submittals
      d. Change orders
      e. Applications for payment/Schedule of Values
      f. Contractor quality control
      g. Submittal of Shop Drawings, project data and samples
   7. Adequacy of distribution of Contract Documents
   8. Procedures for maintaining as built and record documents
   9. Use of premises:
      a. Office, work and storage areas
      b. City's requirements
      c. Housekeeping
   10. Temporary construction facilities
   11. Temporary utilities
   12. Safety and first aid procedures
   13. Rules and regulations
   14. Security procedures
   15. Place, date and time for regular progress meetings
   16. Completion time for Contract and liquidated damages

1.04 PROGRESS MEETINGS

A. The City shall schedule progress meetings at least once per month as required by progress of the Work with the first meeting approximately one (1) month after the pre-construction meeting.

B. Attendance:
   1. City
   2. Contractor
   3. Subcontractors as appropriate to the agenda
   4. Suppliers as appropriate to the agenda
   5. Others as appropriate

C. The Contractor's representative is to attend the project meetings and have the authority to act on behalf of the entity represented on field related matters. Contractor's representative is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics and provide specific information including but not limited to:
   1. Status of submittals and actions necessary to expedite them
   2. Status of activities behind schedule and actions necessary to regain the approved schedule
   3. Status of materials and equipment deliveries and action necessary to expedite materials and equipment and maintain the approved schedule
   4. Status of open RFI's and actions necessary to address them

D. To the maximum extent practicable, the Contractor is to assign the same personnel to represent the Contractor at Progress Meetings throughout the progress of the work.

E. The Contractor is to provide a current Shop Drawing submittal log at each progress meeting.

F. The Contractor is to provide copies of the updated Progress Schedule at each project meeting in accordance with the General Conditions including a 3 week look ahead schedule for upcoming events.

G. Suggested Agenda:
   1. Review and approve minutes from previous meeting
   2. Review of work progress since previous meeting to include current As-Builts
   3. Contractor's/Subcontractor's workforce and equipment
   4. Progressive As-Built Drawings
   5. Surveyor's submittals
   6. Field observations, problems and conflicts
   7. Construction progress and problems which impede construction schedule
   8. Shop Drawing submittal status
   9. Requests for Information (RFI) status
   10. Change Order status
   11. Review of off site fabrication and delivery schedules
   12. Corrective measures and procedures to regain approved schedule
   13. Revisions to construction schedule
   14. Job progress and schedule for succeeding work period
   15. Coordination of schedules
   16. Maintenance of quality standards
   17. Review submittal schedule; expedite as required
   18. Pending requests for information, changes and substitutions
   19. Review proposed changes for effect on construction schedule and completion date
   20. Pay application status
   21. Other business

H. Revision to Minutes:
   1. Unless minutes are challenged, in writing, prior to the next regularly scheduled Progress Meeting, they will be accepted as properly summarizing the discussions and decisions of the meeting.
   2. Persons challenging minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
   3. Challenge to minutes shall be settled as priority portion of "old business" at next regularly scheduled meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION MEETING

A. Pre-construction Meeting: At the pre-construction meeting the Contractor shall be provided with a blank electronic version of the spreadsheets for: Asset Attribute Data and Pipe Deflection tables. The Contractor's Surveyor shall use these tables to input the data and shall not alter the table format or formulas.

3.02 CONSTRUCTION PROGRESS MEETINGS

A. Contractor shall provide the following:
   1. Progressive As-Built Drawings
   2. Surveyor submittals
      a. As-Built Asset Attribute Data Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-2)
      b. Pipe Deflection Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-3)
      c. Gravity Main Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-4)
      d. Boundary Surveys of fee simple and permanent easements for pump stations, treatment facilities, and constructed pipe in easements
   3. Construction Contract, As-Built Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents
   4. Specifications and Addenda: Record manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed as well as any changes made by Field Order, Change Order or other
   5. Change orders, verbal orders, and other modifications to Contract
   6. Written instructions by the City as well as correspondence related to Requests for Information (RFIs).
   7. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.
   8. Field test records, inspection certificates, manufacturer certificates and construction photographs.

9. As-Built Asset Attribute Data: Surveyor shall obtain field measurements of vertical and horizontal dimensions of constructed improvements. The monthly submittal shall include the Surveyor's certified statement regarding the constructed improvements being within the specified accuracies as described in Specification Section 01050 "Surveying and Field Engineering", Table 01050-1 Minimum Survey Accuracies or if not, indicating the variances.
10. Gravity Main Table: Surveyor shall prepare and update a Gravity Main Table to include as a minimum the pipe segment identification, pipe lengths, manhole inverts and tops, and slopes for gravity mains. Surveyor shall certify the data entered are correct and indicate if the minimum slopes have not been met.
11. Pipe Deflection Table: Surveyor shall input the type of pipe, pipe manufacturer, PVC manufacturer deflection allowance, allowable angle of offset and radius of curvature, laying length of pipe, and coordinates. Surveyor shall certify the data entered are correct and indicate if the deflection allowance, offset or radius of curvature exceeds the manufacturer's recommendations.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

Work completed without approved Shop Drawings and/or samples shall be considered installed at the Contractor's risk.

1.01 SHOP DRAWINGS AND DATA

A. Shop Drawings defined in the General Conditions, shall complement design and construction Drawings, and shall contain sufficient detail to clearly define all aspects of the Construction. These Drawings shall be complete and detailed.

B. Contractor and Supplier’s catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked with specification title and numbers to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.

C. If Shop Drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in the letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, the Contractor shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such Drawings have been reviewed.

D. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction and similar descriptive material. Materials and equipment list shall, for each item, give the name and location of the Supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.

E. For all equipment furnished, the Contractor shall provide a list including the equipment name and address and telephone number of the Supplier's representative and service company so that service and/or spare parts can be readily obtained.

F. The Contractor will obtain an installation list from suppliers and equipment suppliers who propose to furnish equipment or products for submittal to City/Professional along with the required Shop Drawings. The installation list shall include at least 5 installations where identical equipment has been installed and has been in operation for a period of at least 1-year.

1.02 REVIEW OF SHOP DRAWINGS AND SAMPLES

A. The City /Professional's review of Shop Drawings, Data, and Samples as submitted by the Contractor will be to determine if the items(s) generally conform(s) to the information in the Contract Documents and is/are compatible with the design concept. The City/Professional's review and exceptions, if any, will not constitute an approval of dimensions, connections, quantities, and details of the material, equipment, device, or item shown.

B. The review of drawings and schedules will be general, and shall not be construed:
   1. As permitting any departure from the Contract Documents
   2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials
   3. As approving departures from details furnished by the City/Professional, except as otherwise provided herein

C. If the drawings or schedules as submitted describe variations and show a departure from the Contract Documents which the City/Professional finds to be in the interest of the City and to be so minor as not to involve a change in Contract Price or Contract Time, the City/Professional may return the reviewed drawings without noting an exception.

D. "Approved As Noted": Contractor shall incorporate City/Professional's comments into the submittal before release to manufacturer. The Contractor shall send a letter to the City/Professional acknowledging the comments and their incorporation into the Shop Drawing.

E. "Amend and Resubmit": Contractor shall resubmit the Shop Drawing to the City/Professional. The resubmittal shall incorporate the City/Professional's comments highlighted on the Shop Drawing.

F. "Rejected": Contractor shall correct, revise and resubmit Shop Drawing for review by City/Professional.

G. Resubmittals will be handled in the same manner as first submittals. For resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by City/Professional on previous submissions. The Contractor shall make any corrections required by the City/Professional.

H. If the Contractor considers any correction indicated on the Drawings to constitute a change to the Drawings or Specifications, the Contractor shall give written notice thereof to the City/Professional.

I. When the Shop Drawings have been completed to the satisfaction of the City/Professional, the Contractor shall carry out the Construction in accordance therewith and shall make no further changes therein except upon written instructions from the City/Professional.

J. No partial submittals will be reviewed. Submittals not deemed complete will be stamped "Rejected" and returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the City/Professional, make all submittals in groups containing all associated items for:
   1. Systems
   2. Processes
   3. As indicated in specific Specifications Sections
      All drawings, schematics, manufacturer's product data, certifications, and other Shop Drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interfaces checking.

K. Only the City/Professional shall utilize the color "red" in marking Shop Drawing submittals.

L. Failure to comply with any of the above may result in the rejection of Shop Drawings.

1.03 PRODUCT DATA

A. Submit not less than 6-copies, unless approved by the City/Professional. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information unique to the Work.

1.04 MANUFACTURERS' INSTRUCTIONS

A. When required in an individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for product data.

1.05 SAMPLES

A. Submit full range of manufacturers' standard colors, textures and patterns for the City's selection. Submit samples for selection of finishes within 30-days after Award of Contract. All color and finish selections must be submitted by the Contractor in a single submission, properly labeled and identified.

B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

C. Submit the number of samples specified in the respective Specification section, but no less than two (2). After review one (1) will be retained by the City. Reviewed samples that may be used in the Work are indicated in the Specification Section.

D. Samples shall be delivered to the City as directed. The Contractor shall prepay shipping charges on samples. Materials or equipment for which samples are required shall not be used in the Work until approved by the City/Professional.

E. Samples shall be of sufficient size to clearly illustrate:
   1. Functional characteristics of the product, with integrally related parts and attachment devices
   2. Full range of color, texture and pattern
   3. Each sample shall have a label indicating:
      a. Name of Project
      b. Name of Contractor and Subcontractor
      c. Material or equipment represented
      d. Place of origin
      e. Name of product and brand (if any)
      f. Location in Project
      g. Specification title and number
      h. Submittal number
      i. Note: Samples of finished materials shall have additional marking that will identify them under the finished schedules.

F. The Contractor shall prepare a transmittal letter, in triplicate (3) for each shipment of samples containing the information required in paragraph herein. The Contractor shall enclose a copy of this letter with the shipment and send a copy of this letter to the City/Professional. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.

G. Approved samples not destroyed in testing shall be sent to the City or stored at the site of the Work. Approved samples of the hardware in good condition may be incorporated in the Work if requested in writing by the Contractor and approved in writing by the City/Professional. Samples that failed testing or were not approved will be returned to the Contractor at the Contractor's expense, if so requested at time of submission.

1.06 FIELD SAMPLES

A. Provide field samples of finishes as required by individual Specifications sections. Install the sample completely and finished. Acceptable samples in place may be retained in completed Work.

1.07 DRAWINGS, PRODUCT DATA AND CERTIFICATES

A. Each letter of transmittal shall identify each and every item transmitted by title, drawing number, revision number and date.

B. The City generally will not check dimensions, quantities or schedules, except in cases where the information is lacking in the Specifications.

C. The following is applicable to submitted drawings, data and certificates:
   1. Show relation to adjacent structures or materials.
   2. Clearly identify field dimensions.
   3. Show required dimensions and clearances.
   4. Performance characteristic and capabilities shall accompany original Shop Drawing submittals.
   5. Wiring diagrams and controls shall accompany original Shop Drawing submittals.
   6. Installation instructions shall accompany original Shop Drawing submittals.
   7. Each submittal shall identify applicable Standards, such as ASTM number or Federal Specification number.
   8. All information not pertinent shall be removed from the submittal, or shall be crossed out.

D. When resubmission is required, the City/Professional will return only two (2) marked up copies. A third submission from the same manufacturer will not be accepted.

1.08 SUBSTITUTIONS

A. The substitution requirements of this Section are in addition to the requirements of the General Conditions and Supplementary Conditions.

B. When a particular product is specified or called for, it is intended and shall be understood that the proposal tendered by the Bidder includes those products in his Bid. Substitutions will only be considered in cases where original materials are unavailable or in an instance where substitute can be proven superior in its planned application

C. The intent of these specifications is to provide the City with a quality facility without discouraging competitive bidding. For products specified only by reference standards, performance and descriptive methods, without naming manufacturer's products, the Contractor may provide the products of any manufacturer complying with the Contract Documents, subject to the review of product data by the City/Professional as specified herein.

D. The City/Professional's approval is required for substitutions.

E. The Contract is based on the materials, equipment and methods described in the Contract Documents.

F. The City/Professional will consider proposals for substitution of materials equipment and methods only when such proposals are accompanied by full and complete technical data and all other information required by the City/Professional to evaluate the proposed substitution.

G. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this Work by the City/Professional in writing. The Contractor must provide a submittal per this Section specifically requesting approval of the substitution. Failure to specifically identify the requested substitution may invalidate approval of a submittal.

1.09 AVAILABILITY OF SPECIFIED ITEMS

A. Verify prior to bidding that all specified items will be available in time for installation during Construction for orderly and timely progress of the Work.

B. In the event that specified items will not be available, notify the City/Professional prior to receipt of proposals.

1.10 OPERATING MANUALS

A. Submit all manuals in accordance with requirements of Divisions 2 through 16 of the Contract Specifications and Section 01700 "Project Closeout."

1.11 WARRANTIES, GUARANTEES AND BONDS

A. Provide as required by Technical Sections of the Specifications and Sections 01700 "Project Closeout" and Section 01740 "Warranties and Bonds."

1.12 CADD FILES

A. The Professional's CADD files will be available on a limited basis to qualified firms at the City’s prerogative. The procedure for requesting such files is noted elsewhere in these documents and there is a cost associated with handling and reproduction. Recipients are cautioned that these files may not accurately show actual conditions as constructed. Users are responsible to verify actual field conditions.

B. The Professional’s Drawings are to be used only for background information. If the Professional’s Drawings are just reproduced and resubmitted (e.g. for ductwork drawings) they will be rejected.

C. Copies of data furnished by the City/Professional to Contractor or Contractor to City/Professional that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user’s sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

D. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60-days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

E. When transferring documents in electronic media format, the transferring party makes no representations as to long-term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

1.13 PROGRESS PHOTOGRAPHS

A. Photographs and digital pictures shall be in color. Provide 1 copy of each digital picture on each of three (3) CDs and provide 1 print of each photograph in two (2) separate albums.

B. Photographs shall be from locations to illustrate the condition of Construction and state of progress adequately.

C. Provide up to 12 digital photographs of views randomly selected by the City, taken prior to any construction and prior to each scheduled Application for Payment.

D. Deliver electronic images, prints, and negatives to the City.

E. Each print shall be single weight paper with glossy finish and the overall dimension shall be 7-1/2-inch x 10-inches (19.05 x 25.4 cm). The print shall be clear, sharp and free of distortion after the enlargement from the negative.

F. Provide loose-leaf albums for each set of photographs to hold prints with a maximum of 50-leaves per binder.

G. Each print shall be protected by flexible, transparent acetate or plastic sheet protector leaves with metal reinforced holes. Two (2) extra leaves shall be provided in each binder.

H. Capture and provide digital, ortho-rectified, true-color, aerial photographs of the complete project site prior to start of Construction and at final completion. A final 6-inch or less ground pixel resolution is required. If using traditional photography, the photos will need to be captured at an appropriate scale and scanned at a high enough dpi to yield a final ground pixel size of 6-inches or less. If captured digitally, a final 6-inches or less ground sample distance is required. The final orthorectified photos shall use a projection of NAD 27, State Plane West and all vertical reference shall be NAVD 88, US feet. All orthophoto mosaics shall meet a final accuracy of plus or minus 5-feet.

I. Provide a total of four (4) true-color, color balanced orthophoto mosaic prints. Three (3) prints each of the pre and post construction (final completion) orthophoto mosaics, for a total of six (6). Each orthophoto mosaic print shall be on double-weight paper with glossy finish and shall have overall dimensions of 36-inches x 58-inches. Two (2) copies of each of the digital orthophoto mosaics shall be supplied in Geotiff format on disk for each time period (pre and post construction). The final color balanced, true-color orthophoto mosaics will be projected in NAD 27, State Plane West and all vertical reference shall be NAVD 88, US feet and shall meet a final accuracy of plus or minus 5-feet.

J. The Contractor shall provide before and after photographs of each portion of the site. The below ground facilities shall include all equipment, walls, floor, piping, supports and entrance. At major locations, photographs shall include before, during, and after prints and all prints shall be placed in binders in ascending date order to show the Work as it progresses.

K. Descriptive Information:
   1. Each photograph shall have a permanent title block on the back and shall contain the typed information and arrangement as follows:
      a. CITY, FLORIDA
      b. (ENTER PROJECT NAME)
      c. BID No. (Enter Bid Number)
      d. CONTRACTOR: (Name of Contractor)
      e. DATE: (When photo was taken)
      f. PHOTO NO.: (Consecutive Numbers)
      g. PHOTO BY: (Firm Name of Photographer)
      h. LOCATION: (Description of Location and View)
   2. The Contractor shall provide the Professional with a written description of each photograph. This description shall be included in the binders and a copy shall be submitted with the CDs.

1.14 PROJECT RECORD DOCUMENTS

Project Record Documents shall be submitted in accordance with Section 01720 "Project Record Documents" of these specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SUBMITTAL PROCEDURES

A. Article 9 of the General Conditions contains additional provisions regarding submittals.

B. Preliminary Shop Drawing Data: Within 20-days after the Award of the Contract or before the Pre-Construction Meeting, the Contractor shall submit to the City/Professional a complete listing of manufacturers for all items for which Shop Drawings are to be submitted.

C. Shop Drawing Submittal Schedule: Within 30-days after the Notice to Proceed, the Contractor shall submit to the City/Professional a complete schedule of Shop Drawings submittals with the respective dates for submission, the beginning of manufacture, testing and installation of materials, supplies and equipment, noting those submittals critical to the progress schedule.

D. Submittal Log: An accurate updated log of submittals will be maintained by the Contractor and subject to review by the City/Professional at each scheduled progress meeting.

E. If the Contractor considers any correction indicated on the Drawings to constitute a change to the Contract Drawings or specifications, the Contractor shall give written notice thereof to the City/Professional. This does not constitute a change order until accepted by the City.

F. Shop Drawing and submittal data shall be reviewed by the City/Professional for each original submittal and first resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor. The Contractor shall reimburse the City for services rendered by the City/Professional at the rate multiplied by the City's Professional multiplier based on the fee schedule provided to the City for this Project. If a City engineer is performing any portion of the review, this fee is based upon the hourly rate of the engineer times the City's multiplier for overhead, benefits, and expenses. The Contractor agrees that the City shall deduct such charges from the Contract Amount by a deductive Change Order.

G. Contractor Shop Drawing and Sample submittals shall include 5 copies in addition to any other copies that the Contractor wants returned. The City will retain 5 copies of approved submittals.

H. Identify Project, Project Number, date, dates of previous submittals, Contractor, Sub-Contractors, suppliers with their addresses, pertinent Drawings by sheet and detail number, and Specification Section number, as appropriate. Identify all deviations from the Contract Documents. Provide space for Contractor and Professional review stamps.

I. Contractor's delivery of Shop Drawings for review shall follow a reasonable sequence, as is necessary to support the dates on the Progress Schedule and avoid an overload of Shop Drawings awaiting review at any one time. Coordinate submittal of related items.

J. Submit Shop Drawings per the schedule of Shop Drawing submittals, inserted in 1 loose-leaf binder, with tabs and index to the City/Professional. All individual submittal sheets inserted in said binder must be clearly marked and referenced to proper paragraph and subparagraph of specifications. Cross out any items on sheets which constitute information not pertaining to equipment specified. Clearly mark all components that are provided as "optional" by manufacturer. Shop Drawings shall be approved by the Contractor prior to submittal to the City/Professional. Shop Drawings will be reviewed by the City/Professional. After City/Professional approval, reproduce and distribute in accordance with requirements herein.

K. All submissions of Shop Drawings, brochures and catalog cuts shall be accompanied by a transmittal letter listing the Drawings submitted by number and title.

L. When engineering calculations and/or professional certification of performance criteria of materials, systems, and/or equipment are required, the City is entitled to rely upon the accuracy and completeness of such calculations and certifications submitted by the Contractor. Calculations, when required, shall be submitted in a neat, clear and in an easy to follow format. Such calculations and/or certifications shall be signed and sealed by a Professional Engineer registered in the State of Florida.

M. Distribute copies of reviewed submittals to concerned parties. Instruct recipients to promptly report any inability to comply with provisions.

N. Prior to submission of Shop Drawings and samples, the Contractor shall stamp and sign the submittals. Any submission which, upon examination by the City, shows evidence of not having been thoroughly checked, or is not in compliance with the provisions of this Section will be returned to the Contractor for completion before it will be considered for review.

O. Notify the City of the need for making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the material or equipment Contactor proposes to supply.

P. On resubmittals, direct specific attention in writing or on the revised Drawings or sample to revisions other than the corrections required by City on previous submissions.

Q. All drawings, schematics, manufacturer’s product data, certifications and other drawing submittals required for a system specification shall be submitted at one time as a package to facilitate interface checking.

R. The City will distribute Shop Drawings as follows for the indicated action taken:

SHOP DRAWING SUBMITTAL DISTRIBUTION

Representative Party	No Exception Taken or Make Correction Noted			Rejected or Revise & Resubmit		
	Submittal Transmittal	Shop Drawing	Review Comment Sheet	Submittal Transmittal	Shop Drawing	Review Comment Sheet
Engineer	2 Copies	File Copy	1 Copy	Original	File Copy	1 Copy
Contractor (see Note 1)	2 Copies	1 Copy Each Submittal	1 Copy	1 Copy	All Copies Except Engineers	1 Copy
City	1 Copy	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy
Inspector	2 Copies	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy
Project Record Data (see Note 2)	1 Copy	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy

NOTES:
1. Contractor shall distribute additional copies to Subcontractors as required.
2. Stored by Contractor to be furnished to City upon closeout.

S. All Shop Drawings shall be accompanied with a transmittal letter providing the following information:
   1. Project Title and Contract Number
   2. Date
   3. Contractor's name and address
   4. The number of each Shop Drawing, project data, and sample required
   5. Notification of Deviations from Contract Documents
   6. Submittal Log Number conforming to specification section numbers
      a. Submit each specification section separately.
      b. Identify each Shop Drawing item required under respective specification section.
      c. Identify resubmittal using specification section followed by A (first resubmittal), B (second resubmittal)…etc.

3.02 CONTRACTOR'S REVIEW

A. Contractor's Responsibility for Coordination: Where the dimension, size, shape, location, capacity or other characteristic affects another item, and where the Contractor selects, fabricates or installs related or adjacent products to be used, the Contractor shall be responsible for coordination of related items. The Contractor shall insure that a proper exchange of information takes place prior to or during preparation of each submittal and that submittals reflect such coordination. The notation "verify" or "coordinate" on the Drawings indicates the necessity for Contractor coordination in the particular instances used.

B. Contractor's Checking: When checking submittals from Subcontractors and suppliers, the Contractor shall mark all sets, indicating his corrections and comments in blue or green. Copies marked in red may be returned for revision.

C. The Contractor is responsible to deliver and pick-up all submittals in a timely manner at the City/Professional's designated office. The Contractor is responsible for all related costs and expenses for the transmittal of such submittals.

3.03 CITY'S / PROFESSIONAL'S REVIEW

A. Corrections or comments made on Shop Drawings during review do not relieve the Contractor from compliance with the requirements of Drawings and Specifications. This check is only for review of general conformance with the design concept of this Project and general compliance with information given in Contract Documents. Any substitutions or changes shall be properly noted.

B. No action will be taken on "rough-in" Shop Drawings for plumbing and electrical connections when the items of equipment are not included in the same submittal.

C. Review Time:
   1. On a normal basis, each submittal will be returned to the Contractor within 15 working days of the date it is received. Some submittals may require additional time.
   2. If, for any reason, the above schedule cannot be met, the Contractor will be so informed within a reasonable period and the Schedule of Submittals revised. If the specific submittal affects the critical path, the Contractor shall immediately notify the City/Professional in writing. In the event of separate submittals of individual components of a system, these submittals may be held until all components of the system are submitted, and the Contractor will be so notified.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01301
PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 SUMMARY

A. General
   1. Base all bids on materials and equipment specified in the Appendix B City Utilities List of Approved Products.
   2. Certain types of equipment and kinds of material are described in specifications by means of references to names of manufacturers and vendors, trade names, or catalog numbers.
      a. When this method of specifying is used, it is not intended to exclude from consideration other products bearing other manufacturer's or vendor's names, trade names, or catalog numbers, provided said products are "or-equals," as determined by City/Professional.
   3. Other types of equipment and kinds of material may be acceptable substitutions under the following conditions:
      a. Or-equals are unavailable due to strike, discontinued production of products meeting specified requirements, or other factors beyond control of Contractor; or,
      b. Contractor proposes a cost and/or time reduction incentive to the Owner.

1.02 QUALITY ASSURANCE

A. In making request for substitution or in using an approved product, Contractor:
   1. Has investigated proposed product, and has determined that it is adequate or superior in all respects to that specified, and that it will perform the function for which it is intended.
   2. Will provide same guarantee for substitute item as for product specified.
   3. Waives all claims for additional costs related to substitution which subsequently arise.

1.03 DEFINITIONS

A. Product: Manufactured material or equipment.

1.04 PROCEDURE FOR REQUESTING SUBSTITUTION

A. Substitution shall be considered only:
   1. After award of Contract
   2. Under the conditions stated herein

B. Written request through Contractor only.

C. Transmittal Mechanics
   1. Follow the transmittal mechanics prescribed for Shop Drawings in Specification Section 01300 "Submittals."
      a. Product substitution will include in the transmittal letter, either directly or as a clearly marked attachment, the items listed in Paragraph D below.

D. Transmittal Contents
   1. Product identification:
      a. Manufacturer's name
      b. Telephone number and representative contact name
      c. Specification Section or Drawing reference of originally specified product, including discrete name or tag number assigned to original product in the Contract Documents.
   2. Manufacturer's literature clearly marked to show compliance of proposed product with Contract Documents.
   3. Itemized comparison of original and proposed product addressing product characteristics including but not necessarily limited to:
      a. Size
      b. Composition or materials of construction
      c. Weight
      d. Electrical or mechanical requirements
   4. Product experience
      a. Location of past projects utilizing product.
      b. Name and telephone number of persons associated with referenced projects knowledgeable concerning proposed product.
      c. Available field data and reports associated with proposed product.
   5. Data relating to changes in construction schedule.
   6. Data relating to changes in cost.
   7. Samples
      a. At request of City/Professional.
      b. Full size if requested by City/Professional.
      c. Held until substantial completion.
      d. City/Professional is not responsible for loss or damage to samples.

1.05 APPROVAL OR REJECTION

A. Written approval or rejection of substitution to be given by the Engineer.

B. Engineer reserves the right to require proposed product to comply with color and pattern of specified product if necessary to secure design intent.

C. In the event the substitution is approved, the resulting cost and/or time reduction will be documented by Change Order in accordance with the General Conditions.

D. Substitution will be rejected if:
   1. Submittal is not through the Contractor with his stamp of approval.
   2. Request is not made in accordance with this Specification Section.

3. In the City/Professional's opinion, acceptance will require substantial revision of the original design.
4. In the City/Professional's opinion, substitution will not perform adequately the function consistent with the design intent.

E. Contractor shall reimburse the City for the cost of the evaluation whether or not substitution is approved.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01310
PROGRESS SCHEDULES

PART 1 - GENERAL

1.01 REQUIREMENT

A. The Contractor will submit precedence method cost loaded Critical Path Method (CPM) Progress Schedules to the City depicting the approach to prosecution and completion of the Work. This requirement includes, but is not limited to the Contractor's approach to Activity cost loading, recovering schedule and managing the effect of changes, substitutions and Delays on Work sequencing.

B. The Progress Schedule shall show how the Contractor's priorities and sequencing for the Work (or Work remaining) conform to the Contract requirements and the sequences of Work indicated in or required by the Contract Documents; reflect how the Contractor anticipates foreseeable events, site conditions and all other general, local and prevailing conditions that may affect cost, progress, schedule, furnishing and performance of the Work; and show how the Contractor's Means and Methods translate into Activities and logic.

C. The Progress Schedule will consist of the Initial Submittal, Payment Submittals and Revision Submittals. Upon acceptance by the City, the Initial submittal will become the As-Planned Schedule for the Work. Revision submittals upon acceptance will become the As-Planned Schedule for the Work remaining to be completed as of the submittal date for that Revision.

D. References to the Critical Path Method (CPM) are to CPM construction industry standards that are consistent with the requirements of this Section.

1.02 GLOSSARY OF TERMS

A. The following terms, whether or not already defined elsewhere in the Contract Documents, have the following intent and meanings within this Section:
   1. Activity Value (Value): That portion of the Contract Price representing an appropriate level of payment for the part of the Work designated by the Activity.
   2. As-Planned Schedule: The first, complete Initial Progress Schedule submitted by the Contractor with the intent to depict the entire Work as awarded and accepted by the City or returned as no resubmittal required.
   3. Contract Float: Days between the Contractors anticipated date for completion of the Work, or of a specified portion of the Work, if any, and the corresponding Contract Time.

4. CPM Schedule: The Progress Schedule based on the Critical Path Method (CPM) of scheduling. The term Critical Path means any continuous sequence of Activities in the Progress Schedule controlling, because of their sum duration, the Early Date of a pertinent, specified Contract Time.
5. Early/Late Dates: Early/late times of performance, based on CPM calculations, for an Activity in the Progress Schedule. Early Dates will be based on proceeding with all or part of the Work on the date when the corresponding Contract Time commences to run. Late Dates will be based on completing all or part of the Work on the corresponding Contract Time, even if the Contractor plans early completion.
6. Milestones: Key, pre-determined points of progress in the completion of a facility, denoting interim targets in support of the Contract Times. Milestones may pinpoint targets for key excavation and substructure events, significant deliveries, critical path transition from superstructure to piping and electrical rough in and building enclosure. Also, hook-up of mechanical and electrical equipment, availability of power for testing, equipment shakedown, training of City personnel, start□-up, Substantial Completion and other events of like import.
7. Official Schedule: The Initial or most recent Revision Submittal accepted by the City or returned as no resubmittal required and the basis for Payment Submittals until another Revision Submittal is submitted and accepted. The accepted Initial Submittal is also the As-Planned Schedule.
8. Payment Submittal: A monthly Progress Schedule update reflecting progress and minor adjustments on the Activities, sequencing and restraints for Work remaining.
9. Total Float: Days by which an activity may slip from its Early Dates without necessarily extending a pertinent Contract Time. Total Float at least equals Contract Float. Total Float may also be calculated and reported in working Days. When an activity is delayed beyond Early Dates by its Total Float it becomes a Critical Path activity and if delayed further will impact a Contract Time.

1.03 QUALITY ASSURANCE

A. The Contractor may self-perform the Work covered by this Section or employ a Subcontractor, subject to the City's consent. Employment of a scheduling Subcontractor shall not in any way alter or reduce the Contractor's obligations under the Contract Documents.

B. The Contractor will obtain a written interpretation from the City, if the Contractor believes that the selection of activities, logic ties and/or restraints requires a written interpretation of the Contract Documents. With each submission, the Contractor will point out by specific, written notation, any Progress Schedule feature that may reflect variations from any requirements of the Contract Documents.

C. It is the Contractor's responsibility to obtain information directly from each Subcontractor and Supplier when scoping their respective Activities, Values, logic ties and restraints.

D. Neither Acceptance nor Review of any Progress Schedule will relieve the Contractor from the obligation to comply with the Contract Times and any sequence of Work indicated in or required by the Contract Documents and to complete, within the Contract Times, any Work omitted from that Progress Schedule.

E. Neither Acceptance nor Review of any Progress Schedule will imply approval of any interpretation of or variation from the Contract Documents, unless expressly approved by the City through a written interpretation or by a separate, written notation on the returned Progress Schedule Submittal.

1.04 MILESTONES AND SCHEDULE RECOVERY

A. The City will select Milestones and Milestone Dates on the basis of the As-Planned Schedule. As the Official Schedule is revised, Milestone Dates will be revised accordingly. Milestone Dates will serve as target dates.

B. Whenever any Activity slips by 14 or more Days from the Late Date for an activity in the Official Schedule, Milestone Dates selected by the City, or a pertinent Contract Time, the Contractor will deliver a Revision Submittal documenting the Contractor's schedule recovery plan and/or a properly supported request for an extension in the Contract Time. The narrative will identify the Delay and actions taken by the Contractor to recover schedule, whether by adding labor, Subcontractors or construction equipment, activity re-sequencing, expediting of submittals and/or deliveries, overtime or shift Work, and so forth. Activity shortening and overlapping shall be explained as to their basis (and be supported by increases in resources).

C. Upon evaluation of that Revision Submittal, if the City determines there is sufficient cause, the City may withhold liquidated damages or provide a notice of intent to do so, if schedule is indeed not recovered, and/or may give a notice of default.

1.05 PROGRESS SCHEDULE SOFTWARE

A. The scheduling software employed by the Contractor to process the Progress Schedule will be the current version of Primavera P6.0®, or Primavera® Contractor 5.0 CPM scheduling software.

B. If the Contractor intends to use companion schedule reporting, analysis or graphics software tools, the Contractor will furnish to the City descriptive materials and samples describing such software tools.

1.06 NON-PERFORMANCE

A. The City may refuse to recommend all or any part of any payment, if the Contractor fails, refuses or neglects to provide the required Progress Schedule information on a timely basis. Partial payments without a properly updated Progress Schedule shall be returned to the Contractor as non-conforming.

B. If justified under the circumstances, the City also may prepare alternate Progress Schedules, as appropriate, and deduct from the Contract Amount all related costs by Change Order and/or take other action commensurate with the breach.

1.07 REPORTS, SCHEDULES AND PLOTS

A. Schedule Reports will include Activity (ID) code and description, duration, calendar, Early Dates, Late Dates and Total Float. Separate Schedule Reports will tabulate, for each Activity, all preceding and succeeding logic types and lead times, whether CPM Plots displaying logic ties are appended or not.

B. CPM Schedule Plots will be plotted on a suitable time scale and identify the Contract Times, Critical Paths, phases and work areas on 24-inch x 36-inch or smaller sheets. Activities will be shown on the Early Dates with Total Floats noted by Late Date flags. For Payment and Revision Submittals plot a target comparison based on the current Official Schedule.

C. The Activity Value report will tabulate Activity code and description and Activity Value, percent complete and earned value as calculated by the scheduling software. Cash flow plots shall be provided showing the monthly and cumulative actual and planned earned values with curves shown for Early and Late Dates in the schedules. For Payment and Revision Schedule submittals, the cash flow curves shall also plot the most current Official Schedule planned earnings curves.

D. Each submittal shall include listings of all added and deleted activities, logic, constraints, Activity Value changes and update information vs. the previous Progress Schedule submittal. This list may be manually prepared or generated by accessory software that will generate such listings.

1.08 NARRATIVE REQUIREMENTS

A. The Initial Submittal narrative will describe the Contractor’s approach to prosecution of the Work and the basis for determination of activity durations, sequence and logic, including the Contractor's management of the site, e.g., lay down, staging, parking, etc.; Contractor’s phasing of the Work; use of crewing and construction equipment; identification of non-work City/Professional’s, shifts, weekend Work and multiple calendars applied to activities and an explanation of the basis for restraint dates.

B. Revision and Payment Submittal narratives will explain any changes to the approach or planning referred to in Paragraph A above on account of any change, delay, schedule recovery, substitution and/or Contractor-initiated revision occurring since the previous submittal.

C. Each narrative will list the Critical Path Activities and compare Early and Late Dates against Contract Times and Milestone Dates. Narratives shall also recap progress and Days gained or lost vs. the current Official Schedule, and identify delays, their extent and causes.

D. The Initial Submittal narrative will describe all delays occurring since Contract Award and all pending and anticipated "or equal" and substitution proposals. Payment and Revision Submittal narratives will describe any new delays and shall certify that the Contractor has not been delayed, as of the cut off date, by any acts or omissions of the City, except as otherwise specifically stated.

1.09 ACTIVITY REQUIREMENTS

A. Separate activities will identify permits, design when included in the Work, construction, Submittal preparation and review (and resubmission and re-review), deliveries (site or storage), testing, start-up, commissioning and Punch List.

B. Activities will be detailed to the extent required to show the transition of trade Work. Activities will delineate the progression of the Work.

C. Activities will not combine separate or non-concurrent items of Unit Price or lump sum Work.

D. Activity durations will equal the Work Days required to sufficiently complete the Work designated by the Activity, (i.e., when finish-to-start successors could start, even if the Activity is not quite 100% complete). Installation Activities will last from 10 to 40 workdays. Submittal review activity durations shall conform to specified timeframes.

E. Activities will be assigned consistent descriptions and identification codes. Sort codes will group Activities by meaningful schemes.

F. Activities will be assigned Activity Values as appropriate and needed to reasonably allocate the Contract Amount to the time periods that they will be earned and eligible for payment based on the Progress Schedule and Schedule of Values. Separate pay activities may be used to simplify cost loading of the Progress Schedule. When used, pay activities shall be loaded with the cost of Work that is included, at no cost, in related (generally, concurrent) CPM activities. Pay activities shall not control the rate of progress; however, their start and finish dates shall be consistent with those of their related CPM activities to ensure accurate Early Date and Late Date cash-flow plots.

1.10 FLOAT TOLERANCES AND FLOAT OWNERSHIP

A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total and Contract Floats, whether shown/calculated or not. Any Revision Submittal with less than negative 20-days of Float will be returned as "Revise and Resubmit," unless a time extension is requested or the City assesses liquidated damages or gives notice of intent to do so, in the event schedule is not recovered.

B. Float calculated from the definitions given in this Section supersede any conflicting Float values in any early completion Progress Schedule.

C. Neither the City nor the Contractor own the Float time, the Project owns the Float time. Neither the City nor the Contractor use of positive Total Float will impact a Contract Completion Date or justify an extension of Contract Time.

1.11 SUBMITTALS

A. Each Progress Schedule Submittal will consist of a narrative, 5 copies of the required reports and plots and an optical ROM data disk with the Contractor's corresponding schedule and schedule layout files in Primavera ".XER" format.

B. The City will review Progress Schedule Submittals and return a review copy within 14-days after receipt and the Contractor shall, if required, resubmit within 7-days after return of the review copy.

C. Requirements for the Initial Submittal:
   1. Within 20-days after receipt of Notice to Proceed and prior to commencing Work on the Project, prepare and submit to the City the Initial Submittal of the Progress Schedule for the Work. The Initial Submittal will show the Work as awarded, without delays, Change Orders or substitutions.
      a. Activity Values will prorate Schedule of Values costs and/or pay items through to Activities. Provide a cross-reference listing with two parts; a part that will list each activity with the respective amounts allocated from each Schedule of Values and Unit Price Item making up the total value of each activity and a second part that will list the Schedule of Values and Unit Price Items with the respective amounts allocated from each activity that make up the total value of each item.
   2. After the As-Planned Schedule is established, the City will select Milestones and record the Milestone Early and Late Dates. As the Official Schedule evolves, Milestone Dates will be revised accordingly.
   3. If the City refuses to endorse the Initial Submittal (or a resubmission) as "Resubmittal Not Required," the As-Planned Schedule will not be established. In that event, the Contractor will continue to submit Payment and Revision Submittals reflecting progress and the Contractor's approach to remaining Work. The City will rely on the available Payment and Revision Submittals, subject to whatever adjustments it determines appropriate.

D. Requirements for Payment Submittals:
   1. Payment Submittals with progress up to the closing date and updated Early Dates and Late Dates for progress and remaining Activities will be due with each Progress Payment. As-built data will consist of actual dates, percent complete, earned payment, changes, Delays and other significant events occurring before the closing date.
   2. Activity percent complete and earned value should indicate a level of completion that corresponds to the Application for Progress Payment for the same period. The earned value should be calculated by the scheduling software as Activity Value times percent complete. Explanation should be provided whenever the cumulative earned value of activities in a Payment Submittal is not within 10% of the value of Work completed as represented in the corresponding Application for Progress for Payment.

3. At the Contractor's option, a Payment Submittal may overlay minor adjustments on activities and sequencing for Work remaining. This excludes Activity re-scoping to reflect Delays, changes, schedule recovery or substitutions.

E. Requirements for Revision Submittals:
   1. Revision Submittals will be submitted when necessary because of major changes or delays affecting activities, sequencing or restraints for Work remaining and/or to put forth a schedule recovery plan. Revision Submittals may also be required because of Contractor-initiated re-planning, or when Contractor plans to perform Work ahead or out-of-sequence that will require additional testing or inspection personnel, or when requested by the City when Work is performed out-of-sequence from the current Official Schedule such that the number of Days gained or lost can not be determined or the scheduled dates of completion of the Work in a Payment Submittal are not viewed as reliable.
   2. If requesting a time extension, the Revision Submittal should show the impact of the delay after incorporating reasonable mitigation to minimize the impact and illustrate how the number of Days requested time extension was determined. The delay should be determined as the change in the forecast Contract Completion Date(s) resulting solely from delays that entitle the Contractor to a time extension as provided in the General Conditions. Any and all Contractor slippage and delay occurring prior to and concurrent with the delay potentially entitling the Contractor to a time extension shall be incorporated in the Revision and explained such that the concurrent and non-concurrent periods of delay are indicated. If the Contractor does not follow the procedures contained in this Section or, if the Contractor's analysis is not verifiable by an independent, objective evaluation by the City using the electronic files and data furnished by the Contractor, any such extension in Contract Time will not be granted.

F. Retrospective Delay Analysis.
   1. If the City/Professional refuses to endorse any Revision Submittal as "Resubmittal Not Required," the Contractor and City will use the latest Official Schedule when evaluating the effect of Delays on Contract Time and/or Contract Price. The procedure to be used will consist of progressively updating the latest Official Schedule at key closing dates corresponding to starting and finishing dates of the delays and/or dates the delays became critical or dates the Critical Path may have changed for other reasons. For each Progress Schedule iteration, slippage between actual Milestone Dates and Initial Milestone Dates will be correlated to Delays occurring solely in that iteration.
   2. For each iteration, revisions in Activities, logic ties and restraints affecting Work after the closing date will be included in that Progress Schedule only if they meet any of the following conditions. First, they are Progress Schedule revisions that the City consented to contemporaneously (i.e., before the closing date) in writing. Second, they reflect comments or objections raised by or on behalf of the City and that were actually confirmed by the as-built progress. Lastly, they represent Contractor's schedule recovery plans or other Progress Schedule revisions that were actually confirmed by the as-built progress.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01370
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DEFINITION

A. Schedule of Values: Schedule that divides the Contract Amount into pay items, such that the sum of all pay items equals the Contract Amount for the Work, or for any portion of the Work having a separate specified Contract Amount.

1.02 REQUIREMENT

A. The Schedule of Values established as provided in the General Conditions will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the City. Progress payments on account of Unit Price Work will be based on the number of units completed and shall be prorated by the percent complete on the number of units installed not meeting all requirements of the Contract including testing

B. No payment will be made for Work performed on a lump sum contract or a lump sum item until the appropriate Schedule of Values is approved by the City.

C. The equitable value of Work deleted from a lump sum contract or lump sum item shall be determined from the approved Schedule of Values.

1.03 SUBMITTALS

A. Submit 3 copies of a Preliminary Schedule of Values within 15-days after the recommended award of the Contract.

B. Submit 3 copies of a proposed final Schedule of Values within 20-days after receipt of Notice to Proceed as per the General Conditions.

C. Submit the Schedule of Values, typed, on EJCDC 1910-8-E form or City forms or spreadsheets provided by City. The Contractor's standard form or electronic media printout will be considered for acceptability by the City.

D. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.

E. Coordinate listings with the Progress Schedule.

F. For items on which payments will be requested for stored materials or equipment, list sub-values for cost of stored products with taxes paid and provide corresponding schedule of value item number. Stored materials quantities shall not exceed installed quantities on bid tab or as required by the Contract Documents.

G. Submit a sub-schedule for each separate stage of Work specified in Section 01010 "Summary of Work."

H. The sum of values listed shall equal the total Contract Amount for the Work or the Contract Amount for a part of the Work with a separate Contract Amount provided for by the Contract Documents.

I. When the City requires substantiating information, submit data justifying line item amounts in question.

1.04 UNIT PRICE CONTRACTS

A. For unit price contracts, the bid item prices on the Project Bid Schedule shall be used as the basis for the schedule of values. The Contractor shall resubmit the bid item prices in the format described herein, and may, at its option, or if requested by the City, divide the items in the Project Bid Schedule into sub-items to provide a more detailed basis of payment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01380
AUDIO – VISUAL DOCUMENTATION

PART 1 - GENERAL

1.01 PURPOSE AND DESCRIPTION OF WORK

A. The purpose of the audio - visual documentation is to provide the City with regularly documented audio - visual records of the Construction process from the existing conditions through final completion.

1.02 PRE-CONSTRUCTION VIDEO REQUIREMENTS INCLUDED

A. The Contractor shall employ a professional videographer to take a Pre-Construction video of the entire site including the areas of adjacent properties within 100-feet of the limits of Work and shall be made within 30-days of Work beginning. Special attention shall be made to show the existing paved roads, shoulders, signs, and other existing features.

B. The Contractor shall submit a quality audio-video recording documenting Pre-Construction field conditions for the entire project. When the Work includes construction of water, wastewater, reuse, or other lines in the vicinity of any street or road, the Contractor shall take digital audio-video recordings of existing conditions along both sides of the street or road. The Pre-Construction video shall be submitted to the City and accepted prior to commencing any Work or using any Contractor laydown areas.

C. Electronic digital photography shall also be used as necessary to record and facilitate resolution of on-site issues through the transmission of electronic photographs by e-mail from the site to the Professional’s and City’s offices.

PART 2 - PRODUCTS

2.01 AUDIO-VIDEO RECORDING

A. Each audio-video recording shall be saved on appropriate DVD media viewable on standard DVD players or computer.

B. Each DVD shall contain the following information and arrangement at the beginning as a title screen:

CITY, FLORIDA
PROJECT NAME
PROJECT NUMBER
CONTRACTOR: (Name of Contractor)
DATE: (When photo was taken)
VIDEO BY: (Firm Name of Videographer)
LOCATION: (Description of Location(s) and View(s))

C. Each DVD recording section shall begin with an audio description of the City's name, Contract name and number, Contractor's name, date and location information such as street name, direction of travel, viewing side, etc.

D. Information appearing on the video recording must be continuous and run simultaneously by computer generated transparent digital information. No editing or overlaying of information at a later date will be acceptable.

E. Digital information to appear in the upper left corner shall be as follows:
1. Name of Contractor
2. Day, date and time
3. Name of Project & Specification Number

F. Time must be accurate and continuously displayed on the video record

G. Written documentation must coincide with the information on the DVD so as to make easy retrieval of locations at a later date.

H. The video system shall have the capability to transfer individual frames of video electronically into hard copy prints or photographic negatives.

I. Audio shall be recorded at the same time as the video recording and shall have the same information as on the viewing screen. Special commentary shall be given for unusual conditions of buildings, sidewalks and curbing, foundations, trees and shrubbery, structures, equipment, pavement, etc.

J. All DVDs and boxes shall bear labels with the following information:
1. DVD Number
2. City's Name
3. Date of Recording
4. Project Name and Number
5. Location and Standing Limit of Video

2.02 CONSTRUCTION PHOTOGRAPHS

A. The Contractor shall employ a competent photographer to take construction record photographs periodically during the course of the Work.

B. Prints: Date imprinted 8-inch x 10-inch high resolution glossy single weight color print paper; 5 sets, bound in 3-ring binders to be provided to the City with each respective Application for Payment and distributed by the City as follows:
   1. City (2 sets)
   2. Engineer (1 set)
   3. Contractor (1 set)
   4. Project Record Data (1 set stored by Contractor to be furnished to City upon Closeout)

PART 3 - EXECUTION

3.01 VIDEO VIEWS REQUIRED

A. Complete coverage shall include all surface features within 100-feet of the Work area to be used by the Contractor and shall be supported by appropriate audio description made simultaneously with video coverage. Such coverage shall include, but not be limited to, all existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culverts, headwalls, and retaining walls, equipment, structures, pavements, manholes, vaults, handrails, etc. located within the work zone. Video coverage shall extend to the maximum height of all structures within this zone.

B. The video recorder shall take special efforts to point out and provide audio commentary on cracking, breakage, damage, and other defects in existing features.

C. All video recording shall be done during times of good visibility. No video recording shall be done during periods of visible precipitation, or when more than 10% of the ground area is covered with standing water, unless otherwise authorized by City.

D. Prior to commencement of audio-video recording, the Contractor shall notify the City in writing within 48-hours of the audio-video recording. The City may provide a designated representative to accompany and observe all video recording operations. Audio-video recording completed without a City Representative present will be unacceptable unless specifically authorized by the City.

3.02 AUDIO-VIDEO REQUIREMENTS

A. Major Locations:
   1. The Contractor shall provide color digital video of each major facility and structures and facilities adjacent to the Construction before construction starts.
   2. All videos shall be recorded with character generator operating with date, time, and location on screen. During video recording, the Contractor shall narrate video explaining what is being shown. All master videos shall be delivered to the City.

3. The audio and video portions of the recording shall maintain viewer orientation. To this end, overall establishing views of all visible house and business addresses shall be used. In areas where the proposed construction location will not be readily apparent to the video recording viewer, highly visible yellow flags shall be placed, by the Contractor, in such a fashion as to clearly indicate the proposed centerline of Construction. When conventional wheeled vehicles are used as conveyances for the recording system, the vertical distance between the camera lens and the ground shall not exceed 10-feet. The camera shall be firmly mounted such that transport of the camera during the recording process will not cause an unsteady picture.
4. All video recording shall be done during time of good visibility. No video recording shall be done during precipitation, mist or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording and to produce bright, sharp video recordings of those subjects.
5. The average rate of travel during a particular segment of coverage shall be directly proportional to the number, size and value of the surface features within that construction area's zone of influence. The rate of speed in the general direction of travel of the vehicle used during taping shall not exceed 44-feet per minute.

3.03 PHOTOGRAPHS

A. A minimum of 3 views (top, upstream, and downstream) each shall generally be taken prior to backfilling pipelines or structures. Photographs shall be provided for:
   1. Utility conflicts/relocations
   2. Manholes
   3. Pump stations
   4. Boring and jacking
   5. Directional drilling pipe entrance and exit
   6. Valve installation
   7. Air release valve installation
   8. Fire hydrant assembly

B. Photo Identification
   1. Name of Project
   2. Name of Structure
   3. Orientation of View
   4. Date & Time of Exposure
   5. Film numbered identification of exposure

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01400
QUALITY CONTROL

PART 1 - GENERAL

1.01 SITE INVESTIGATION AND CONTROL

A. Contractor shall verify all dimensions in the field and check field conditions continuously during construction. Contractor shall be solely responsible for any inaccuracies built into the Work due to Contractor's failure to comply with this requirement.

B. Contractor shall inspect related and appurtenant Work and report in writing to City any conditions which will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor at Contractor's sole cost and expense.

1.02 INSPECTION OF THE WORK

A. The Work shall be conducted under the general observation of representatives of the City acting on behalf of the City to ensure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop, or field inspection, as required. The City shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated. Inspection by the City are in addition to the inspections required of Contractor by his QC Representatives.

B. The presence of the City, however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the City. Further, no requirement of this Contract may be waived or modified except by change order or formal (written) substitution approval.

C. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no materials or articles shall be used in the Work until they have been inspected and accepted by the City. No Work shall be backfilled, buried, cast in concrete, hidden, or otherwise covered until it has been inspected. Any Work so covered in the absence of inspection shall be subject to uncovering. Where uninspected Work cannot be uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal, and reconstruction under proper inspection and no additional payment will be allowed therefore.

D. The Contractor is responsible for the Quality of his own work and shall designate a qualified individual, to be approved by the City, who will ensure that all work is performed in strict accordance with the Contract Documents. This quality representative shall inspect the work for the Contractor and provide to the City and the Contractor a report outlining all work accomplished, all inspections, and all testing performed for all days when work is performed. The objective of this report is to provide "Objective Evidence of Compliance" by the Contractor with the requirements of the Contract.

1.03 TIME OF INSPECTION AND TESTS

A. Samples and testing required under these Specifications shall be furnished and prepared in ample time for the completion of the necessary tests and analyses before said articles or materials are to be used. Except as otherwise provided in the Contract Documents, performance of the required tests will be by the Contractor and all costs therefore will be borne by the Contractor at no cost to the City. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide, or otherwise cover any Work under this Contract, the City shall be notified not less than 24-hours in advance to request inspection before beginning any such Work of covering. Failure of the Contractor to notify the City at least 24-hours in advance of any such inspections shall be reasonable cause for the City to order a sufficient delay in the Contractor's schedule to allow time for such inspection, any remedial, or corrective work required, and all costs of such delays, including its impact on other portions of the Work, shall be borne by the Contractor.

1.04 SAMPLING AND TESTING

A. When not otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered. However, the City reserves the right to use any generally accepted system of inspection which, in the opinion of the City, will ensure the City that the quality of the workmanship is in full accord with the Contract Documents.

B. Any waiver of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief form the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any technical or qualitative requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the City shall reserve the right to make independent investigations and tests as specified in the following paragraph and, upon failure of any portion of the Work to meet any of the qualitative requirements of the Contract Documents, shall be reasonable cause for the City to require the removal or correction and reconstruction of any such Work.

D. In addition to any other inspection or quality assurance provisions that may be specified, the City shall have the right to independently select, test, and analyze, at the expense of the City, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials so tested or analyzed provided that wherever any portion of the Work is discovered, as a result of such independent testing or investigation by the City which fails to meet the requirements of the Contract Documents, all costs of such independent inspection and investigation and all costs of removal, correction, reconstruction, or repair of any such Work shall be borne by the Contractor.

1.05 RIGHT OF REJECTION

A. The City shall have the right at all times and places to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. If the City or inspector, through an oversight or otherwise, has accepted materials or Work which is defective or which is contrary to the Contract Documents, such material, no matter in what stage or condition of manufacture, delivery, or erection, may be rejected by City.

B. Contractor shall promptly remove rejected articles or materials from the site of the Work after notification or rejection.

C. All costs of removal and replacement of rejected articles or materials, as specified herein, shall be borne by the Contractor.

D. If the Contractor fails to remove or replace defective work after notification to do so, the City may have the work removed and replaced by others and deduct all costs from the Contractor's pay requests.

1.06 TESTING LABS

A. All geotechnical testing laboratory services for field testing will be paid by the City. The lab(s) shall function as independent lab(s) and report independently to the City and the Contractor. The test lab(s) may not approve or allow any deviation from the Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:
   1. City will employ and pay for services of an Independent Testing Laboratory to perform Testing specifically indicated on the Contract Documents or specified in the Specifications and may at any other time elect to have materials and equipment tested for conformity with the Contract Documents.
   2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
   3. Employment of laboratory by City shall in no way relieve Contractor's obligations to perform the Work.

B. Related Requirements Described Elsewhere:
   1. Conditions of the Contract.
   2. Respective section of Specifications: Certification of products.
   3. Each Specification section listed: Laboratory tests required and standards for testing.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with City's personnel; provide access to work and manufacturer's operations.

B. Secure and deliver to the City adequate representational samples of materials proposed to be used and which require testing.

C. Provide to the City the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.

D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. The City may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the City shall be allowed on account of such testing and certification.

E. Contractor shall not have direct contact with laboratory or laboratory personnel. All testing shall be coordinated through City.

F. Furnish incidental labor and facilities:
   1. To provide access to work to be tested.
   2. To obtain and handle samples at the Project site or at the source of the product to be tested.
   3. To facilitate inspections and tests.
   4. For storage and curing of test samples.

G. Notify City sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse City for laboratory personnel and travel expenses incurred.. The following field testing schedule summarizes the responsibilities of various tests that may be required by the Contract Documents.

TEST	**NOTES**	**PAID FOR**
Soil Compaction	A. Pipe Work: Every 300 ft. at each lift of compaction B. Structures: As a minimum one test per 2000 SF of fill area per lift, or at least 2 tests per structure, per lift. As specified in material specifications sections	City
Low Pressure Air Exfiltration	Each section of gravity sewer pipe between manholes or lift station	Contractor
Hydrostatic Pressure	All segments of pressure piping (24-hour test).	Contractor
Hydrostatic Leakage	All segments of pressure piping (2-hour test).	Contractor
Bacteriological	As required by local and state agencies	City
Asphaltic Concrete Paving	As required by City	City
LBR	Each 600 SY of pavement	City
Concrete	Slump test each delivery, cylinders every 20 CY	City
Asbestos	Environmental testing of materials	City
All Other Testing	As specified in various sections of the Project Manual	As Indicated

H. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.

I. If the test results indicate the material or equipment complies with the Contract Documents, the City shall pay for the cost of the testing laboratory. If the tests and any subsequent retests indicate the materials and equipment fail to meet the requirements of the Contract Documents, the Contractor shall pay for the laboratory costs directly to the City or the total costs shall be deducted from any payments due to the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01516
COLLECTION SYSTEM BYPASS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Work covered by this section consists of providing all temporary bypassing to perform all operations in connection with the flow of wastewater around pipe segment(s) or pump stations. The purpose of bypassing is to prevent wastewater overflows and provide continuous service to all wastewater customers. The Contractor will maintain wastewater flow in the construction area in order to prevent backup and/or overflow and provide reliable wastewater service to the users of the wastewater system at all times.

1.02 SUBMITTALS

A. Prior to implementation of any bypass, the Contractor will submit and receive City acceptance of a bypass plan. The Contractor will submit to the Cityy a comprehensive written plan for approval and acceptance that describes the intended bypass for the maintenance of flows during construction. The Contractor will also provide a sketch showing the location of bypass pumping equipment for each pump station or line segment(s) around which flows are being bypassed. The plan will include proposed tanker(s), pump(s), bypass piping, backup plan and equipment, work schedule, monitoring log for bypass pumping, monitoring plan of the bypass pumping operation, and maintenance of traffic plan.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Contractor will provide and maintain adequate equipment, piping, tankers, and other necessary appurtenances in order to maintain continuous and reliable wastewater service in all wastewater lines as required for construction. The Contractor will have tankers, backup pump(s), piping, and appurtenances ready to deploy immediately.

B. All piping will be designed to withstand at least twice the maximum system pressure or a minimum of 50-psi, whichever is greater.

C. When bypassing a pump station, one (1) back-up pump equal to the primary unit will be provided by the Contractor. Bypass pumps shall have a maximum rating of 55 decibels for sound attenuation.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall have all materials, equipment and labor necessary to complete the repair, replacement, or rehabilitation on the job site prior to isolating the gravity main segment, manhole, or pump station. The Contractor will demonstrate that the temporary bypass pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 24-hours prior to beginning the Work.

3.02 TRAFFIC CONSIDERATIONS

A. The Contractor shall locate bypass pumping suction and discharge lines so as to not cause undue interference with the use of streets, private driveways, and alleys, to include the possible temporary trenching of piping at critical intersections. Additional traffic maintenance requirements are found in Section 01570 "Maintenance of Traffic".

3.03 BYPASS OPERATION

A. The Contractor shall submit a bypass plan to the City and the bypass plan must be approved before the bypass is operational to perform the Work. Contractor shall maintain the wastewater system flow and no surcharging will be allowed to occur out of the system.

B. Where Work requires the main or pump station to be taken out service after normal working hours and bypass pumping is being used; the Contractor shall be responsible for monitoring the bypass operation 24-hours per day, 7-days per week. Any electronic monitoring in lieu of on-site monitoring must be detailed in the comprehensive written bypass plan.

C. The Contractor shall ensure that no damage will be caused to private property as a result of bypass pumping operations. The Contractor will complete the Work as quickly as possible and pass all tests and inspections before discontinuing bypassing operations and returning flow to the wastewater manhole, main, or pump station.

D. During bypassing, no wastewater will be leaked, dumped, or spilled in or onto, any area outside of the existing wastewater system.

E. The Contractor shall immediately notify the Cityy should a sanitary sewer overflow (SSO) occur. The Contractor shall take the necessary action to wash down, clean up and disinfect the spillage area to the satisfaction of the Cityy or other governmental agency.

F. The Contractor shall cease bypass operations and return flows to the new and/or existing sewer when directed by the Cityy. When bypass operations are complete, all bypass piping shall be drained into the wastewater system prior to disassembly.

3.04 CONTRACTOR LIABILITY

A. The Contractor shall be responsible for all required pumping, equipment, piping, and appurtenances to accomplish the bypass and for any and all damage that results directly or indirectly from the bypass pumping equipment, piping and/or appurtenances. The Contractor shall also be liable for all City personnel labor and equipment costs, penalties and fines resulting from sanitary sewer overflows. It is the intent of these specifications to require the Contractor to establish adequate bypass pumping as required regardless of the flow condition.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01520
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 Section Includes

Construction facilities, controls, temporary utilities, project identification signs, field office and storage sheds, storage of materials and equipment.

1.02 Submittals

A. Prior to installation of construction facilities and temporary controls, submit the following items for review and approval:

B. Project identification sign - provide proposed text, layout, and sizing of all required signs

1.03 Construction Facilities and Temporary Controls

All construction facilities and temporary controls remain the property of the Contractor establishing them and shall be maintained in a safe and useful condition until removed from the construction site.

1.04 Removal of Temporary Construction

Remove the various temporary facilities, services, and controls and legally dispose of them as soon as the Owner deems permissible. Portions of the site and areas used for temporary facilities shall be restored to existing or better condition, including but not limited to fill replacement, regrading, compaction, and sodding.

1.05 Transportation and Handling

A. Manufactured materials and products shall be delivered to the project site as needed for installation, undamaged, in original packages, containers, or bundles, as packaged by the manufacturer with manufacturer's name, brand, seals, and labels intact.

B. Materials other than those designated within the Specifications or approved by the Owner shall not be delivered to the project site.

1.06 Storage and Protection

A. The Contractor shall be responsible for protection and preservation of all materials until final acceptance of the Project. Any damage to work prior to acceptance shall be remedied by the Contractor at no additional cost to the Owner.

B. Provide temporary weather-tight enclosures to protect work from damage by the elements, and protect finished surfaces to prevent any damage resulting from the work of any trade.

1.07 Security

A. Contractor shall, at all times, be responsible for the security required in all project areas and shall provide all reasonable protection to prevent damage, injury or loss to employees on the Work and all other persons who may be affected thereby; all the work materials and equipment to be incorporated therein, whether in storage on or off the project site, under the care, custody or control of the Contractor or any subcontractors; and any other property under the care, custody or control of the Contractor or any subcontractors. Contractor shall be responsible for such security and safety until final acceptance of the Work.

B. Full time watchmen will not be specifically required as a part of the Contract, but the Contractor shall provide inspection of work area daily and shall take whatever measures are necessary to protect the safety of the public, workmen, and materials, and provide for the security of the site, both day and night.

PART 2 PRODUCTS (if required)

2.01 Temporary Electric Service

A. Furnish and maintain temporary lighting and power required to perform the Work. Include in the Bid all costs for providing temporary electrical service.

B. Temporary service shall include protective enclosures, branch wiring, outlets, lamps, and grounding as required by NEC and Local Electrical Codes.

2.02 Temporary Heating

The Contractor shall furnish fuel or power and provide and operate all temporary heating units. Heat shall be provided as necessary to perform the Work. Temporary heating units shall be adequately vented and approved devices which will not damage finished areas. The Contractor shall also furnish all tarpaulins and temporary enclosures necessary to provide this protection.

2.03 Temporary Ventilation

The Contractor shall provide, operate, and furnish power for temporary ventilation required for the proper installation and curing of materials and safety of workmen.

2.04 Temporary Water

A. Provide a temporary water distribution system for all construction purposes and pay for all water used. Obtain temporary meters from the local water utility as required and pay all associated fees.

B. Furnish potable drinking water in suitable dispensers and with cups for use of all employees at the job.

C. Provide all temporary piping, hoses, etc., required to transport water to the point of usage by all trades.

2.05 Temporary Sanitary Facilities

Provide temporary toilet facilities as required. Maintain these during the entire period of construction under this Contract for the use of all construction personnel on the job. Enough chemical toilets shall be provided to conveniently serve the needs of all personnel. Chemical toilets and their maintenance shall meet the requirements of State and local health regulations and ordinances.

2.06 Temporary Pumping and Site Drainage

Keep the site free from water at all times to permit continuous access and to prevent damage to the work.

2.07 Material Hoists and Cranes

A. Provide material hoists required for normal use by all trades and employ skilled hoist operators. Provide all necessary guards, signals, safety devices, etc., required for safe hoist operation. The construction and operation of material hoists shall be in accordance with the applicable ANSI Standards, the "Manual Code of Accident Prevention in Construction" of the Associated General Contractors of America, OSHA, and of other Federal, State, and municipal codes or ordinances. The Contractor shall prohibit the use of hoists for transporting personnel. Hoists shall be located to avoid risk of damage to completed work.

B. Special rigging and hoisting facilities shall be provided by each trade requiring their use.

2.08 Temporary Runways, Scaffolding, and Ladders

A. Provide temporary ladders, ramps, and runways as required for performance and inspection of the work. The above facilities shall be constructed and maintained in accordance with the applicable Federal, State, and Municipal regulations and codes.

B. Furnish, erect, and maintain all scaffolding required for this work. Scaffolding shall be constructed and maintained in accordance with applicable State and Federal laws and local ordinances. Scaffolding shall be promptly removed after serving its purpose.

C. The structural strength and safety of scaffolding, runways, covers, railings, ladders, stairs, etc., and compliance with law shall be the sole responsibility of the Contractor.

2.09 Temporary Chutes

No materials shall be dropped from structures except through enclosed wooden or metal chutes which shall be provided and maintained as required for the performance of the work by the various trades.

2.10 Contractor's Field Office and Storage Sheds

The Contractor shall provide field office and storage sheds that it determines are required for the performance of the Work and protection of materials and equipment.

PART 3 EXECUTION

3.01 Access Roads and Parking Areas

A. Construct temporary roadways and parking areas within the site as required to provide proper access to the site for delivery of material and equipment of all trades. It is up the Contractor to determine whether it needs to construct any temporary roads or parking areas to accommodate its construction (including delivery of materials, equipment, and manpower to the site).

B. At completion of the work or when directed by the Owner, surfacing and sub-base material used for the temporary road and parking areas shall be removed, unless otherwise approved by the Owner.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01570
MAINTENANCE OF TRAFFIC

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes identifying safety hazards and then furnishing all necessary labor, materials, tools, and equipment including, but not limited, to signs, barricades, traffic drums, cones, flashers, construction fencing, flag persons, variable message boards, uniformed police officers, warning devices, temporary pavement markings, temporary sidewalk, delineators, etc., to maintain vehicular and pedestrian traffic through and adjacent to the project area. These measures and actions shall be taken to safely maintain the accessibility of public and construction traffic by preventing potential construction hazards. All materials, work and incidental costs related to Maintenance of Traffic will be paid for at the contract lump sum price.

1.02 REQUIREMENTS

A. The Traffic Control Plan shall conform to the following standards:
   1. Standard Specifications for Road and Bridge Construction, latest edition including all subsequent supplements issued by the Florida Department of Transportation, (FDOT).
   2. Manual on Uniform Traffic Control Devices for Streets and Highways by U.S. Department of Transportation, Federal Highway Administration.
   3. Right-of-Way Utilization Regulations, City, Florida, latest edition.

B. All references to the respective agencies in the above referenced standards shall be construed to also include the municipality as applicable for this Work.

C. Sequence the Work in a manner that will minimize disruption of vehicular and pedestrian access through and around the construction area.

D. Traffic planning and control for the maintenance and protection of pedestrian and vehicular traffic affected by the Contractor's Work includes, but is not limited to:
   1. Construction and maintenance of any necessary detour equipment and facilities.
   2. Providing necessary facilities for access to residences and businesses.
   3. Furnishing, installing, and maintenance of traffic control and safety devices (e.g. signage, barricades, barriers, message boards, etc.), and flag persons as appropriate during Construction.
   4. Control of water runoff, dust and any other special requirements for safe and expeditious movement of traffic.

E. Planning, maintenance and control of traffic shall be provided at the Contractor's expense. The Contractor will bear all expense of maintaining the vehicle and pedestrian traffic throughout the work area.

F. The Contractor will ensure all personnel involved in traffic control are and capable of communicating with the public. The Contractor may be required to hire off-duty uniformed police officers, in addition to flag persons, to direct and maintain traffic. Locations and conditions requiring such uniformed police officers shall be as directed by the City. The Contractor shall be required to utilize uniformed police officers for work within FDOT maintained ROW, road closures affecting school traffic and during all night work involving a road closure or crossing on nonresidential roads.

G. The Contractor will remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.

1.03 SUBMITTALS

A. Submit at Contractor's own expense a Traffic Control Plan for approval by the controlling roadway agency (FDOT, City Public Works or other local government) having jurisdiction over the road for approval.
   1. The Traffic Control Plan will detail procedures and protective measures proposed by the Contractor to provide for protection and control of traffic affected by the Work consistent with the following applicable standards:
      a. Standard Specifications for Road and Bridge Construction, latest edition including all subsequent supplements issued by the Florida Department of Transportation, (FDOT Spec.).
      b. Manual of Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations, FDOT.
      c. Right-of-Way Utilization Regulations, City, Florida, latest edition.

B. All references to the respective agencies in the above referenced standards shall be construed to also include the municipality as applicable for this Work.

C. The Traffic Control Plan will be signed and sealed by a Professional Engineer registered in the state of Florida and shall include proposed locations and time durations of the following, as applicable:
   1. Pedestrian and public vehicular traffic routing.
   2. Lane and sidewalk closures, other traffic blockage and lane restrictions and reductions anticipated to be caused by construction operations. Show and describe the proposed location, dates, hours and duration of closure, vehicular and pedestrian traffic routing and management, traffic control devices for implementing pedestrian and vehicular movement around the closures, and details of barricades.
   3. Location, type and method of shoring to provide lateral support to the side of an excavation or embankment parallel to an open travel-way.
   4. Allowable on-street parking within the immediate vicinity of worksite.
   5. Access to buildings immediately adjacent to worksite.
   6. Driveways blocked by construction operations.

7. Temporary traffic control devices, temporary pavement striping and marking of streets and sidewalks affected by construction
8. Temporary commercial and industrial loading and unloading zones.
9. Construction vehicle reroutes, travel times, staging locations, and number and size of vehicles involved.

D. Obtain and submit prior to erection, or otherwise impacting traffic, all required permits from all authorities having jurisdiction, including City Public Works, if applicable.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. The Contractor shall furnish, erect, and maintain all necessary traffic control devices, including flag person, in accordance with the Manual of Uniform Traffic Control Devices for Streets and Highways published by the U.S. Department of Transportation, Federal Highway Administration.
   1. FLAG PERSONS
      a. All flag persons used on this Project will adhere to the following requirements:
      b. Any person acting as a flag person on this Project will have attended a training session taught by a Contractor's qualified trainer before the start date of this Contract.
      c. The Contractor's qualified trainer will have completed a "Flag person Train the Trainer Session" in the 5-years previous or before the start date of this Contract and will be on file as a qualified flag person trainer.
      d. The flag person trainer's name and Qualification Number will be furnished by the Contractor at the Pre-Construction meeting. The Contractor will provide all flag persons with the Flag Person Handbook and will observe the rules and regulations contained therein. This handbook will be in the possession of all flag person while flagging on the Project.
      e. Flag persons will not be assigned other duties while working as authorized flag persons.
      f. Any person replacing flag person for break shall have the same training.

PART 3 - EXECUTION

3.01 NOTIFICATIONS

A. The Contractor will notify individual owners, owner's agents, and tenants of buildings affected by the construction, with copies to the City, 72-hours in advance of any construction activities.

B. The Contractor shall notify residents and pedestrians via variable message boards no later than 10 days prior to the closure of any road, lane or pedestrian thoroughfare.

C. The Contractor shall notify Emergency Management Services agencies, Lynx and OCPS

no less than 7 days prior to such closures or whenever roads are impassable.

D. Implement closing of vehicle or pedestrian thoroughfare in accordance with the construction drawings and the approved Traffic Control Plan.

E. The Contractor will immediately notify the City of any vehicular or pedestrian safety or efficiency problems incurred as a result of the construction of the Project.

3.02 GENERAL TRAFFIC CONTROL

A. The Contractor will sequence and plan construction operations and will generally conduct Work in such a manner as not to unduly or unnecessarily restrict or impede normal traffic.

B. Unless otherwise provided, all roads within the limits of the Work will be kept open to all traffic by the Contractor. The Contractor will keep the portion of the project being used by public traffic, whether it is through or local traffic, in such condition that traffic will be adequately accommodated.

C. The Contractor will be responsible for installation and maintenance of all traffic control devices and requirements for the duration of the construction period. Necessary precautions for traffic control will include, but not be limited to, warning signs, signals, lighting devices, markings, barricades, canalizations, and hand signaling devices.

D. The Contractor will provide and maintain in a safe condition temporary approaches or crossings and intersections with trails, roads, streets, businesses, parking lots, residences, garages and farms.

E. The Contractor will provide emergency access to all residences and businesses at all times. Residential and business access will be restored and maintained at all times outside of the Contractor's normal working hours.

F. Traffic is to be maintained on one section of existing pavement, proposed pavement, or a combination thereof. Alternating one-way traffic may be utilized and limited to a maximum length of 500-feet during construction hours. Lane width for alternating one-way traffic will be kept to a minimum width of 10-feet, or as directed by the City.

G. Travel lanes and pedestrian access will be kept reasonably smooth, dry, and in a suitable condition at all times.

H. The Contractor will make provisions at all "open cut" street crossings to allow for free passage of vehicles and pedestrians, either by bridging or other temporary crossing structures. Such structures will be of adequate strength and proper construction and will be maintained by the Contractor in such a manner as not to constitute an undue traffic hazard.

I. The Contractor will keep all signs in proper position, clean, and legible at all times. Care will be taken so that weeds, shrubbery, construction materials, equipment, and soil are not allowed to obscure any sign, light, or barricade. Signs that do not apply to construction conditions should be removed or adjusted so that the legend is not visible to approaching traffic.

J. The City may determine the need for, and extent of, additional striping removal and restriping.

K. Excavated material, spoil banks, construction materials, equipment and supplies will not be located in such a manner as to obstruct traffic, as practicable. The Contractor will immediately remove from the site all demolition material, exercising such precaution as may be directed by the City. All material excavated shall be disposed of so as to minimize traffic and pedestrian inconvenience and to prevent damage to adjacent property.

L. During any suspension, the Contractor will make passable and open to traffic such portions of the Project and/or temporally roadways as directed by the City for accommodation of traffic during the anticipated period of suspension. Passable conditions will be maintained until issuance of an order for the resumption of construction operations. When Work is resumed, the Contractor will replace or renew any Work or materials lost or damaged because of such temporary use in every respect as though its prosecution had been continuous and without interferences.

3.03 TEMPORARY SHORING

A. Use shoring to maintain traffic when it is necessary to provide lateral support to the side of an excavation or embankment parallel to an open travel-way. Provide shoring when a theoretical 2:1 or steeper slope from the bottom of the excavation or embankment intersects the existing ground line closer than 5-feet (1.5 m) from the edge of pavement of the open travel-way.

B. The Contractor will furnish, install, and remove sheeting, shoring, and bracing necessary to maintain traffic at locations shown on the Traffic Control Plan and other locations determined during construction.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01580
PROJECT IDENTIFICATION AND SIGNS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. The Contractor shall furnish, install, and maintain all sign materials including sign posts, weighted stands, brackets, any required mounting hardware, and miscellaneous materials required for temporary signs for the purpose of:
   1. Project Identification.
   2. Informational signs to direct traffic
   3. On-site safety signs as appropriate for the Work

B. Remove temporary signs on completion of Construction prior to obtaining Certificate of Occupancy and Substantial Completion.

C. Allow no other signs to be displayed without written approval of the City.

1.02 SUBMITTALS

A. Submit complete Shop Drawings identifying locations, material, layout, sign content, font type and size, and sample colors. Make sign and lettering to scale, clearly indicating condensed lettering if used. The sign details will be submitted to the City for approval prior to fabrication.

B. Submit method of erection to include materials, fasteners, and other items to assure compliance with the requirements for wind pressures as required by the authorities having jurisdiction.

C. Submit signs in accordance with any details provided in the Drawings.

D. Prior to erection obtain and submit all required permits from the authorities having jurisdiction.

1.03 PROJECT IDENTIFICATION SIGN

A. Provide 1 painted sign at the site, or at each end of the Work if a linear project, or at each of the separate sites of Work, if applicable. The sign will be not less than 32-square feet area, with a minimum dimension of 4-feet and painted graphics with content to include:
   1. Title of Project
   2. City Government name and logo
   3. Names and titles of the Board of City Commissioners, City Administrator, Director of City Utilities Department, the Consulting Engineer, and the Contractor

B. Erect on the site at a lighted location of high public visibility, adjacent to main entrance to site, as approved by the City. The sign must be located 5-feet from all rights-of-way and 20-feet from all property lines.

1.04 INFORMATIONAL SIGNS

A. All signs and other traffic control devices shall conform to the requirements for shape, color, size, and location as specified in the latest Manual on Uniform Traffic Control and Safe Streets and Highways and the Florida Manual of Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations. Information as to the above may be obtained from FDOT Division engineers.

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New construction grade lumber, structurally adequate and suitable for exterior application and specified finish.

B. Sign Panels: New A-B Grade, exterior type, APA DF plywood with inset hardwood edges and mitered corners, standard large sizes to minimize joints.
   1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles, minimum 3/4-inch.

C. Rough Hardware: Galvanized steel, of sizes and types to enable sign assemblies to resist wind pressures as required by the authorities having jurisdiction but not less than a wind velocity of 50-mph.
   1. Use minimum 1/2-inch diameter button head carriage bolts to fasten sign panels to supporting structures. Bolt heads to be painted to match sign face.

D. Paint: Exterior quality, as specified in Division 9 or as a minimum as specified herein.
   1. Primer and finish coat: exterior, semi-gloss, alkyd enamel.
   2. Colors for structure, framing, sign surfaces, and graphics: As shown on the Drawings or as selected by the City.

E. Safety Sign Number Tags
   1. Removable aluminum or galvanized steel, with 4-inch high, blue numerals and steel tag hooks.

PART 3 - EXECUTION

3.01 PROJECT IDENTIFICATION SIGN

A. Install project identification signs within 10-days of the Notice to Proceed date. Failure to erect the signs may be reason to delay approval of the initial Application for Payment.

B. Paint exposed surfaces of supports, framing, and surface material; one (1) coat of primer and two (2) coats of finish paint.

C. Set signs plumb and level and solidly brace as required to prevent displacement during the Construction period. If mounted on posts, sink posts 3-feet to 4-feet below grade, leaving a minimum of 8-feet of each post above grade for mounting the sign.

D. Install informational signs at a height for optimum visibility, on ground mounted poles or attached to temporary structural surfaces.

3.02 MAINTENANCE

A. Maintain signs and supports in a neat, clean condition; repair damages to structure, framing, or sign.

B. Relocate informational signs as required by the progress of the Work.

C. Poorly maintained, defaced, damaged, or dirty signs shall be replaced, repaired, or cleaned without delay.

D. Special care must be taken to ensure that construction materials and dust are not allowed to obscure the face of a sign.

E. Signs not in effect shall be covered or removed.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at Substantial Completion of the Work.

B. Leave areas clean and patch as required to remove any traces of temporary signs.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01610
DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section specifies the general requirements for the delivery, handling, storage and protection for all items required in the construction of the Work.

B. Deliver, handle and store products in accordance with manufacturer's recommendations and by methods and means that will prevent damage, deterioration, and loss including theft and protect against damage from climatic conditions. Control delivery schedules to minimize long-term storage of products at the site and overcrowding of construction spaces. In particular, provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss. Damaged or defective items, in the opinion of the City, will be replaced at no cost to the City.

1.02 REQUIREMENTS

A. The Contractor is responsible for all material, equipment and supplies sold and delivered to the City under this Contract until final inspection of the Work and acceptance thereof by the City.

B. All materials and equipment to be incorporated in the Work will be handled and stored by the Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.

C. All materials and equipment, which in the opinion of the City, have become so damaged as to be unfit for the use intended or specified, will be promptly removed from the site of the Work, and the Contractor will receive no compensation for the damaged materials or equipment or for its removal.

D. In the event any such material, equipment and supplies are lost, stolen, damaged or destroyed prior to final inspection and acceptance, the Contractor will replace same without additional cost to the City.

1.03 DELIVERY

A. Transport and handle items in accordance with manufacturer's instructions.

B. The City and the Contractor's project superintendent must be on-site to accept all deliveries shipped directly to the job site. If the project superintendent is not present for a delivery, that delivery may be rejected by the City. If any delivery is rejected due to non-availability of the Contractor's project superintendent, delivery shall be rescheduled at no additional cost to the City.

C. Schedule delivery to reduce long-term on-site storage prior to installation and/or operation. Under no circumstances will materials or equipment be delivered to the site more than 1-month prior to installation without written authorization from the City.

D. Coordinate deliveries in order to avoid delay in, or impediment of, the progress of the Work.

E. Schedule deliveries to the site not more than 1-month prior to scheduled installation without written authorization from the City.

F. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.

G. All items delivered to the site will be unloaded and placed in a manner that will not hamper the Contractor's normal construction operation or those of Subcontractors and other Contractors and will not interfere with the flow of necessary traffic.

H. Deliver products in undamaged condition, in manufacturer’s original containers or packaging, with identifying labels intact and legible. Maintain packaged materials with seals unbroken and labels intact until time of use.

I. Immediately on delivery, inspect shipments with the City to ensure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged. If the Contractor does not notify the City regarding the delivery and the City rejects any part of the delivery, there will be no additional cost to the City for the material to be returned. For items furnished by others (i.e. City), perform inspection in the presence of the City. Provide written notification to the City of any problems.

J. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the City.

1.04 STORAGE AND HANDLING

A. Provide equipment and personnel to handle products by methods recommended by the manufacturer to prevent soiling or damage to products or packaging, with seals and labels intact and legible.

B. The Contractor is responsible for securing a location for on-site storage of all material and equipment necessary for completion of the Work. The location and storage layout will be submitted to the City at the Pre-Construction conference.

C. Manufacturer's storage instructions will be carefully studied by the Contractor and reviewed with the City. These instructions will be carefully followed and a written record of this kept by the Contractor.

D. All material delivered to the job site will be protected from dirt, dust, dampness, water, and any other condition detrimental to the life of the material from the date of delivery to the time of installation of the material and acceptance by the City.

E. When required or recommended by the manufacturer, the Contractor will furnish a covered, weather protected storage structure providing a clean, dry, non-corrosive environment for all mechanical equipment valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this Project.

F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions and free from damage or deterioration.

G. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within 7-days after written notice to do so has been given, the City retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contract Amount. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.

1.05 SPECIFIC STORAGE AND HANDLING

(Additional specific storage and handling requirements may be found in the specification sections addressing the material requirements.)

A. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) will be stored in a weather tight building to prevent damage. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the City. The building will be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer.
   1. All equipment will be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer. Mechanical equipment to be used in the Work, if stored for longer than 90-days, will have the bearings cleaned, flushed and lubricated prior to testing and startup, at no extra cost to the City.
   2. Moving parts will be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding." Upon installation of the equipment, the Contractor will start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

3. Lubricants will be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants will be put into the equipment at the time of acceptance. Prior to acceptance of the equipment, the Contractor will have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer will be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment will be judged to be defective. It will be removed and replaced at the Contractor's expense.
4. Electric motors provided with heaters will be temporarily wired for continuous heating during storage. Upon installation of the equipment, the Contractor will start the equipment, at least half load, and once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.

B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

C. Cement and lime will be stored under a roof and off the ground and will be kept completely dry at all times.

D. Brick, block and similar masonry products will be handled and stored in a manner to minimize breakage, chipping, cracking and spilling to a minimum.

E. Precast Concrete will be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking.

F. All structural and miscellaneous steel and reinforcing steel will be stored off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams will be stored with the webs vertical.

G. Metals will be stored dry, all under cover and vented to prevent build-up of humidity, all off ground to provide air circulation.

H. Lumber will be stacked to provide air circulation. Store materials for which maximum moisture content is specified in an area where moisture content can be maintained.

I. Gypsum wallboard systems will be stored to protect all metal studs, furring, insulation boards, batts, accessories and gypsum board to prevent any type of damage to these materials. Rusted material components, damp or wet insulation or gypsum boards will not be accepted.

J. Acoustical materials will be delivered to the job site in unbroken containers labeled and clearly marked. Materials will not be removed from containers until ready to install, but will be stored in dry area with cartons neatly stacked. Before installation, acoustical board will be stored for not less than 24-hours in the Work area at the same temperature and relative humidity.

K. Linear items will be stored in dry area with spacers to provide ventilation. Stack linear items to prevent warping, complying with manufacturer's instructions.

L. Paints and other volatile materials will be stored within approved safety containers. No glass jugs will be permitted. Storage areas will be equipped with not less than 2 fire extinguishers (C02 type) sufficient to discharge a distance of 25-feet when fully charged and have current tags. No other building materials will be stored in this area. Used rags will be removed daily. Clean rags will be stored in metal closed containers.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01700
PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

The term "Project Closeout" is defined to include requirements near the end of the Contract Time, in preparation for Substantial Completion acceptance, occupancy by the City, release of retainage, final acceptance, final payment, and similar actions evidencing completion of the Work. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single period for the entire Work or a series of time periods for individual elements of Work that has been certified as substantially complete at different dates. This time variation, if any, will be applicable to the other provisions of this section.

1.02 SCOPE OF WORK

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
   1. Final Cleaning
   2. Substantial Completion
   3. Final Acceptance

1.03 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

C. Section 01720 "Project Record Documents"

D. Section 01740 "Warranties and Bonds"

1.04 PREREQUISITES FOR SUBSTANTIAL COMPLETION.

When the Contractor considers the Work as substantially complete, submit to the City a written notice stating so and requesting an inspection to determine the status of completion. The Contractor will attach to the notice a list of items known to be incomplete or yet to be corrected. Complete the following before requesting the City’s inspection for certification of substantial completion.

A. In the progress payment request that coincides with or is the first request following, the date substantial completion is claimed, show 100% completion or list incomplete items, the value of incomplete Work, and reasons for the Work being incomplete. Inspection procedures include supporting documentation for completion as indicated in these Contract Documents.

B. Submit a statement showing an accounting of changes to the Contract Sum.

C. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents in accordance with Section 01740 "Warranties and Bonds."

D. Obtain and submit lien releases enabling the City's full, unrestricted use of the Work and access to services and utilities.

E. Consult with City before submitting Record Documents in accordance with Section 01720 "Project Record Documents."

F. Submit Operation and Maintenance Manuals.

G. Make final changeover of permanent locks. Submit keys and keying schedule.

H. Deliver tools, spare parts, extra stock, and similar items.

I. Complete final cleaning requirements necessary for Substantial Completion.

1.05 FINAL CLEANING.

Complete the following cleaning operations prior to Substantial Completion or Owner occupancy.

A. Remove from job site all tools, surplus materials, construction equipment, storage sheds, debris, waste and temporary services.

B. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

C. Structures:
   1. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges and other foreign matter.
   2. Remove all traces of splashed materials from adjacent surfaces.
   3. Ensure exterior surfaces have a uniform degree of cleanliness.
   4. Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges and other foreign matter.
   5. Remove paint droppings, spots, stains and dirt from finished surfaces.
   6. Remove labels that are not permanent labels.
   7. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

8. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Leave concrete floors broom clean.
9. Wipe surface of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
10. Clean permanent filters of ventilating systems and replace disposable filters if units were operated during construction. Clean ducts, blowers and coils if units were operated without filters during construction.

1.06 OPERATION AND MAINTENANCE MANUALS

A. The Contractor will submit the proposed format, content and tab structure for all Operating and Maintenance Manuals for the City's review and approval. The tab structure for Operating and Maintenance Manuals will follow specification division format as accepted by the Construction Specification Institute. After the City approves the proposed format, content, and tab structure for the Operating and Maintenance Manuals, the Contractor will create and deliver 5 complete sets.

B. Operation and Maintenance documentation is required for each piece of mechanical, electrical, communications, instrumentation and controls, pneumatic, hydraulic, conveyance, and special construction. If required by the technical specifications, provide Operation and Maintenance documentation for any other product not listed in the foregoing.

C. The requirements of this Section are separate, distinct and in addition to product submittal requirements that may be established by other Sections of the Specifications. Owner's manuals, manufacturer's printed instructions, parts lists, test data and other submittals required by other Sections of the Specifications may be included in the Operating and Maintenance Manuals provided that they are approved and are formatted in a manner consistent with the requirements of this Section.

D. Deliver Operation and Maintenance Manuals directly to the City.

E. Operating and Maintenance Manual documents must include, but are not limited to, table of contents, approved submittals, manufacturer's operating and maintenance instructions, brochures, Shop Drawings, performance curves and data sheets annotated to indicate equipment actually furnished (e.g. identifying impeller size, model, horsepower, etc), procedures, wiring and control diagrams, records of factory and field tests and device/controller settings and calibration, program lists or data compact discs, maintenance and warranty terms and contact information, spare parts listings, inspection procedures, emergency instructions, and other Operating and Maintenance documentation that may be useful to the City. The material and equipment data required by this Section must include all data necessary for the proper installation, removal, normal operation, emergency operation, startup, shutdown, maintenance, cleaning, adjustment, calibration, lubrication, assembly, disassembly, repair, inspection, trouble-shooting, and warranty service of the equipment or materials.

F. The Contractor must bind the Operating and Maintenance Manual documents in heavy-duty, 3-ring vinyl-covered binders including pocket folders for folded sheet information. Mark binder identification on both the front and spine of each binder. Binder information must list the project title, identify separate structures or locations as applicable, identify the general subject matter covered in the manual and must include the words "OPERATING AND MAINTENANCE INSTRUCTIONS".
   1. The Contractor must submit the Operating and Maintenance documents on three-hole punched, 8-1/2-inch x 11-inch sheets or on three-hole punched sheets that are foldable in multiples of 8-1/2-inch x 11-inch. The three-hole punched edge will be the left 11-inch edge.
   2. The Contractor may request waivers to the size requirement for specific instances. The Contractor's waiver request must be in writing to the City. The Contractor's waiver request must include a justification for seeking the waiver.

G. The Contractor must provide an electronic version of the complete and final Operating and Maintenance Manuals in original electronic file format on compact disc or DVD. The Contractor must also provide one (1) electronic pdf file of each bound Operating and Maintenance Manual that represents each Manual’s content. The electronic pdf file must match the Operating and Maintenance Manual content and organizational structure.

1.07 SUBSTANTIAL COMPLETION INSPECTION PROCEDURES

A. Upon receipt of the Contractor's request for inspection, the City will either proceed with inspection or advise the Contractor of incomplete prerequisites.

B. Following the initial inspection, the City will either prepare the certificate of Substantial Completion, or advise the Contractor of Work which must be performed before the certificate will be issued. The City will repeat the inspection when requested in writing and when assured that the Work has been substantially completed.

C. Results of the completed inspection will form the initial "punch list" for final acceptance.

1.08 PREREQUISITES FOR FINAL ACCEPTANCE.

Complete the following before requesting the City’s final inspection for certification of final acceptance, and final payment. List known exceptions, if any, in the request.

A. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates for insurance for products and completed operations where required.

B. Submit written certification that:
   1. The City’s final punch list of itemized Work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.
   2. The Contract Documents have been reviewed and Work has been completed in accordance with Contract Documents.

3. Equipment and systems have been tested in the presence of the City and are operational.
4. Work is completed and ready for final inspection.

C. Submit consent of surety.

D. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.09 FINAL ACCEPTANCE INSPECTION PROCEDURES

A. The City will re-inspect the Work upon receipt of the Contractor's written notice that the Work, including punch list items resulting from earlier inspections, has been completed, except for those items for which completion has been delayed because of circumstances that are acceptable to the City.

B. Upon completion of re-inspection, the City will either prepare a certificate of final acceptance or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled, which are required for final acceptance.

C. If necessary, the re-inspection procedure will be repeated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01720
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The purpose of the Project Record Documents is to provide the City with factual information regarding all aspects of the Work, both concealed and visible.

B. To ensure the Work was constructed in conformance with the Contract Drawings, the following survey documents are required to be prepared and certified by a Surveyor as per Spec Section 01050 Surveying and Field Engineering:
   1. Asset Attribute Data Form
   2. Pipe Deflection Table
   3. Gravity Main Data
   4. Boundary Survey and Survey Map Report for pump stations and easements with constructed improvements

   The Asset Attribute Data and Pipe Deflection Table forms can be found on the City's web site.

1.02 DEFINITIONS

A. Boundary Survey: Boundary survey, map and report certified by a Surveyor shall be provided that meets the requirements of Chapter 5J-17 'Minimum Technical Standards', FAC.

B. Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.

1.03 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of the Record Documents to one person on the Contractor's staff as approved by the City.

B. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of specifications and each sheet of Drawings and other documents where such entry is required to show progress and changes properly.

C. Make entries within 24-hours after receipt of information has occurred.

1.04 RECORD DOCUMENTS AT SITE

A. Maintain at the site and always available for City's use one (1) record copy of:
   1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents
   2. Change Orders, Verbal Orders, and other modifications to Contract
   3. Written instructions by the City as well as correspondence related to Requests for Information (RFIs)
   4. Accepted Shop Drawings, Samples, product data, substitution and "or-equal" requests
   5. Field test records, inspection certificates, manufacturer certificates and construction photographs
   6. Paper copies of the Progressive As-Built Drawings
   7. Current Surveyor's tables for the Assets Attribute Data, Pipe Deflection Data, and Gravity Main Data

B. Maintain the documents in an organized, clean, dry, legible condition and protected from deterioration, loss and damage until completion of the Work, transfer of all record data to the final As-built Drawings for submittal to the City.

C. Store As-Built Documents and samples in Contractor's office apart from documents used for construction. Do not use As-Built document for construction purposes. Label each document "AS-BUILT" in neat large printed letters. File documents and samples in accordance with CSI/CSC format.

D. Record information concurrently with construction progress. Do not conceal any Work until required information is recorded.

PART 2 - PRODUCTS

2.01 AS-BUILT SURVEY DRAWINGS

A. Maintain the electronic As-Built Drawings to accurately record progress of Work and change orders throughout the duration of the Contract.

B. Date all entries. Enter RFI No., Change Order No., etc. when applicable.

C. Call attention to the entry by highlighting with a "cloud" drawn around the area affected or other means. In the event of overlapping changes, use different colors for entries of the overlapping changes.

D. Design call-outs shall have a thin strike line through the design call-out and all As-Built information must be labeled (or abbreviated "AB") and be shown in a bolder text that is completely legible.

E. Entries shall consist of graphical representations, plan view and profiles, written comments, dimensions, State Plane Coordinates, details and any other information as required to document field and other changes of the actual Work completed. As a

minimum, make entries to also record:

1. Depths of various elements of foundation in relation to finish floor datum and State Plane Coordinates and elevations.
2. As-Built Asset Attribute Data tables shall be completed in the Drawings.
3. When electrical boxes, or underground conduits and plumbing are involved as part of the Work, record true elevations and locations, dimensions between boxes.
4. Actually installed pipe or other work materials, class, pressure-rating, diameter, size, specifications, etc. Similar information for other encountered underground utilities, not installed by Contractor, their owner and actual location if different than shown in the Contract Documents.
5. Details, not on original Contract Drawings, as needed to show the actual location of the Work completed in a manner that allows the City to find it in the future.
6. The Contractor shall mark all arrangements of conduits, circuits, piping, ducts and similar items shown schematically on the construction documents and show on the As-Built Drawings the actual horizontal and vertical alignments and locations.
7. Major architectural and structural changes including relocation of doors, windows, etc. Architectural schedule changes according to Contractor's records and Shop Drawings.

2.02 RECORD DOCUMENTS

A. Three (3) paper copy sets and three (3) digital media sets of the following final Record Documents below.
   1. The following documents shall be signed and sealed by the Surveyor:
      a. As-built survey drawings as previously described in paragraph 2.01.
      b. As-built Asset Attribute Data (see Specification Section 01050 "Surveying and Field Engineering," Table 01050-2 for an example)
      c. Boundary Survey on a 81/2"x11" format of fee simple and/or permanent easement sites for pump stations, treatment facilities, etc.. As a minimum the Boundary Survey shall show all above ground and underground structures or equipment, pipe, and conduit. All property or easement corners and the center of wetwell shall be shown with GPS coordinates. The Boundary Survey field work shall be dated after the Work has been completed.
      d. Boundary Survey on a 81/2"x11" format for Work related to constructed pipes within any permanent easements. As a minimum the Boundary Survey shall show the location of the pipe centerline and property corners with GPS coordinates. The Boundary Survey field work shall be dated after the Work has been completed within the easements.
      e. Gravity Main Table (see Specification Section 01050 "Surveying and Field Engineering", Table 01050-4 for an example)
      f. Pipe Deflection Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-3 for an example). An electronic blank table will be supplied by the City.
   2. Provide an encompassing digital AutoCAD file in the Engineer's current version of AutoCAD and the file shall be saved under in the format dwg. The file includes all the information of the As-Built Survey and any other graphical information in the As-Built Drawings. It shall include the overall Work, utility system layout and

associated parcel boundaries and easements. Feature point, line and polygon information for new or altered Work and all accompanying geodetic control and survey data shall be included. The Surveyor's certified As-Built Asset Attribute Data shall be added to the As-Built Drawings.

3. Provide Scanned "As-Built" Drawing sets complete and include the title sheet, plan/profile sheets, cross-sections, and details. Each individual sheet contained in the printed set of the As-Built Drawings shall be included in the electronic drawings, with each sheet being converted into an individual tif (tagged image file). The plan sheets shall be scanned in tif format Group 4 at minimum of 400 dpi resolution to maintain legibility of each drawing. Then, the tif images shall be embedded into a single pdf (Adobe Acrobat) file representing the complete plan set.
4. Provide Scanned Record Documents reflecting changes from the Contract Documents.

PART 3 - EXECUTION

3.01 FINAL RECORD DOCUMENTS SUBMITTAL

A. Submit the Final Record Documents within 20-days after Substantial Completion.
   1. Participate in review meetings as required and make required changes and promptly deliver the Final Record Documents to the City.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 01740
WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1.02 RELATED WORK

A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.

B. General closeout requirements are included in Section 01700 "Project Closeout."

C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Division 2 through 16.

1.03 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the City.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the City.

1.04 SUBMITTALS

A. Submit written warranties to the City prior to requesting a Substantial Completion Inspection as outlined in Section 01700 "Project Closeout." If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the City.

B. When a designated portion of the Work is completed and occupied or used by the City, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the City within 15-days of completion of that designated portion of the Work.

C. When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the City for approval prior to final execution.

D. Refer to individual Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.

E. Prior to Substantial Completion Inspection, submit to the City two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8-1/2-inch by 11-inch three-hole punched paper.
   2. Table of Contents will be neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified and the name of the product or work item.
   3. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address and telephone number of the installer, supplier and manufacturer.
   4. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name and the name, address and telephone number of the Contractor.
   5. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.05 WARRANTY REQUIREMENT

A. The Contractor will warrant all equipment in the Contractor's one-year warranty period even though certificates of warranty may not be required. For all major pieces of equipment, the Contractor shall submit a warranty from the equipment manufacturer. "Major" equipment is defined as a device having a 5 HP or larger motor or which lists for more than $1,000.00.

B. In the event that an equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at Substantial Completion, the Contractor will obtain from the manufacturer a warranty of sufficient length commencing at the time of equipment delivery to the job site, such that the warranty will extend to at least 1-year past substantial completion.

C. If an individual specification section requires a particular warranty more stringent than that required by this Section or the General Conditions, the more stringent requirements will govern for the applicable portion of the Work.

D. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty will be equal to the original warranty with an equitable adjustment for depreciation.

F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the City has benefited from use of the Work through a portion of its anticipated useful service life.

G. City's Recourse: Written warranties made to the City are in addition to implied warranties, and will not limit the duties, obligations, rights and remedies otherwise available under the law, nor will warranty periods be interpreted as limitations on time in which the City can enforce such other duties, obligations, rights, or remedies.

H. Rejection of Warranties: The City reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

I. The City reserves the right to refuse to accept Work for the project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to counter-sign such commitments are willing to do so.

J. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DELIVERABLES

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and Subcontractors, and bind into a commercial quality standard 3-ring binder; submit 5 copies of the warranties and bonds to the City for review.
   1. The warranties and bonds shall include:
      a. Equipment or product description
      b. Manufacturer's name, principal, address and telephone number

c. Contractor, name of responsible principal, address and telephone number
d. Local supplier's or representatives name and address
e. Scope of warranty or bond
f. Proper procedure in case of failure
g. Instances which might affect the validity of warranty or bond
h. Date of beginning of warranty, bond or service and maintenance contract
i. Duration of warranty, bond or service maintenance contract

B. Warranties
1. Furnish an extended warranty for sanitary sewer main liner certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for 1-year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner acceptable to the City.
2. Furnish an extended warranty for sanitary lateral liner certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for 1-year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner acceptable to the City.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02050
DEMOLITION OF EXISTING STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work
   1. This Section specifies the labor, materials, equipment, and incidentals required for the demolition, relocation, and/or disposal of all structures, building materials, equipment, and accessories to be removed as shown on the Drawings and as specified herein.
   2. There may be existing and active stormwater, wastewater, water, and other facilities on site as indicated on the Drawings. It is essential that these facilities, when encountered, remain intact and in service during the proposed demolition. Consequently, the Contractor shall be responsible for the protection of these facilities and shall diligently direct all his activities toward maintaining continuous operation of the existing facilities and minimizing operational inconvenience.
   3. Demolition may include:
      a. Complete demolition and removal of piping and associated infrastructure.
      b. Complete demolition and removal of all above and below ground structures, concrete slabs and foundations, vaults, and underground utilities (water, wastewater, electrical, etc.) needed to complete the Work, as encountered in the field.
      c. All material, equipment, rubble, debris, and other products of the demolition shall become the property of the Contractor for his disposal off-site in accordance with all applicable laws and ordinances at the Contractor's expense. The sale of salvageable materials by the Contractor shall only be conducted off-site. The sale of removed items on the site is prohibited by the City.
   4. The Contractor shall examine the various Drawings, visit the site, determine the extent of the Work, the extent of work affected therein, and all conditions under which he is required to perform the various operations.
   5. The Contractor shall fill and compact all voids left by the removal of pipe, structures, etc. with materials described herein to a grade that will provide for positive drainage of the disturbed area to drain run-off in direction consistent with the surrounding area. The Contractor shall provide all fill materials to the site as needed. Compaction of fill shall match the compaction of adjacent undisturbed material.

1.02 QUALITY ASSURANCE

A. Permits and Licenses: Contractor shall obtain all necessary permits and licenses for performing the Work and shall furnish a copy of same to the City prior to commencing the Work. The Contractor shall comply with the requirements of the permits.

B. Notices: Contractor shall issue written notices of planned demolition to companies or local authorities owning utility conduit, wires, or pipes running to or through the project site. Copies of said notices shall be submitted to the City.

C. Utility Services: Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone, or sewer service to remove any equipment in the structures to be demolished and to remove, disconnect, cap, or plug their services to facilitate demolition.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. Submit to the City for their approval, 2 copies of proposed methods and operations of demolition or relocation of the structures specified below prior to the start of Work. Include in the schedule the coordination of shut-off, capping, and continuation of utility service as required.

C. Provide a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the City's operations.

D. Before commencing demolition work, all structure relocation, bypassing, capping, or modifications necessary will be completed. Actual work will not begin until the City has inspected and approved the prerequisite work and authorized commencement of the demolition work.

E. The above procedure must be followed for each individual demolition operation.

1.04 SITE CONDITIONS

A. Prior to demolition, the Contractor shall obtain written verification from the utility owner(s) that the existing utilities, including stormwater, wastewater, and/or water facilities, are not operational and are ready for demolition.

B. The City assumes no responsibility for the actual condition of the structures to be demolished or relocated.

C. Conditions existing at the time of inspection for bidding purposes will be maintained by the City insofar as practicable. However, variations within each site may occur prior to the start of demolition work.

D. No additional payment will be made for pumping or other difficulties encountered due to water.

E. Certain information regarding the reputed presence, size, character and location of

existing underground structures, pipes and conduit has been shown on the Drawings. There is no certainty of the accuracy of this information, and the location of underground structures shown may be inaccurate and other obstructions than those shown may be encountered. The Contractor hereby distinctly agrees that the City is not responsible for the correctness or sufficiency of the information given; that in no event is this information to be considered as a part of the Contract; that he shall have no claim for delay or extra compensation on account of incorrectness of information regarding obstructions either revealed or not revealed by the Drawings; and that he shall have no claim for relief from any obligation or responsibility under this Contract in case the location, size, or character of any pipe or other underground structure is not as indicated on the Drawings, or in case any pipe or other underground structure is encountered that is not shown on the Drawings.

1.05 RESTRICTIONS

A. No building, tank or structure, or any part thereof, shall be demolished until an application has been filed by the Contractor with the Building Department Inspector and a permit issued if a permit is required. The fee for this permit shall be the Contractor's responsibility. Demolition shall be in accordance with applicable provisions of the Building Code of the State of Florida.

B. No explosives shall be used at any time during the demolition. No burning of combustible material will be allowed.

1.06 DISPOSAL OF MATERIAL

A. All salvageable or useable material or equipment to be retained by the City shall be shown on Drawings, and shall be moved to a designated area by Contractor for pick up by City. The Contractor shall promptly remove all other materials from the site as indicated or shown on the Drawings.

B. All materials not retained by the City shall become the Contractor's property and shall be removed off-site.

C. The on-site storage of removed items is prohibited by the City. Off-site sale of salvageable material by the Contractor is acceptable.

1.07 TRAFFIC AND ACCESS

A. Conduct work to ensure minimum interference with on-site and off-site roads, streets, sidewalks, and occupied or used facilities.

B. Special attention is directed towards maintaining safe and convenient access to the existing facilities remaining in operation by plant personnel and plant associated vehicles, including trucks and delivery vehicles.

C. Do not close or obstruct streets, sidewalks, or other occupied or used facilities without permission from the City. Provide alternate routes around closed or obstructed traffic in access ways.

1.08 PROTECTION

A. Conduct operations to minimize damage by falling debris or other causes to adjacent buildings, structures, roadways, other facilities, and persons. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain.

1.09 DAMAGE

A. Promptly repair damage caused to adjacent facilities by demolition operations as directed by the City at no cost to the City.

1.10 UTILITIES

A. Maintain existing utilities as directed by the City to remain in service and protect against damage during demolition operations.

B. Do not interrupt existing utilities serving occupied or operational facilities, except when authorized by City. Provide temporary services during interruptions to existing utilities as acceptable to the City.

C. The Contractor shall cooperate with the City to shut off utilities serving structures of the existing facilities as required by demolition operations.

D. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the interruption of all public and private utilities or services.

E. All utilities being abandoned shall be terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.11 EXTERMINATION

A. If required, before starting demolition, the Contractor shall employ a certified rodent and vermin exterminator and treat the facilities in accordance with governing health laws and

regulations. Any rodents, insects, or other vermin appearing before or during the demolition shall be killed or otherwise prevented from leaving the immediate vicinity of the demolition work.

1.12 POLLUTION CONTROL

A. For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. The Contractor shall comply with the governing regulations.

B. Clean adjacent structures and improvements of all dust and debris caused by demolition operations as directed by the City. Return areas to conditions existing prior to the start of Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SEQUENCE OF WORK

A. The sequence of demolition and relocation of existing facilities shall be in accordance with the approved critical path schedule as specified in paragraph 1.03 above.

3.02 REMOVAL OF EXISTING PROCESS EQUIPMENT, PIPING, AND APPURTENANCES

A. Equipment to be retained by the City will be designated for retention by the City prior to bidding as specified in Paragraph 1.06 above. Subject to the constraints of maintaining existing facilities in operation as shown on the Drawings, all other process equipment, non-buried valving and piping, and appurtenances shall be removed from the site.

3.03 DEMOLITION PROCEDURES

The Contractor shall adhere to the following demolition procedures as referenced on the Drawings:

A. TO BE DEMOLISHED: Demolition shall be the breaking up, cutting, filling of any holes resulting, final grading of the area, performing any other operations required, and the removal from the site of all structures and equipment (structures, substructures, floor slabs, equipment, tanks, pipes, fittings, electrical systems, light poles, wiring, underground conduits and wiring, isolated slabs, and sidewalks) as indicated on the Drawings. All pieces of concrete, metal, and any other demolished material shall be removed to a depth of at least 5-feet below existing grade. Broken pieces of concrete may be size reduced by an on-site crusher, but in any event must be removed from the project site.

Before commencing structural demolition, remove all mechanical, electrical, piping, and miscellaneous appurtenances. Completely remove the structure by thoroughly breaking up concrete into pieces no more than 2-feet across the largest dimension.

B. TO BE REMOVED: Where indicated on the Drawings, the structures and equipment shall be completely removed from the site with all associated connecting piping or electrical service. The item shall be taken whole or in parts to be salvaged or disposed of by the Contractor.

C. TO BE ABANDONED: Where indicated on the Drawings, the structures and equipment shall be left in place, drained, and the contents properly disposed. The upper 4-feet of the structure shall be cut and removed, including the cover slab and access port, frame, and cover. All structures to be abandoned with bottom slabs shall be drilled (2 holes minimum, 2.0-inch diameter each) or hole punched to prevent flotation and filled with common fill.

D. PIPING TO BE REMOVED: Where indicated on the Drawings, pipe (and conduit) shall be drained and the contents properly disposed. The pipe (or conduit) shall then be completely removed from the site, including fittings, valves, and other in-line devices. Connections to existing piping to remain shall be plugged by mechanical means (M.J. plugs, tie-rods, or thrust blocks). Piping shall be removed in accordance with Specification Section 02080 "Abandonment, Removal and Salvage or Disposal of Existing Pipe."

E. PIPING TO BE ABANDONED: Where indicated on the Drawings, piping (or conduit) shall be left in place. All such piping shall be drained and the contents properly disposed. The pipe (or conduit) shall then be filled with grout (flowable fill) and each end of the pipe (or conduit) shall be plugged using a concrete plug in a manner acceptable to the City. Piping shall be abandoned in accordance with Specification Section 02080 "Abandonment, Removal and Salvage or Disposal of Existing Pipe."

F. TO BE PROTECTED: Where indicated on the Drawings, the utility service, fence, structure, tree, or device so designated shall be temporarily protected during the prosecution of the demolition work as specified in Division 1.

G. TO REMAIN: Where indicated on the Drawings, the designated facilities shall remain intact and in service during the prosecution of the demolition work.

3.04 DEWATERING OF EXISTING PROCESS UNITS AND DISPOSAL OF RESIDUE

The Contractor shall notify the City prior to beginning the dewatering work on any existing process units which contain wastewater, grit, or sludge. The Contractor, at his own expense, shall remove the entire contents of each structure and dispose off site. The proper transport and disposal of all residues shall remain the responsibility of the Contractor.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02080

ABANDONMENT, REMOVAL, AND SALVAGE OR DISPOSAL OF EXISTING PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section specifies the furnishing of all labor, materials, equipment, and incidentals required to abandon, remove, salvage, and/or dispose of existing pipelines and appurtenances as shown on the Drawings and as specified herein.

1.02 QUALITY ASSURANCE

A. Permits and Licenses: Contractor shall obtain and pay respective fees for all necessary permits and licenses for performing the Work and shall furnish a copy of same to the City prior to commencing the Work. The Contractor shall comply with the requirements of the permits. All removal or abandonment of asbestos pipe material shall be performed by a licensed asbestos abatement Contractor or Subcontractor registered in the State of Florida.

B. Notices: Contractor shall issue written notices of planned Work to companies or local authorities owning utility conduit, wires, or pipes running to or through the project site. Copies of said notices shall be submitted to the City.

C. Standards:
   1. Florida Administrative Code, Chapter 62-204.800
   2. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR Part 61, Subpart M, latest revision
   3. Occupational Safety and Health Act, 29 CFR
   4. The Environmental Protection Agency (EPA) Asbestos Abatement Worker Protection Rule
   5. Florida Statute 455.300
   6. Asbestos pipe handling best management practices provided at the end of this section

D. Quality Control
   1. It shall be the responsibility of the Contractor to provide supervision and inspections to ensure that the existing piping is removed and disposed, salvaged, or abandoned as designated in the Drawings and as specified herein.
   2. Asbestos Pipe
      a. All removal or abandonment of pipe material containing asbestos shall be performed by a licensed asbestos abatement Contractor or Subcontractor.

b. The asbestos abatement Contractor or Subcontractor shall contact the City Environmental Protection Division (407-836-1400) prior to removal or abandonment of any asbestos material and shall obtain all required permits and licenses and issue all required notices as required by the City Environmental Protection Division. The Contractor shall be responsible for all fees associated with permits, licenses, and notices to the governing regulatory agencies.
c. The asbestos abatement Contractor shall perform Work in accordance with all applicable standards referenced in paragraph 1.02.C of this section.
d. The asbestos abatement Contractor shall have experience performing asbestos removal similar to this Project.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Shop Drawings
1. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
2. Shop Drawings shall be submitted to the City for review and acceptance prior to construction in accordance with these specifications for the following:
a. Grout
b. Caps and plugs
c. Credentials of licensed asbestos abatement Contractor including current certification.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 REMOVAL, ABANDONMENT, SALVAGE, AND DISPOSAL

A. General: Existing piping designated on the Drawings to be removed shall be exposed and removed by the Contractor.

B. Removal and Disposal
1. Pipe designated to be removed shall be completely drained and the contents properly disposed. The piping system including fittings and valves shall then be completely removed from the site.
2. Existing services and/or connections not shown on the Drawings shall be removed in accordance with this section at no additional cost. Existing live services encountered shall be maintained.
3. Asbestos: Pipe material containing asbestos shall be removed and disposed by a licensed asbestos abatement Contractor or Subcontractor.
4. Structures shall be removed in accordance with Section 02050 "Demolition of Existing Structures."

C. Removal of material to be salvaged
   1. Pipe designated on the Drawings to be removed and salvaged shall be completely drained and the contents properly disposed. The pipe shall then be thoroughly pressure washed, palletized on wooden skids to a dimension not exceeding the recommendation of the manufacturer, and conveyed to the City at the location designated by the City.
   2. Items to be salvaged:
      a. Air release valves
      b. Sanitary manhole rings and covers
      c. Isolation valves
      d. Valve boxes
      e. Fire hydrant and valve assemblies

D. Abandonment
   1. Pipe designated on the Drawings to be abandoned (or retired in place) shall be left in place, drained, and its contents properly disposed. Pipe requires end caps or plugs. All air release valves and vaults, valve boxes, fire hydrants, manholes, and manhole rings and covers shall be removed and disposed of or salvaged as specified above.
   2. All pipe 4-inches or larger to be abandoned in place shall be completely filled with grout and each end of the pipe shall be plugged in a manner acceptable to the City.
   3. Plugs: Pipe to be abandoned shall be capped or plugged with a mechanical joint fitting that will prevent soil or other deposits form entering the pipe.

E. Asbestos Pipe Handling Best Management Practices
   1. Projects will require worker documentation before entering the regulated Work area. A copy of: their current training certificate (workers and their supervisor); current medical condition showing the doctor approved their working with asbestos and wearing a respirator; signed acknowledgment forms; and current record (6-months) of each workers respirator fit test will be required from all workers.
   2. Projects also require air monitoring. OSHA will accept historic data on air monitoring within 12-months of the Project, provided the data is from a project of like material and conditions with a crew of the same experience, supervision, and training. Otherwise, monitoring is required throughout the Project. OSHA requires two (2) types of personnel air monitoring, full shift and 30-minute excursion level (when highest levels are anticipated).
   3. Some provisions should be made for worker showering or otherwise washing following work before removing respirators, etc. Even if direct exposure is not anticipated, and at a minimum, a source of water to rinse the respirators, wash workers faces and hands, and (in the event of unanticipated direct exposure) some place to shower is required. The workers will also need a change room and some place to keep their street clothes and personal possessions.
   4. Proposals to remove asbestos pipe sections by cutting must address how the cutting debris will be captured and kept from becoming airborne. Soil that could be considered contaminated may also have to be removed.
   5. Licensed asbestos abatement Contractors or Subcontractors should have a pollution endorsement in their liability insurance in case of asbestos fiber release. A

contingency plan, in case the project does not run as smoothly as expected, should be developed and include emergency phone numbers kept on site during the Project.

6. Daily logs of the asbestos removal work should be kept, and should include sign in sheets for the workers and whatever air monitoring was done. Accident reports and other reports or correspondence if something unusual happened should also be included.
7. Waste receipts must be kept through all stages of transport from the site to, and including, the acceptance at the dumpsite where the material will be abandoned. Amount of material removed must be equal to the amount of material to be turned into to the dump.
8. The primary Contractor will give "approval for tear down" at project completion, indicating that all asbestos removal operations are complete and whether there is a need for any air monitoring. Air monitoring, if not required by any governing agency or approved permit as discussed previously, may also be required by the City if documentation to the general public pertaining to contamination is deemed necessary. This air monitoring is normally done by collecting area samples downwind of the project at the barrier tape or just inside it. It requires a source of electricity to run the pumps, which is often provided by a generator.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02100
TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work
   1. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion, sedimentation and turbidity controls as necessary.
   2. Temporary erosion controls include, but are not limited to, grassing, mulching, setting, watering and reseeding on-site surfaces and soil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by federal, state and local requirements and by the City.
   3. Temporary sedimentation controls include, but are not limited to; silt fence, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by federal, state and local requirements and by the City.
   4. Temporary turbidity controls include, but are not limited to, floating or staked turbidity barriers which will ensure that turbidity pollution will be either eliminated or maintained within acceptable limits as established by Federal, state, and local requirements and by the City.
   5. Contractor is responsible for providing effective temporary erosion, sediment, and turbidity control measures during construction or until permanent controls become effective.

B. Related Work Described Elsewhere: South Florida Building Code and Standard Building Code, FDOT Standard Specifications and FDOT Design Standards.

PART 2 - PRODUCTS

2.01 EROSION CONTROL

A. Netting Fence: fabricated of material acceptable to the City.

B. Sod is specified in Section 02578, "Solid Sodding."

2.02 SEDIMENTATION CONTROL

A. Bales: clean, seed-free cereal hay type.

B. Netting: fabricated of material acceptable to the City.

C. Filter stone: crushed stone conforming to Florida Department of Transportation

specifications.

D. Concrete block: hollow, non-load bearing type.

E. Concrete: exterior grade not less than 1-inch thick.

F. Rock Bags: conforming to FDOT Specifications.

2.03 TURBIDITY CONTROL

A. Conforming to FDOT Design Standards Index 103 - Turbidity Barriers.

PART 3 - EXECUTION

3.01 EROSION CONTROL

A. Minimum Procedures for Grassing Are:
   1. Scarify slopes to a depth of not less than 6-inches and remove large clods, rock, stumps and roots larger than 1/2-inch in diameter and debris.
   2. Sow seed within 24-hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
   3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2-inches.
   4. Apply netting over mulched areas on sloped surfaces.
   5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.02 SEDIMENTATION CONTROL

A. Install and maintain silt fence, silt dams, traps, barriers and appurtenances as shown on the approved descriptions and working Drawings. Hay bales which deteriorate and filter stone which is dislodged shall be replaced.

3.03 TURBIDITY CONTROL

A. Install and maintain turbidity barriers daily and as described in FDOT Index #103.

3.04 PERFORMANCE

A. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the State of Florida, the Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02140
DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This Section specifies the furnishing of equipment; labor and materials necessary to remove storm or subsurface waters from excavation areas in accordance with the requirements set forth, as shown on the Drawings, and/or geotechnical report.

1.02 QUALITY ASSURANCE

A. Qualifications: The Contractor shall engage a Geotechnical Engineer registered in the State of Florida, to design the temporary dewatering system. The Contractor shall submit conceptual plan for the dewatering system prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan and certification of this shall be provided by the Geotechnical Engineer. The dewatering system shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable and qualified in the design of such dewatering systems.

B. The dewatering of any excavation areas and the disposal of the water shall be in strict accordance with the latest revision of all local and state government rules and regulations.

C. Permits: The Contractor shall obtain and pay respective fees for all local, state, and federal permits (including the City, SFWMD, and/or SBDD) required for the withdrawal, treatment and disposal/discharge of water from the dewatering operation, prior to start of work.

D. Comply with Florida Administrative Code, Chapter 62-621.300 (2).

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. In accordance with FAC 62-621.300(2), submit analytical test results from a certified laboratory for the parameters listed in the FDEP "Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity" to the FDEP and the City. The submitted information shall show the location of the work, where the water will be going to, as well as an estimate for the amount, rate and duration of discharge being proposed.

C. Provide notification to all jurisdictional permitting agencies in accordance with the requirements of the respective agency.

D. Provide a detailed plan and operation schedule for dewatering of excavations.
   1. Provide descriptive literature of the dewatering system.
   2. Provide a plan for erosion and sedimentation control during dewatering.
   3. Provide copies of all permits/approvals for disposal/discharge of water during dewatering.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall have on-site and available the analytical test results performed in accordance with the FDEP "Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity" (FAC 62-621.300(2)).

B. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate within the excavation.

C. The Contractor's attention is directed to the water surface elevations discussed in the report(s) on subsurface investigations. Water levels will normally vary from season to season.

D. The Contractor shall be required to monitor the performance of the dewatering system during the progress of the Work and make such modifications as may be required to assure that the systems will perform satisfactorily. The dewatering system shall be designed in such a manner as to preserve the undisturbed bearing capacity of the sub-grade soils at the bottom of the trench or excavation.

E. Prior to excavation, the Contractor shall submit his proposed method of dewatering and maintaining dry conditions to the City. Approval of the dewatering plan shall not relieve the Contractor of the responsibility for the satisfactory performance of the system. The Contractor shall be responsible for correcting any disturbance of natural bearing soils or damage to structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.

F. If subsurface water is encountered, the Contractor shall utilize suitable equipment to adequately dewater the excavation. A wellpoint system or other City acceptable dewatering method shall be utilized if necessary to maintain the excavation in a dry condition for preparation of the trench bottom and for pipe laying. Within and adjacent to residential areas and other areas as required by the City, engines driving dewatering pumps shall be equipped with residential type mufflers and the noise shall not exceed 55 decibels within 50-feet.

3.02 DEWATERING AND DISPOSAL

A. The Contractor shall construct and place all pipelines, structures, concrete work, structural fill, backfill and bedding material in-the-dry. In addition, the Contractor shall make the final 24-inches of excavation in-the-dry and not until the water level is a minimum of 2-foot below proposed bottom of excavation. For purposes of this Contract, in-the-dry is defined as ±2% of the optimum moisture content of the soil.

B. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of all water entering excavations. Contractor shall keep excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

C. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

D. It is expected that dewatering will be required for pre-drainage of the soils prior to final excavation for most of the in-ground structures or piping and for maintaining the lowered groundwater level until construction has been completed so that the structure, pipeline or fill will not be floated or otherwise damaged.

E. If wellpoints are used, Contractor shall adequately space wellpoints to maintain the necessary dewatering. Provide suitable filter sand and/or other means to prevent pumping of fine sands and silts. A continual check shall be maintained by the Contractor to ensure that the subsurface soil is not being removed by the dewatering operations. Pumping from wellpoints shall be continuous and standby pumps shall be provided.

F. The Contractor's proposed method of dewatering shall include groundwater observation wells to determine the water level during construction. Observation wells shall be installed along pipelines as required to verify depth to water level and at locations approved by the City.

G. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from the surface shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped or drained by gravity to maintain an excavation bottom free from standing water.

H. Flotation shall be prevented by the Contractor by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible for all damages which may result from failure to adequately keep excavations dewatered.

I. The Contractor shall dispose of water from the Work in a suitable manner without damage to adjacent properties or facilities. No water shall be discharged without appropriate treatment for adverse contaminants. No water shall be drained in work built or under construction without prior consent from the City. Water shall be filtered to remove sand and fine soil particles before disposal into any drainage system.

J. Dewatering of excavations shall be considered incidental to the construction of the Work and all costs shall be included in the various Contract prices in the Bid Form, unless a separate bid item has been established for dewatering.

3.03 GROUNDWATER TREATMENT (IF REQUIRED)

A. If concentrations of tested groundwater quality parameters exceed those allowable in the FDEP Generic Permit for the Discharge of Produced Groundwater from any Non-Contaminated Site Activity (62-621.300(2), F.A.C.), the Contractor shall treat the effluent.

B. The Contractor shall immediately notify the City and discuss the parameters that exceed allowable limits.

C. The Contractor shall meet with the FDEP to determine alternatives that are acceptable to the FDEP.

D. The Contractor shall apply for and obtain any and all permits and/or treatment approvals that FDEP requires including but not limited too:
   1. Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1)). Allows discharges from sites with automotive gasoline, aviation gasoline, jet fuel, or diesel fuel contamination; or
   2. Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660). The coverage is available only through the individual NPDES permit issued by FDEP, allows discharges from sites with general contaminant issues i.e. ground water and/or soil contamination other than petroleum fuel contamination; or
   3. Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity (62-621.300(2), F.A.C.); or
   4. Generic Permit for Stormwater Discharge from Large or Small Construction Activities (62-621.300(4)(a), F.A.C.); or
   5. An Individual Wastewater Permit (62-604.300(8) (a)

E. The Contractor shall implement the appropriate treatment that is acceptable to FDEP and City to attain compliance for all excess limits encountered during dewatering activities. Treatment may include, but is not limited to: Chemical, Biological, Electrolysis or any combination of the three.

F. The Contractor shall make every effort to minimize the spread of contamination into uncontaminated areas. Provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Ensure provision adhere to all applicable laws, rules or regulations covering hazardous conditions and will be in a manner commensurate with the level of severity of the conditions.

G. If necessary, provide contamination assessment and remediation personnel to handle site assessment, determine the course of action necessary for site security and perform the necessary steps under applicable laws, rules and regulations for additional assessment and/or remediation work to resolve the contaminations issue.

H. Delineate the contamination area(s) and any staging or holding area required and develop a work plan that will provide the schedule of projected completion dates for the final resolution of the contamination issue.

I. Maintain jurisdiction over activities inside any delineated contamination areas and any associated staging or holding areas. Be responsible for the health and safety of workers within the delineated areas. Provide continuous access to representatives of regulatory or enforcement agencies having jurisdiction.

3.04 REMOVAL

Immediately upon completion of the dewatering system, the Contractor shall remove all of his equipment, materials, and supplies from the site of the Work, remove all surplus materials and debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before work started. The site shall be thoroughly cleaned and approved by the City.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02215
FINISH GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Provide finish grading to all areas within the limits of construction.

B. Grade sub-soil. Cut out areas to receive stabilizing base course materials for paving and sidewalks. Place, finish grade, and compact topsoil.

1.02 PROTECTION

A. Prevent damage to existing fencing, trees, landscaping, natural features, benchmarks, pavement, and utility lines. Correct damage at no cost to the City.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

PART 2 - PRODUCTS

2.01 MATERIALS

A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

B. Topsoil: Friable loam free from subsoil, roots, grass, excessive amount of weeds, stones, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4% and a maximum of 25% organic matter. The topsoil shall be suitable for the proposed plant growth shown on the Drawings and specified. Use topsoil stockpiles on site if conforming to these requirements. If there is not sufficient topsoil available at the project site, the Contractor shall furnish additional topsoil as required to complete the Work at no additional cost to the City.

PART 3 - EXECUTION

3.01 SUB SOIL PREPARATION

A. Rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, etc. Remove sub-soil that has been contaminated with petroleum products.

B. Cut out areas to subgrade elevation which are to receive stabilizing base for paving and sidewalks.

C. Bring sub soil to required levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.

D. Slope grade away from building a minimum of 2-inches in 10-feet unless indicated otherwise on the Drawings.

E. Cultivate subgrade to a depth of 3-inches where topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted sub-soil.

3.02 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding, and planting is to be performed. Place to the following minimum depths, up to finished grade elevations.
   1. 6-inches for seeded areas
   2. 4-1/2-inches for sodded areas
   3. 24-inches for shrub beds
   4. 18-inches for flower beds

B. Use topsoil in relatively dry state. Place during dry weather.

C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.

D. Remove stones, roots, grass, weeds, debris, and other foreign material while spreading.

E. Manually spread topsoil around trees, plants, and buildings to prevent damage which may be caused by grading equipment.

F. Lightly compact placed topsoil.

3.03 SURPLUS MATERIAL

A. Remove surplus sub soil and topsoil from site.

B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02220
EXCAVATING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Excavate, backfill, and compact as required for the construction of the utility system consisting of piping and appurtenances, and structural construction as shown on the Drawings and specified herein. The Contractor shall furnish all labor, materials, equipment, and incidentals necessary to perform all excavation, backfill, compaction, grading, and slope protection to complete the Work. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, all under ground utilities locations and appurtenances shown on the construction Drawings.

B. Definitions:
   1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material as determined by AASHTO T-180 (ASTM D155).
   2. Optimum Moisture: Percentage of water in a specific material at maximum density.
   3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
   4. Suitable: Suitable materials for fills shall be non-cohesive, non-plastic granular local sand and shall be free from vegetation, organic material, marl, silt, or muck. The Contractor shall furnish all additional fill material required.
   5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-8 in accordance with AASHTO Designation M 145.

C. Plan For Earthwork: The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work under this Contract. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations, including maintenance of traffic, to the City for review. The Contractor shall consider, and his plan for excavation shall reflect, the equipment and methods to be employed in the excavation. The prices established in the Proposal for the Work to be done will reflect all costs pertaining to the Work.

1.02 QUALITY ASSURANCE

A. Testing laboratory employed by the City will make such tests as are deemed advisable. The Contractor shall schedule his work to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for initial testing shall be paid by the City; however, tests which have to be repeated because of the failure of the tested material to meet specification shall be paid for by the Contractor and the cost of re-testing shall be deducted from payments due the Contractor.

B. Standards
   1. AASHTO: American Association of State Highway and Transportation Officials
   2. ANSI: American National Standards Institute
   3. ASCE: American Society of Civil Engineers
   4. ASTM: American Society for Testing and Materials
   5. AWWA: American Water Works Association
   6. OSHA 29 CFR Subpart P – Excavations and Trenches a) 1926.650, 1926.651, 1926.652
   7. OSHA 29 CFR Subpart J - a) 1910.146 for Confined Space Entry

1.03 JOB CONDITIONS

A. Existing Utilities
   1. The Contractor is responsible for subsurface verification of existing utilities prior to construction. Locate existing utilities in the area of work in accordance with Sunshine State One Call regulations, Chapter 556, "Underground Facility Damage Prevention and Safety Act", FS.
   2. Should uncharted or incorrectly charted piping or other utility be encountered during excavation, notify the City. Keep all facilities in operation and repair damaged utilities to the satisfaction of the City.
   3. Damage and repair costs to such piping or utilities are the Contractor's responsibility.
   4. If utilities are to remain in place, the Contractor shall provide adequate means of protection.

B. Test borings and the sub-surface exploration data if previously done on the site will be made available upon request and are for the Contractor's information only.

1.04 PROTECTION

A. Sheeting and Bracing
   1. Requirements of the Trench Safety Act shall be adhered to at all times.

2. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, to protect adjacent structures and power poles from undermining, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other acceptable methods. If the City is of the opinion that at any point sufficient or proper supports have not been provided, the City may order additional supports put in at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the City.
3. The Contractor shall construct the sheeting outside the neat lines of the foundation unless indicated otherwise for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressure to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected by the Contractor at their own expense so as to provide the necessary clearances and dimensions.
4. Where sheeting and bracing is required to support the sides of excavations for structures, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and the Professional Engineer shall provide certification of this.
5. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.
6. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which the City may direct him in writing to leave in place at any time during the progress of the Work for the purpose of preventing damage to structures, utilities, or property, whether public or private. The City may direct that timber used for sheeting and bracing be cut off at any specified elevation.
7. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed by the City.
8. The right of the City to order sheeting and bracing left in place shall not be construed as creating any obligation on the City's part to issue such orders, and their failure to exercise this right shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the Work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

9. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1-foot above the top of any pipe.

B. Pumping and Drainage:
   1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing the water level to return to the natural level as stipulated in Section 02140 "Dewatering." The Contractor shall engage a Professional Geotechnical Engineer registered in the State of Florida to design the dewatering systems. The Contractor shall submit to the City for a plan for dewatering systems prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan, and the Professional Engineer shall provide certification of this. The Professional Engineer shall be required to monitor the performance of the dewatering systems during the progress of the Work and require such modifications as may be required to assure that the systems are performing satisfactorily.
   2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the proposed bottom of excavation and to preserve the integrity of adjacent structures. Dewatering by trench pumping will not be permitted if migration of fine grained natural material from bottom, sidewalls, or bedding material will occur.
   3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
   4. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.
   5. Permission to use any storm sewers or drains for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the City or the authority having jurisdiction, at no cost to the City.
   6. The Contractor shall prevent flotation by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
   7. Removal of dewatering equipment shall be accomplished after compaction/density testing has been completed and the system is no longer required. The Contractor shall remove the material and equipment constituting the system.
   8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, or other contaminates in order to prevent adverse effects on groundwater quality.

1.05 TESTING AND INSPECTION SERVICE

A. The City will provide a geotechnical testing and inspection service. The services include testing soil materials and quality control testing during filling and backfilling operations. Samples of soil materials shall be furnished to the testing service by the Contractor. The City shall pay costs of initial geotechnical testing. The Contractor shall pay for any subsequent testing required due to failure and laboratory stand-by charges incurred.

B. The Contractor shall provide monthly density testing reports to the City during backfilling activities. Density testing reports not submitted in a timely manner shall result in rejection of the pipe installed and rejection of the density testing reports until such time that density re-testing is coordinated and repeated at the Contractors expense.

C. Density testing scheduled subsequent to backfilling activities shall be coordinated with, and witnessed by the City. Failure by the Contractor to coordinate or have the City present shall result in rejection of the submitted density testing reports and re-testing at the Contractor's expense.

D. Dewatering systems shall not be removed until compaction/density testing has been completed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:
   1. All fill material shall be subject to the review and acceptance of the City.
   2. All fill material shall be free of organic material, trash, or other objectionable material. The Contractor shall remove excess or unsuitable material from the job site.

B. Common Fill Material: Common fill shall consist of mineral soil, substantially free of clay, organic material, muck, loam, wood, trash, and other objectionable material which may be compressible or which cannot be compacted properly. Common fill shall not contain stones larger than 3-1/2-inches in any dimension in the top 12-inches or 6-inches in any dimension in the balance of fill area. Common fill shall not contain asphalt, broken concrete, masonry, rubble or other similar materials. It shall have physical properties that allow it to be easily spread and compacted during filling. Additional common fill shall be no more than 12 % by weight finer than the No. 200 mesh sieve, unless finer material is approved for use in a specific location by the City. Select Common Fill shall be as specified as above from common fill, except that the material shall contain no stones larger than 1/2-inches in largest dimension, and shall be no more than 5 % by weight finer than the No. 200 mesh sieve.

C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand having the following gradation:

US Sieve Size	Percent Passing By Weight

No. 1	100
No. 4	75 - 100
No. 40	15 - 80
No. 100	0 - 30
No. 200	0 - 12

D. Class 1 Soils*: Manufactured angular, granular material, 1/4 to 1-1/2-inches (6 to 4 mm) size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming to ASTM C33 stone size No. 89 and with particle size limits as follows:

U.S. Sieve Size	% Passing By Weight
½	100
3/8	100
No. 4	20 – 25
No. 8	5 – 30
No. 16	0 - 10
No. 50	0 - 2

E. Class II Soils**:
1. GW: Well graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
3. SW: Well graded sands and gravelly sands, little or no fines. More than passes No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
4. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 % passes No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.

*Soils defined as Class I materials are not defined in ASTM D2487.
**In accordance with ASTM D2487, less than 5 % pass No. 200 sieve.

F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

U.S. Sieve Size	Percent Passing By Weight
3/8	100
No. 10	85 – 100
No. 40	20 – 40
No. 200	0 - 12

G. Other Material: All other material, not specifically described, but required for proper completion of the Work shall be selected by the Contractor and acceptable by the City.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing:
   1. The construction areas shall be cleared of all obstructions and vegetation including large roots and undergrowth within 10-feet of the lines of the excavation.
   2. Strip and stockpile topsoil on the site at the location to be determined by the City.

3.02 EXCAVATION

A. General: Excavations for roadways, structures, and utilities must be carefully executed in order to avoid interruption of utility service.

B. Excavating for Roadways/Structures/Utilities:
   1. Excavation shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.
      a. Excavation for precast or prefabricated structures shall be carried to an elevation 2-feet lower than the proposed outside bottom of the structure to provide space for the select backfill material. Prior to placing the select backfill, the excavation shall be measured by the City to verify that the excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.
      b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete.
      c. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation.
   2. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.
   3. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the Work.
   4. Encounters with subsurface obstructions shall be hand excavated.
   5. Excavation and dewatering shall be accomplished by methods that preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods shall be removed and replaced by crushed stone as required by the City at the Contractor's expense.
   6. The bottom of excavations shall be rendered firm and dry before placing any piping or structure.
   7. All pavements shall be cut with saws or approved power tools prior to removal.

8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor.

3.03 DRAINAGE

A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition. The dewatering method used shall prevent disturbance of earth below grade.

B. All water pumped or drained from the Work shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.

C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete within 24-hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.

D. The Contractor will be required at his expense to excavate below grade and refill with crushed stone (gradation 57 or 89) or other acceptable fill material if the City determines that adequate dewatering has not been provided.

3.04 UNDERCUT

A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable subgrade due the Contractor's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction method shall be approved by the City.

3.05 FILL AND COMPACTION

A. Compact and backfill excavations and construct embankment according to the following schedule. (Modified Proctor standard shall be ASTM D-1557):

STRUCTURES AND ROADWORK

Area	Material	Compaction
Beneath Structures	Structural Fill	12-inch lifts, compacted to 98% maximum density as determined by AASHTO T-180. Fill Should not be placed over any in-place soils until those deposits have been compacted to 98% Modified Proctor.
Around Structures	Structural Fill	12-inch lifts, 95% of maximum density as determined by AASHTO T-180. Rubber Tire or vibratory plate compactors shall be used

Beneath Paved Surfaces	Common Fill	12-inch lifts, 98% by maximum density as determined by AASHTO T-180 or as required by the FDOT Standards.
Open Areas	Common Fill	12-inch lifts, 95% by maximum density as determined by AASHTO T-180.

B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.

C. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. The backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.

D. Embankments shall be constructed true to lines, grades, and cross sections shown on the plans or ordered by the City. Embankments shall be placed in successive layers of not more than 8-inches in thickness, loose measure, for the full width of the embankment. As far as practicable, traffic over the Work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.

E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified herein, such request shall be in writing to the City. Acceptance will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The City's acceptance shall be in writing.

F. One compaction test location shall be required for each 300 linear feet of pipe and for every 100 square feet of backfill around structures as a minimum. The City may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of the compaction tests within the trench shall be in conformance with the following schedule:
   1. At least one test at the spring line of the pipe.
   2. At least one test for each 12-inch layer of backfill within the pipe bedding zone for pipes 24-inches and larger.
   3. One test at an elevation of 1-foot above the top of pipe.
   4. One test for each 2-feet of backfill placed from 1-foot above the top of the pipe to finished grade elevation.
   5. Density testing is required for sanitary sewer manholes. Tests shall be staggered around the manhole within 3-feet of the structure’s outside diameter.
      a. First test shall be 1-foot above the structure base.
      b. Second test shall be 2-feet above the first test and subsequent tests every 2-feet up the finished grade.
   6. The Contractor shall provide additional compaction and testing prior to commencing further construction if the City’s testing reports and inspection indicate that the fill has been placed below specified density.
   7. The Contractor shall coordinate testing with the City approved testing laboratory and shall provide monthly test results to the City in a timely manner during construction activities. Density testing scheduled subsequent to backfilling activities shall be

coordinated with the City and witnessed by the City representative. Failure by the Contractor to coordinate or have the City representative present shall result in rejection of the submitted density testing reports and re-testing at the Contractor's expense. Density testing reports not submitted in a timely manner shall result in rejection of the pipe installed and rejection of the density testing reports until such time that density re-testing is coordinated and repeated at the Contractor's expense as deemed necessary by the City's representative.

8. Dewatering systems shall not be removed until compaction/density testing has been completed.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02570
STABILIZED SUBGRADE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: All labor, materials, and equipment required to install stabilized subgrade.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO) latest edition:
   1. AASHTO T-180 – Moisture-Density Relations of Soils Using a 10-lb Rammer and 18-in Drop

B. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition:
   1. Section 914 – Stabilization Materials

1.03 QUALITY ASSURANCE

A. Field compaction density, stability, and thickness testing frequencies of the subgrade shall be tested once every 300 linear feet of paving per 24-foot wide strip, staggered left, center, and right of centerline. Where less than 300 linear feet of asphalt is placed in 1-day, provide minimum of 1 test for each per day's construction at a location designated by the City.

1.04 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
   1. Materials certificates signed by material producer and Contractor, certifying that each material item complies with specified requirements.

1.05 SYSTEM DESCRIPTION

A. Stabilize the roadbed below the proposed base to provide a firm and unyielding subgrade.

B. Provide a finished roadbed section that meets the bearing value requirements regardless of the quantity of stabilizing materials necessary to be added.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the approved products.

B. The Contractor may choose the type of stabilizing material.

C. Materials may be lime rock, shell rock, cemented coquina, or shell-base sources approved by the FDOT.

D. At least 97% by weight of the total material shall pass a 3-1/2-inch (90-mm) sieve. Material having a plasticity index greater than 10 or a liquid limit greater than 40 shall not be used as a stabilizer.

2.02 LIMEROCK

A. For limerock, carbonates of calcium and magnesium shall be at least 70%.

2.03 CRUSHED SHELL

A. Crushed shell for this use shall be mollusk shell (i.e., oysters, mussels, clams, cemented coquina). Steamed shell will not be permitted.

B. At least 50% by weight of the total material shall be retained on the No. 4 (4.75 µm) sieve.

C. Not more than 20% by weight of the total material shall pass the No. 200 (75 µm) sieve. The determination of the percentage passing the No. 200 (75 µm) sieve shall be by washing only.

2.04 LOCAL MATERIALS

A. Local materials used for this stabilizing may be soils or recyclable materials such as crushed concrete, roof tiles, asphalt coated base, or reclaimed pavement. However, no materials that deteriorate over time, cause excessive deformations, contain hazardous substances, contaminates, or do not improve the bearing capacity of the stabilized material may be used.

PART 3 - EXECUTION

3.01 GENERAL

A. Prior to the beginning of stabilizing operations, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades, and cross-section shown in the plans. Prior to spreading any additive stabilizing material, bring the surface of the roadbed to a plane approximately parallel to the plane of the proposed finished surface.

B. Process the subgrade to be stabilized in 1 course, unless the equipment and methods

being used do not provide the required uniformity, particle size limitation, compaction, and other desired results, in which case, the City will direct that the processing be done in more than 1 course.

3.02 APPLICATION OF STABILIZING MATERIAL

A. When additive stabilizing materials are required, spread the designated quantity uniformly over the area to be stabilized.

B. When materials from an existing base are to be used in the stabilizing at a particular location, place and spread all of such materials prior to the addition of other stabilizing additives.

C. Spread commercial stabilizing material by the use of mechanical material spreaders, except that where use of such equipment is not practicable, use other means of spreading, but only upon written approval of the proposed alternate method.

3.03 MIXING

A. Perform mixing using rotary tillers or other equipment meeting the approval of the City. The Contractor may mix the materials in a plant of an approved type suitable for this Work. Thoroughly mix the area to be stabilized throughout the entire depth and width of the stabilizing limits.

B. Perform the mixing operations as specified (either in place or in a plant) regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

3.04 MAXIMUM PARTICLE SIZE OF MIXED MATERIALS

A. At the completion of the mixing, ensure that the gradation of the material within the limits of the area being stabilized is such that 97% will pass a 3-1/2-inch sieve and that the material does not have a plasticity index greater than 8 or liquid limit greater than 30. Note that clay balls or lumps of clay size particles (2 microns or less) cannot be considered as individual particle sizes. Remove any materials not meeting the plasticity requirements from the stabilized area. The Contractor may break down or remove from the stabilized area materials not meeting the gradation requirements.

3.05 COMPACTION

A. Compact the materials at a moisture content permitting the specified compaction. If the moisture content of the material is improper for attaining the specified density, either add water or allow the material to dry until reaching the proper moisture content for the specified compaction.

3.06 FINISH GRADING

A. Shape the completed stabilized subgrade to conform to the finished lines, grades, and

cross-section indicated in the Drawings. Check the subgrade using elevation stakes or other means approved by the City.

3.07 CONDITION OF COMPLETED SUBGRADE

A. After completing the stabilizing and compacting operations, ensure that the subgrade is firm and substantially unyielding to the extent that it will support construction equipment and will have the bearing value required by the Drawings.

B. Remove all soft and yielding material, and any other portions of the subgrade that will not compact readily. Replace yielding material with suitable material so that the whole subgrade is brought to line and grade with proper allowance for subsequent compaction.

3.08 MAINTENANCE OF COMPLETED SUBGRADE

A. After completing the subgrade, maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of materials, equipment, and tools. The Contractor is responsible for maintaining the required density until the subsequent base or pavement is in place including any repairs or replacement of curb and gutter or sidewalk which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Perform any such recompaction at no expense to the City. Construct and maintain ditches and drains along the completed subgrade section.

3.09 FIELD QUALITY CONTROL

A. When proper moisture conditions are attained, compact the material to not less than 98% of maximum density determined by AASHTO T-180, and a minimum LBR of 40.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02573
ASPHALT PAVEMENT REMOVAL AND REPLACEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Mill or remove existing asphalt pavement and base materials and install asphalt paving on a prepared base or as an overlay to existing asphalt pavement sections. Provide Maintenance of Traffic and coordinate and install temporary and permanent replacement of traffic signalization and pavement striping and markings.

1.02 REFERENCES

A. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, 2000 and 2004 editions.
   1. Section 300 – Prime and Tack Coats for Base Courses (2000 and 2004 Editions)
   2. Section 320 – Hot Bituminous Mixtures – Plant, Methods, and Equipment (2000 and 2004 Editions)
   3. Section 327 – Milling of Existing Asphalt Pavement (2000 and 2004 Editions)
   4. Section 330 – Hot Bituminous Mixtures – General Construction Requirements (2000 and 2004 Editions)
   5. Section 331 – Type S Asphalt Concrete (2000 Edition)
   6. Section 334 – Superpave Asphalt Concrete (2004 Edition)
   7. Section 901 – Coarse Aggregate (2000 and 2004 Editions)
   8. Section 902 – Fine Aggregate (2000 and 2004 Editions)
   9. Section 916 – Bituminous Materials (2000 and 2004 Editions)
   10. Section 917 – Mineral Filler (2000 and 2004 Editions)

B. Florida Department of Transportation (FDOT) Design Standards, 2000 and 2004 editions.

1.03 QUALITY ASSURANCE

A. Asphalt pavements shall be plant-mixed hot bituminous mixtures. Plant operations shall not begin unless all weather conditions are suitable for laying operations. A prime and tack coat shall be first applied to newly constructed bases. A tack coat shall be applied on existing pavements that are to be overlayed with an asphalt mix and between successive layers of asphalt mix. Apply prime and tack coats when ambient or base surface temperature is above 40°F, and when temperature has been above 35ºF for 12-hours immediately prior to application. Construct asphaltic concrete paving when ambient temperature is above 45°F. Do not apply when base is wet, contains excess moisture, or during rain. Establish and maintain required lines and elevations.

B. Do not spread the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

C. Field compaction density and thickness testing frequencies of the asphalt shall be tested once every 300-linear feet of paving per 24-foot wide strip, staggered left, center, and right of centerline. Where less than 300-linear feet of asphalt is placed in 1-day, provide minimum of 1 test for each per day's construction at a location designated by the City.

D. Asphalt extraction gradation shall be tested from grab samples collected once every 1,800-square yards of asphalt delivered to the site, or a minimum of once per day. Obtain the results in a timely manner (no later than the end of the day) so that adjustments can be made if necessary.

E. On initial use of a Type S mix design at a particular plant, as a minimum, run an additional extraction gradation analysis if more than 500-tons [450-metric tons] of mixture are produced on the first day of production.

F. Tolerances for Quality Control Tests (Extraction Gradation Analysis) shall be in accordance with FDOT Specification Section 331.

1.04 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
   1. Submit for each proposed design mix the Gradation analysis; Grade of asphalt cement used; and Marshall Stability in pounds flow.
   2. Provide a single percentage of asphalt by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%. For structural mixes (S-1, S-3) establish the optimum asphalt content at a level corresponding to a minimum of 4.5% air voids. Provide the laboratory density of the asphalt mixture for all mixes except Open-Graded Friction Courses.
   3. Identify source and description of the materials to be used.
   4. Provide certification that the mix design conforms to specification requirements.
   5. Field compaction density and thickness testing.
   6. Field asphalt extraction gradation.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

B. Type S Asphalt Concrete (Type S-1 or S-3) is required. The equivalent fine Type SP (Superpave) Asphalt Concrete mixture (Traffic Level C) meeting the requirements of FDOT Specification Section 334 may be selected as an alternate at no additional cost to the City. The equivalent mixes are as follows:
   1. Type S-1: Type SP-12.5
   2. Type S-3: Type SP-9.5

C. Asphalt plant and equipment shall meet the requirements in FDOT Specification Section 320.

2.02 AGGREGATE

A. Coarse Aggregate, Stone, Slag, or Crushed Gravel shall meet the requirements in FDOT Specification Section 901.

B. Fine Aggregate shall meet the requirements in FDOT Specification Section 902.

C. Aggregate gradation shall meet the following:

Table 02573-1
Bituminous Concrete Mixtures
(Gradation Design Range)

Type	Total Aggregate Passing Sieves1							
	3/4-inch [19.0 mm]	1/2-inch [12.5 mm]	3/8-inch [9.5 mm]	No. 4 [4.75 mm]	No. 10 [2.0 mm]	No. 40 [425 µm]	No. 80 [180 µm]	No. 200 [75 µm]
S-1[4]	100	88-98	75-93	47-75	31-53	19-35	7-21	2-6
S-3[4]		100	88-98	60-90	40-70	20-45	10-30	2-6
ABC-1		100						0-12
ABC-2		100			55-90			0-12
ABC-3[2]	70-100			30-70	20-60	10-40		2-10
FC-2[3]		100	85-100	10-40	4-12			
FC-3[4]		100	88-98	60-90	40-70	20-45	10-30	2-6

1. In inches [mm] or sieves [µm].
2. 100% passing 1-1/2-inch [37.5 mm] sieve.
3. The City may increase the design range for the No. 10 [200 mm] sieve for lightweight aggregates.
4. The City may retain up to 1% on the maximum sieve size.

D. Use clean aggregate containing no deleterious substances. Do not use coarse or fine aggregate which contains more than 0.5% of phosphate.

E. In laboratory tests, and for the purpose of proportioning the paving mixture, consider all material passing the No. 10 [2.00-mm] sieve and retained on the No. 200 [75 µm] sieve as fine aggregate, and the material passing the No. 200 [75 µm] sieve as mineral filler.

F. Do not use any screenings in the combination of aggregates containing more than 15% of material passing the No. 200 [75 µm] sieve. When two screenings are blended to produce the screening component of the aggregate, one of such screenings may contain up to 18% of material passing the No. 200 [75 µm] sieve, as long as the combination of the two does not contain over 15% material passing the No. 200 [75 µm] sieve. Screenings may be washed to meet these requirements.

2.03 ASPHALT CEMENT

A. Superpave PG Asphalt Binder or Recycling Agent shall meet the requirements in FDOT Specification Section 916.

B. Mineral Filler shall meet the requirements in FDOT Specification Section 917.

C. Marshall design mix shall be in accordance with the following:

Table 02573-2
Marshall Design Properties For Bituminous Concrete Mixes

Mix Type	Minimum Marshall Stability (lbs.)	Flow* (0.01 in)	Minimum VMA (%)	Air Voids (%)	Minimum Effective Asphalt Content (%)	VFA Voids Filled with Asphalt (%)
S-1	1,500	8-13	14.5	4-5	**	65-75
S-3	1,500	8-13	15.5	4-6	**	65-75
ABC-1	500	7-15	15	5-16	6.0	-
ABC-2	750	7-15	15	5-14	5.5	-
ABC-3	1,000	8-13	14	4-7	**	65-78
FC-2	-	-	-	-	-	-
FC-3	1,500	8-13	15.5	4-6	**	65-75

* The maximum Flow value during production shall not exceed one point more than shown in the Table.
** The ratio of the percentage by weight of total aggregate passing the No. 200 sieve to the effective asphalt content expressed as a percentage by weight of total mix shall be in the range of 0.6 to 1.2.

2.04 BITUMINOUS MIXTURE

A. Use a bituminous mixture composed of a combination of aggregate (coarse, fine or mixtures thereof), mineral filler, if required, and bituminous material. Ensure that no more than 20% by weight of the total aggregate used is silica sand or local materials as defined in FDOT Specification Section 902. Size, grade, and combine the several aggregate fractions in such proportions that the resulting mixture meets the grading and physical properties of the verified mix design.

PART 3 - EXECUTION

3.01 GENERAL

A. Set up, install and maintain temporary traffic control devices and detours as necessary in accordance with Specification Section 1570 "Maintenance of Traffic."

B. Asphalt pavements, including all surface courses and base courses, where shown to be open cut and removed on the Drawings or specified in the Project Manual, shall be removed to a line back from each edge of the trench, other excavation, or to the limits indicated on the Drawings. Pavements shall be cut straight, clean and square with a power saw or other tools and equipment suitable for the Work.

C. Asphalt pavements, where shown to be milled on the Drawings or specified in the Project Manual, shall be milled according to FDOT Specification Section 327.

D. Asphalt mixtures shall meet the general construction requirements specified in FDOT Specification Section 330.

E. Spread the mixture only when the surface upon which it is to be laid has been previously prepared, is intact, firm, and properly cured, and is dry. Do not spread mixture that cannot be finished and compacted during daylight hours.

F. Deliver the asphalt cement from the asphalt plant at a temperature not to exceed 350°F and equip the transport tanks with sampling and temperature sensing devices meeting the requirements of FDOT. Maintain the asphalt cement in storage within a range of 230°F to 350ºF in advance of mixing operations. Maintain constant heating within these limits, and do not allow wide fluctuations of temperature during a day's production.

G. Produce a homogeneous mixture, free from moisture and with no segregated materials, that meets all specification requirements for the mixture, including compliance with the Marshall Properties. Also apply these requirements to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.

3.02 PREPARATION OF APPLICATION SURFACES

A. Prior to the laying of the mixture, clean the surface of the base or pavement to be covered of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

B. Where an asphalt mix is to be placed on an existing pavement or old base that is irregular, and wherever the plans indicate, bring the existing surface to proper grade and cross-section by the application of patching or leveling courses.

C. Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep and dispose of all loose material from the paving area.

D. Paint all structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb and gutter, with a uniform coating of asphalt cement to provide a closely bonded, watertight joint.

E. Apply a prime and tack coat on newly constructed bases and apply a tack coat, as specified in FDOT Specification Section 300, on existing pavement structures that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes.

3.03 PLACING MIXTURE

A. Lay all asphaltic concrete mixtures, including leveling courses, other than adjacent to curb and gutter or other true edges, by the string line method to obtain an accurate, uniform alignment of the pavement edge.

B. For each paving machine operated, use a separate crew, each crew operating as a full unit. The Contractor's Certified Paving Technician in charge of the paving operations may be responsible for more than one crew but must be physically accessible to the City at all times when placing mix.

C. Check the depth of each layer at frequent intervals, and make adjustments when the thickness exceeds the allowable tolerance. When making an adjustment, allow the paving machine to travel a minimum distance of 32-feet to stabilize before the second check is made to determine the effects of the adjustment.

D. In limited areas where the use of the spreader is impossible or impracticable, the Contractor may spread and finish the mixture by hand.

E. Straightedge and back-patch after obtaining initial compaction and while the material is still hot.

F. Upon arrival, dump the mixture in the approved mechanical spreader, and immediately spread and strike-off the mixture to the full width required, and to such loose depth for each course that, when the Work is completed, the required weight of mixture per square yard [square meter], or the specified thickness, is secured. Carry an excess amount of mixture ahead of the screed at all times. Hand-rake behind the machine as required.

G. Construct each course in layers of the thickness as shown on FDOT Design Standards Index No. 513.

H. Before starting any rolling, check the surface; correct any irregularities; remove all drippings, fat sandy accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

3.04 APPLICATION OF LEVELING COURSES

A. Before spreading any leveling course, fill all depressions in the existing surface more than 1-inch deep by spot patching with leveling course mixture, and then compact them thoroughly.

B. Place all courses of leveling by the use of two (2) motor graders; equip one with a spreader box. Use other types of leveling devices after they have been approved by the City.

C. When the total asphalt mix provided for leveling exceeds 50-lb/yds² [27-kg/m²], place the mix in two or more layers, with the average spread of any layer not to exceed 50-lb/yd² [27-kg/m²]. When using Type S-3 Asphaltic Concrete for leveling, do not allow the average spread of a layer to be less than 50-lb/yd² [27-kg/m²] or more than 75-lb/yd² [40-kg/m²]. The Contractor may vary the rate of application throughout the Project as directed by the City. When leveling in connection with base widening, the City may require placing all the leveling mix prior to the widening operation.

3.05 COMPACTING MIXTURE

A. The coverage is the number of times the roller passes over a given area of pavement. Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops below 160°F.

B. Seal Rolling: Provide two (2) coverages with a tandem steel-wheeled roller (either vibratory or static), weighing 5 to 12-tons, following as close behind the spreader as possible without pick-up, undue displacement, or blistering of the material. Use vibratory rollers in the static mode for layers of 1-inch or less in thickness.

C. Intermediate Rolling: Provide five (5) coverages with a self-propelled pneumatic-tired roller, following as close behind the seal rolling operation as the mix will permit.

D. Final Rolling: Provide one (1) coverage with a tandem steel-wheeled roller (static mode only), weighing 5 to 12-tons, after completing the seal rolling and intermediate rolling, but before the surface pavement temperature drops below 160ºF.

E. Operate the self-propelled, pneumatic-tired roller at a speed of 6 to 10-mph. For each roller, do not exceed an area of coverage of 4,000 yd²/hour; if rolling Type S Asphaltic Concrete, do not exceed an area of coverage of 3,000 yd²/hour.

F. Use a sufficient number of self-propelled pneumatic-tired rollers to ensure that the rolling of the surface for the required number of passes does not delay any other phase of the laying operation and does not result in excessive cooling of the mixture before completing the rolling. In the event that the rolling falls behind, discontinue the laying operation until the rolling operations are sufficiently caught up.

G. Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, headers, gutters, manholes, etc.

H. Use self-propelled pneumatic-tired rollers to roll all patching and leveling courses. Where placing the initial leveling course over broken concrete pavement, use a pneumatic-tired roller that weighs at least 15-tons. For Type S-3 Asphaltic Concrete leveling courses, use a steel-wheeled roller to supplement the traffic rollers. On other leveling courses, use a steel-wheeled roller to supplement the traffic rollers on all passes after the first pass.

I. Do not allow the rollers to deposit gasoline, oil, or grease onto the pavement. Remove and replace any areas damaged by such deposits as directed by the City. While rolling is in progress, test the surface continuously, and correct all discrepancies to comply with the surface requirements. Remove and replace all drippings, fat or lean areas, and defective construction of any description. Remedy depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface. Correct all high spots, high joints, and honeycombing as directed by the City. Remove and replace any mixture remaining unbonded after rolling. Correct all defects prior to laying the subsequent course.

J. Use a self-propelled pneumatic-tired roller on the first structural layer placed on a milled surface. Compact with a minimum of three passes.

3.06 JOINTS

A. Place the mixture as continuously as possible. Do not pass the roller over the unprotected end of the freshly laid mixture except when discontinuing the laying operation long enough to permit the mixture to become chilled. When thus interrupting the laying operation, construct a transverse joint by cutting back on the previous run to expose the full depth of the mat.

B. For all layers of pavement except the leveling course, place each layer so that longitudinal construction joints are offset 6-inches to 12-inches laterally between successive layers.

C. When laying fresh mixture against the exposed edges of joints (trimmed or formed as provided above), place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

3.07 SURFACE REQUIREMENTS

A. Obtain a smooth surface on all pavement courses placed, and then straightedge all intermediate and final courses with a 15-foot rolling straightedge. Furnish a 15-foot [4.572-m] manual straightedge, and make it available at the job site at all times during the paving operation for checking joints and surface irregularities.

B. Produce a finished surface of uniform texture and compaction with no pulled, torn, or loosened portions and free of segregation, sand streaks, sand spots, or ripples.

3.08 ACCEPTANCE REQUIREMENTS

A. Upon completion of the final surface or friction course, the City will test the finished surface with a 15-foot rolling straightedge. Correct all deficiencies in excess of 3/16-inch.

B. If correction is made by removing and replacing the pavement, remove the full depth of the course and extend at least 50-feet on either side of the defective area for the full width of the paving lane.

C. If correction is made by overlaying, cover the length of the defective area and taper uniformly to a featheredge thickness at a minimum distance of 50-feet on either side of the defective area. Extend the overlay the full width of the roadway. Maintain the specified cross slope. The City may adjust, as necessary, the mix used for the overlay for this purpose.

D. The maximum deficiency from the specified thickness as follows:
   1. For pavement of a specified thickness of 2-1/2-inches or more: 1/2-inch
   2. For pavement of a specified thickness less than 2-1/2-inches: 1/4-inch

E. Where the deficiency in thickness is: (1) in excess of 3/8-inch for pavement of less than 2-1/2-inches in specified thickness, or (2) in excess of 3/4-inch for pavement of specified thickness of 2-1/2-inches or more, correct the deficiency either by replacing the full thickness for a length extending at least 50-feet from each end of the deficient area.

F. For any case of excess deficiency of the pavement, if approved by the City for each particular location, correct the deficient thickness by adding new surface material, and compact it to the same density as the adjacent surface. The City will determine the area to be corrected and the thickness of new material added.

3.09 REPAIR AND RESTORATION

A. Replace asphalt pavement or roadway surfaces cut or damaged to equal or better condition than the original, including stabilization, base course, surface course, curb and gutter, and other appurtenances.

3.10 SIGNALIZATION, PAVEMENT STRIPING AND MARKING

A. The Contractor shall be responsible for coordinating, repairing or replacing all traffic signalization devices and traffic loops damaged during the pavement milling, removal and replacement process.

B. The Contractor shall be responsible for coordinating, inventorying, and replacing all temporary and permanent pavement striping and markings damaged during the asphalt pavement milling, removal, and replacement process.

C. Temporary pavement striping and markings shall be paint or reinforced retro-reflective removal tape. Foil back tape is not acceptable. Permanent pavement striping and markings shall be alkyd thermoplastic tape and raised reflective pavement markers.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02576
CONCRETE SIDEWALKS AND DRIVEWAYS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Constructing new concrete sidewalks, driveways, and curb and gutters as shown on the Drawings.

1.02 QUALITY ASSURANCE

A. Codes and Standards: Comply with applicable sections of F.D.O.T. Specifications and local governing regulations.

B. The mixture, placement, and curing of all concrete work shall be in accordance with F.D.O.T. Specifications.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. Furnish manufacturer's product data, design mixes, test reports, and materials certifications.

1.04 JOB CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities, as specified under Section 01570 "Maintenance of Traffic."

B. Utilize flagman, barricades, warning signs, and warning lights as required.

1.05 GUARANTEE

A. All restored areas within the public right-of-way shall be guaranteed for 1-year after final acceptance. In the event of cracked or broken concrete surfaces, the Contractor shall make the necessary repairs to restore the concrete within 10-calendar days after notification by the City. The cost of such repairs shall be paid by the Contractor.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the approved products.

2.02 CONCRETE MATERIALS

A. Forms: Steel or wood for each type of use of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
   1. Use flexible spring steel forms or laminated boards to form radius bends as required.
   2. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete.

B. Fibermesh Reinforcement: Fibermesh reinforcement fibers shall be 2-inches to 3-inches collated polypropylene fibers. Fibers shall be in strict accordance with the manufacturer recommendations and within the time as specified in ASTM C94, Type III 4.13 and applicable building codes.

C. Concrete Materials: Comply with requirements of F.D.O.T. Section 347 for concrete materials, admixtures, bonding materials, curing materials, and others as required.

D. Epoxy Resin Grout: Type N as specified in F.D.O.T. Section 926.

E. Aggregate, brick, or other material required to match existing driveway or walk shall be as approved by the City.

2.03 CONCRETE MIX, DESIGN, AND TESTING

A. Comply with requirements of applicable F.D.O.T. Section 347 for concrete mix design, sampling and testing, and quality control, and as herein specified.

B. Design the mix to produce standard weight concrete consisting of Portland cement, aggregate, air entraining admixture, and water to produce the following properties.
   1. Compressive Strength: Class B, 3,000 psi for walks and curbs.
   2. Compressive Strength: Class A, 4,000 psi for driveways.
   3. Air Content: 3% to 6% .

C. Concrete slump shall not exceed plus or minus 1-inch from approved design slump.

PART 3 - EXECUTION

3.01 CONCRETE SIDEWALK, DRIVEWAY, AND CURB AND GUTTER

A. Surface Preparation:
   1. Remove loose material from the compacted sub base surface immediately before

placing concrete.

2. Proof-roll prepared sub base surface to check for unstable areas and the need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

B. Form Construction:
   1. Set forms to the required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of the Work and so that forms can remain in place at least 24-hours after concrete placement.
   2. Check completed form work for grade alignment to the following tolerances:
      a. Top of forms not more than 1/8-inch in 10-feet.
      b. Vertical face on longitudinal axis, not more than 1/4-inch in 10-feet.
   3. Clean forms for reuse immediately after use, and coat with form release agent as often as required to ensure separation from concrete without damage.

C. Concrete Placement:
   1. Do not place concrete until sub base and forms have been checked for line and grade. Moisten if required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are completed to required finish elevation and alignment. Use special colors or aggregate as required to match existing material.
   2. Place concrete using methods which prevent segregation of the mix. Consolidate concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices. Do not use vibrators to push or move concrete in forms or chute.
   3. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.
   4. An automatic machine may be used for sidewalk or curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed the minimum herein specified. Machine placement must produce sidewalks and/or curbs and gutters to the required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.
   5. Joints: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise indicated. Construct transverse joints at right angles to the centerline, unless otherwise indicated. When joining existing structures place transverse joints to align with previously placed joints, unless otherwise indicated.
      a. Weakened-Plane Joints: Provide weakened-plane (contraction) joints sectioning concrete into areas as shown on the Drawings. Construct weakened plane joints for a depth equal to at least 1/4 concrete thickness, by sawing within 24-hours of placement or formed during finishing operations. Place joints at intervals not to exceed 10-feet if not otherwise indicated.
      b. Construction Joints: Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than 1/2-

hour, except where such pours terminate at expansion joints. Construction joints shall be as shown or, if not shown, use standard metal keyway-section form of appropriate height.

c. Expansion Joints:
   (1) Provide premolded joint filler for expansion joints abutting concrete curbs, catch basin, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.
   (2) Locate expansion joints at 12-feet on center for concrete walks unless otherwise indicated.
   (3) Extend joint fillers full-width and depth of joint, and not less than 1/2-inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
   (4) Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Pieces shorter than 4-inches shall not be used unless specifically shown as such.
   (5) Protect the top edge of the joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
   (6) Fillers and Sealants: Comply with the requirements of these specifications for preparation of joints, materials installation, and performance, and as herein specified.

D. Concrete Finishing:
   1. After striking-off and consolidating concrete, smooth the surface by screening and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
   2. After floating, test surface for trueness with a 20-foot straightedge. Variations exceeding 1/3-inch for any two points within 10-feet shall not be acceptable. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
   3. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round 10-1/2-inch radius, unless otherwise indicated. Eliminate any tool marks on concrete surface.
   4. After completion of floating and when excess moisture or surface sheen has disappeared, broom finish sidewalks by drawing a fine-hair broom across concrete surface, perpendicular to a line of pedestrian traffic. If the existing material has another finish, match existing finish.
   5. Do not remove forms for 24-hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas.

E. Curing:

   Protect and cure finished concrete paving and walks, complying with applicable requirements of F.D.O.T. Section 350. Use moist-curing methods for initial curing of approved concrete curing compounds whenever possible.

F. Repairs and Protections:

1. Repair or replace broken or defective concrete, as directed by the City.
2. Drill test cores where directed by the City, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy resin grout.
3. Protect concrete from damage until acceptance of work. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
4. Sweep concrete pavement and wash free of stains and discolorations, dirt, and other foreign material just prior to final inspection.

3.02 FIELD QUALITY CONTROL

A. General: Repair or remove and replace unacceptable concrete sidewalk, driveways, or curb and gutter as directed by the City.

B. Surface Elevation: Actual surface elevations shall be within ± 0.05 feet of specified or indicated elevations an any given point. Surface elevations between any 2 given points shall be interpolated from a direct line between the 2 points. Surfaces exceeding actual elevation tolerances of more than ± 0.05 feet at any 2 points within a distance of 15-feet will not be acceptable.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02578
SOLID SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Establishing a stand of grass by furnishing and placing grass sod. Included are fertilizing, watering, and maintenance as required to assure a healthy stand of grass. Solid sodding shall be placed on all slopes greater than 4:1, within 10-feet of all proposed structures, and in all areas where existing grass or sod (regardless of it's condition) is removed or disturbed by Contractor's operation unless otherwise specified or shown on the Drawings.

1.02 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
   1. A certification of sod quality by the producer shall be delivered to the City ten days prior to use.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 GRASS SOD

A. Grass sod for the road rights-of-way shall be of variety to match the existing adjacent area and shall be well matted with grass roots. The sod shall be taken up in rectangles, preferably 12-inch by 24-inch, shall be a minimum of 2-inches in thickness, and shall be live, fresh, and uninjured at the time of planting.

B. Grass sod for restoration of new construction sites and/or areas disturbed by construction on existing sites shall be St. Augustine well matted with grass roots. The sod shall be taken up in rectangles, preferably 12-inch by 24-inch, shall be a minimum of 2-inches in thickness, and shall be live, fresh, and uninjured at the time of planting.

C. It shall be reasonably free of weeds and other grasses and shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. The sod shall be planted as soon as possible after being dug and shall be shaded and kept moist until it is planted.

2.03 FERTILIZER

A. Commercial fertilizers shall comply with the state fertilizer laws.

B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water-soluble potash contained in the fertilizer.

C. The chemical designation of the fertilizer shall be 6-6-6. At least 50% of the nitrogen shall be derived from organic sources. At least 50 % of the phosphoric acid shall be from normal super phosphate or an equivalent source, which will provide a minimum of two units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container.

2.04 WATER FOR GRASSING

A. The water used in the sodding operations shall be by the Contractor as approved by the City.

PART 3 - EXECUTION

3.01 PREPARATION OF GROUND

A. The area over which the sod is to be placed shall be scarified or loosened to a depth and then raked smooth and free from debris. Where the soil is sufficiently loose and clean, the City, at its discretion, may authorize the elimination of ground preparation.

3.02 APPLICATION OF FERTILIZER

A. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 - 7.0.

B. The fertilizer shall be spread uniformly over the area to be sodded at the rate of 700-pounds per acre, or 16-pounds per 1,000 square feet, by a spreading device capable of uniformly distributing the material at the specified rate. Immediately after spreading, the fertilizer shall be mixed with the soil to a depth of approximately 4-inches.

C. On steep slopes, where the use of a machine for spreading or mixing is not practicable, the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a depth of approximately 2-inches.

3.03 PLACING SOD

A. The sod shall be placed on the prepared surface, with edges in close contact and shall be firmly and smoothly embedded by light tamping with appropriate tools.

B. Where sodding is used in drainage ditches, or on slopes of 4:1 or greater, the setting of the pieces shall be staggered to avoid a continuous seam along the line of flow. Along the edges of such staggered areas, the offsets of individual strips shall not exceed 6-inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a featheredge effect.

C. On slopes greater than 2:1, the Contractor shall, if necessary, prevent the sod from sliding by means of wooden pegs driven through the sod blocks into firm earth at suitable intervals.

D. Sod which has been cut for more than 72-hours shall not be used unless specifically authorized by the City after the inspection thereof. Sod which is not planted within 24-hours after cutting shall be stacked in an approved manner, maintained, and properly moistened. Any pieces of sod that, after placing, show an appearance of extreme dryness shall be removed and replaced by fresh, uninjured pieces.

E. Sodding shall not be performed when weather and soil conditions are, in the City’s opinion, unsuitable for proper results.

3.04 WATERING

A. The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the City, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2-weeks. Thereafter, the Contractor shall apply water as needed until the sod roots and starts to grow for a minimum of 60-days (or until final acceptance, whichever is latest).

3.05 MAINTENANCE

A. The Contractor shall maintain, at his expense, the sodded areas in a satisfactory condition until final acceptance of the Project. Such maintenance shall include repairing of any damaged areas and replacing areas in which the establishment of the grass stand does not appear to be developing satisfactorily.

B. Replanting or repair necessary due to the Contractor's negligence, carelessness, or failure to provide routine maintenance shall be at the Contractor's expense.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02660
POTABLE WATER SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Provide a complete system for water transmission/distribution pressure piping and appurtenant items.

1.02 QUALITY ASSURANCE

A. Design Requirements
   1. Piping shall be laid with a minimum cover of 36-inches below finished grade for mains sized 12-inch and below and a minimum cover of 48-inches for mains sized 16-inch and greater. Pipe located within Local roadways (subdivisions) or within an easement, shall be laid with a minimum cover of 30-inches.
   2. Pipelines shall be constructed of the materials indicated in this specification and on the Drawings.

B. Pipe Inspection:
   1. The Contractor shall obtain a certificate of inspection from the pipe manufacturer stating that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications.
   2. The entire product of any plant may be rejected when, in the opinion of the City, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.
   3. All pipe and fittings shall be subjected to a visual inspection at the time of delivery and before being lowered into the trench. Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor.
   4. The City reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.

C. Prevention of electrolysis is required in accordance with AWWA C105 and when crossing, or adjacent to, a power easement, gas easements, any location where induced currents may be present, in areas where aggressive soils exist, and where shown on Drawings. Electrolytic action through the contact of dissimilar metals shall be prevented by either:
   1. The separation of one material from the other by means of an insulating or dielectric coupling (polyethylene wrap), or
   2. The use of alternative materials, as directed by the City.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
   1. Mill test certificates or certified test reports on pipe
   2. Details of restrained and flexible joints
   3. Detailed laying schedule for pipe
   4. Valves and valve boxes

1.04 JOB CONDITIONS

A. Water in Excavation
   1. Dewatering shall be in accordance with. Section 02140 "Dewatering." Water shall not be allowed in the trenches while the pipes are being laid and/or tested. The Contractor shall not open more trench than the available pumping facilities are able to dewater to the satisfaction of the City. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working.
   2. In no case shall the pipelines being installed be used as drains. The ends of the pipe shall be kept properly and adequately blocked during construction by the use of approved stoppers and not by improvised equipment.
   3. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the Work any such material has entered the pipelines, it must be cleaned as directed by the City so that the entire system will be left clean and unobstructed.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 MATERIALS

A. Pipe, Fittings, Valves, and Ancillary Equipment shall be installed as shown on the Drawings and as specified in Division 15.

B. Additional Work: Additional items of construction, necessary for the complete installation of the systems, shall conform to specific details shown on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these specifications.

PART 3 - EXECUTION

3.01 PREPARATION

A. Bedding:
   1. Pipe Cradle: Upon satisfactory installation of the pipe bedding material as specified in Section 02220 "Excavating, Backfilling and Compacting", a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.
   2. Cleanliness: The interior of the pipes shall be thoroughly cleaned of all foreign matter before being gently lowered into the trench and shall be kept clean during laying operations by means of plugs or other methods approved by the City. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

3.02 INSTALLATION

A. Pipe Identification/Location
   1. All PVC water mains shall be solid blue. All lettering shall appear legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as is acceptable for the intended use.
   2. All ductile iron water mains shall be color coded blue with tape. The tape (minimum 2-inches) shall be permanently affixed to the top and each side of the pipe (3 locations parallel to the axis of the pipe). For pipes less than 24-inches in diameter, a single tape may be used along the top of the pipe.
   3. All HDPE water mains shall be a solid blue or black with 4 co-extruded equally spaced blue stripes of the same material as the pipe. Stripes painted on the pipe outside surface shall not be acceptable.
   4. If main is located over 30-feet from the edge of the pavement or in an easement, the Contractor shall install 4-inch diameter schedule 80 PVC utility pipe line markers over the pipe alignment at 1,000-feet intervals, at all valves, and at all locations where fittings deflect the pipe alignment in the horizontal plane. Utility pipeline markers shall include a decal and shall be colored blue for water service.
   5. All mains (PVC, HDPE, and DI) shall be installed with a continuous, insulated 10-gauge copper wire installed directly above the pipe for location purposes. Locate wire shall terminate in a test station box and be capable of extending 12-inches above the top of the box. Directionally drilled pipe shall be installed with 2 insulated 10-gauge copper wires.

B. Pipe: The color stripe and pipe text shall be located on the top of the pipe when installed. When installing PVC pipe, no additional joints will be installed until the preceding pipe joint has been completed and the pipe carefully embedded and secured in place.
   1. Gradient: Pipe shall be laid straight and depth of cover shall vary to provide uniform gradient or slope to pipe, whether grading is completed or proposed at time of pipe

installation. When a grade or slope is shown on the Drawings, batter boards with string line paralleling design grade, or other previously approved means, shall be used by the Contractor to assure conformance to required grade.

2. Pipe Joint Deflection
   a. Ductile Iron Pipe: Whenever it is desirable to deflect pipe, the amount of deflection shall not exceed 75% of the maximum limits as shown in AWWA Standard C600 for ductile iron pipe.
   b. PVC Pipe: Joint deflection or pipe bending shall not be permitted. The maximum allowable tolerance in the joint due to variances in installation is 0.75° (degrees) (3-inches per joint per 20-foot stick of pipe). No bending tolerance in the pipe barrel shall be acceptable. Alignment change shall be made only with sleeves and fittings.
3. Rejects: Any pipe found defective shall be immediately removed and replaced with sound pipe at the Contractor's expense.
4. Joint Compounds: No sulfur base joint compound shall be used.
5. Thrust restraints shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein. Restraining devices shall be specified in Sections 15062 "Ductile Iron Pipe and Fittings" and 15064 "Polyvinyl Chlorine (PVC) Pipe and Fittings", respectfully.

C. Installing Valves and Boxes
1. Valves: Valves shall be carefully inspected, fully opened, and then tightly closed and the various nuts and bolts shall be tested for tightness. Any valve that does not operate correctly shall be removed and replaced.
2. Valve Boxes: Valve boxes shall be carefully centered over the operating nuts of the valves so as to permit a valve key to be fitted easily to the operating nut. In unpaved areas, valve boxes shall be set to conform to the level of the finished surface and held in position by a concrete collar placed under the support flange as shown on the Drawings. The letter "V" shall be etched in the curb at each valve location. The valve box shall not transmit surface loads to the pipe or valve but be supported by bedding rock as shown on the Drawings. Extensions or risers for valve boxes shall be an integral part of the box. No cut sections of D.I. or PVC pipe shall be used in extending the box to its proper height. Care shall be taken to prevent earth and other material from entering the valve box. Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dug out and reset. Before final acceptance of the Work all valve boxes shall be adjusted to finish grade.
3. Concrete Collar: Each valve installed in an unimproved area (outside of pavement, driveways or sidewalks) shall require a 24-inch by 24-inch by 6-inch concrete pad or collar as shown in the Drawings.
4. Identification Disc: Each 16-inch or larger valve (unless otherwise shown on the Drawings) installed shall be identified by a 3-inch diameter bronze disc anchored in the concrete pad or collar in unimproved areas and/or anchored on a 4-inch by 4-inch by 18-inch long concrete post set flush with the pavement surface in improved areas. The disc shall be stamped with the following information as shown on the Drawings:
   a. Size of the valve
   b. Type of valve

c. Service
d. Direction and number of turns to open

D. Concrete Encasement
1. Concrete encasement shall be constructed in accordance with details shown on the Drawings and shall be constructed of Class C concrete. Encasement shall be constructed where;
a. Indicated on the Drawings
b. The City orders the pipe encased
2. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

E. Flush Out Connections: Flush out connections shall be installed at the locations as determined by the City and be full pipe size.

F. Service Connections: Service connections shall be installed at the locations determined by the City and in the manner shown on the Drawings. No service line shall terminate under a driveway.

G. Backfilling: Backfilling shall be in accordance with Section 02220 "Excavating, Backfilling and Compacting" of these specifications.

3.03 CLEANING

A. General: At the conclusion of the Work, the Contractor shall thoroughly clean the new pipelines by flushing with water or other means to remove all dirt, stones, or other material which may have entered the line during the construction period. Flushing is permitted for pipes less than or equal to 12-inch diameter.

B. Correction of Non-Conforming Work: All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the City. Non-conforming work shall be defined as failure to adhere to any specific or implied directive of this Project Manual and/or the Drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the Drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, visible or detectable leakage, or failure to pass any specified test or inspection.

3.04 FIELD QUALITY CONTROL

A. Flushing
1. All pipelines less than or equal to 12-inches shall be flushed to remove all sand and other foreign matter. After initial slow-fill, pipe shall sit full for 24-hours to facilitate cleaning and collection of debris from interior of pipe. Flushing shall be accomplished through full pipe size connections at full pipe depth. The velocity of the flushing water shall be at least 2.5-feet per second. Flushing shall be terminated

at the direction of the City. The Contractor shall dispose of the flushing water without causing a nuisance or property damage. The Contractor shall arrange with the City and pay for the source of flushing water.

2. In lieu of flushing, new water mains may be hydraulically or pneumatically cleaned with a polypropylene swabbing device in accordance with " City Utilities Standards and Construction Specifications Manual."
   a. The Contractor is responsible to provide temporary access and egress points.
   b. Passage of the cleaning swabs through the system shall be constantly monitored, controlled, and all poly swabs entered into the system shall be individually marked and identified.
   c. Cleaning of the system shall be done in conjunction with the initial filling of the system for its hydrostatic test.
   d. The Contractor is responsible for collection of debris, water, and the swab. Considerations shall be made for protecting surrounding property and personnel.
   e. Swabbing speed shall range between 2 and 5-feet per second.

B. Pressure and Leakage Tests of Pressure Piping
   1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all pressure piping. Tests shall be made between valves and shall not exceed 2,000-feet. Each side of all valves shall be pressure tested. Multiple sections of main may be tested simultaneously providing there are non-pressurized sections in between each pressure-tested section.
   2. Standard: AWWA C600, Section 4, with the exceptions required herein and the exception that the Contractor shall furnish all gauges, meters, pressure pumps, and other equipment needed to test the lines.
   3. Hydrostatic Pressure Test
      a. Test Pressure: Pressure test at 50% above the normal working pressure, but not less than 150-psi, unless otherwise noted on the Drawings.
      b. Test Duration: Duration is 2-hours. If during the test, the integrity of the tested line is in question, the City may require a 6-hour pressure test.
      c. Air Release: Corporation cocks at least 3/4-inch in diameter, pipe riser, and angle globe valves shall be provided at each dead-end to bleed air from the line.
   4. Hydrostatic Leakage Test
      a. General: Following the pressure test, the Contractor shall perform the leakage test. The line shall be filled with water and all air removed for the test. The Contractor shall provide a pump to maintain the test pressure for the entire test period.
      b. Test Pressure: Maximum operating pressure as determined by the City but not less than 150-psi unless otherwise noted.
      c. Test duration: 2-hours.
      d. Allowable leakage: $$L = \frac{SD(P)0.5}{148{,}000}$$

         L = Allowable leakage (gallons per hour)
         S = Length of pipe tested (feet)
         D = Nominal diameter of pipe (inches)
         P = Average test pressure maintained (psig)

e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage eliminated regardless of the measured total leakage.
f. Leakage Measurement: The amount of water required to maintain the test pressure is the leakage.

C. Wire Continuity Check: The Contractor shall perform a continuity check of the 10-gauge locating wire for the entire length of the main by performing a continuity test at each valve test station box.

3.05 DISINFECTING POTABLE WATER PIPELINES

A. General: Before being placed in service, all potable water pipelines shall be disinfected by chlorination. Taps for chlorination and sampling shall be uncovered and backfilled by the Contractor as required. The disinfection procedure shall be approved by the City.

B. Standard: AWWA 651, "Standard Procedures for Disinfecting Water Mains."

C. Procedure
1. Flush all dirty or discolored water from the line and introduce chlorine in approved dosages through a tap at one end while water is being withdrawn at the other end of the line.
2. The chlorine solution shall remain in the pipeline for 24-hours.
3. Following the chlorination period, all treated water shall be flushed from the line and replaced with water from the distribution system.
4. Bacteriological sampling and analysis shall be made in full accordance with AWWA Manual C651 and the appropriate FDEP permit. If necessary, the Contractor will be required to re-chlorinate.
5. Sampling and analysis shall be done by the City.

D. Approval: The line shall not be placed in service until the requirements of the State and City Public Health Department are met and the bacteriological test results are approved by the Department of Environmental Protection.

3.06 CONNECTION TO EXISTING SYSTEM

A. All connections to existing mains shall be made after complete disinfection of the proposed system and shall be made under the direction of the City. Valves separating the mains being installed from existing mains shall be operated by or under the direction of the City. The cost of the Work in making the connections shall be paid for by the Contractor.

B. In the event the proposed main is to be connected to a main which has one or more active services between the point of connection and the first existing line valve, a temporary plug or cap shall be installed on the new main until the pressure tests and disinfecting are completed. Upon satisfactory completion, the cap or plug shall be removed from both mains and the connection made with pipe which has been swabbed out with a solution of chlorine and water. The connection shall be made as swiftly as possible and any water in

the ditch shall be kept below the level of the pipe. The pipeline shall then be placed in service by the City's personnel.

C. In the event any existing users will be without water while a connection is being made, the Contractor shall notify the City 72-hours prior to disconnection. The City shall notify the affected user(s) when the water will be turned off and when the service is estimated to be resumed. In some instances, these connections may have to be made at night. No user shall be without water service for more than 3-hours.

3.07 SUPPLIER'S FIELD SERVICE:

A. The Contractor shall, at no additional cost to the City, arrange for a pipe supplier's field representative to be on-site to provide instruction to each crew working on the installation for a minimum of 4 push-on joints (PVC, DIP). The supplier's field representative shall certify that the installations observed were satisfactorily completed and all pipe installation crews were familiar with the proper methods and procedures for the pipeline installations.

3.08 WATER FOR USE IN FLUSHING, TESTING, AND DISINFECTION:

A. The Contractor shall arrange with the City for water required for pressure testing, flushing, and disinfection required by the Contractor. The Contractor shall provide meter and backflow preventer.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02670

PRESSURE MAIN SAMPLE COLLECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. Where an existing pressure main is being tapped, connected to a new constructed main, or being prepared for abandonment, a pipe sample shall be collected in order for the City to perform a condition assessment of the pipe. This section specifies the procedures for collecting pipe samples and does not address the work involved in the tapping, the repair, or the actual abandonment of the pipeline.

A. GENERAL SAMPLE REQUIREMENTS:

1. The pipe samples shall be taken from all existing pipe connections or abandoned pipe that is ductile iron pipe, cast iron pipe, asbestos cement pipe, and prestressed concrete cylinder pipe.

PART 2 - MATERIALS (Not Used)

PART 3 - EXECUTION

1.02 PIPE SAMPLE COLLECTION

A. Contractor shall be responsible for obtaining coupons or sections from pressure mains being tapped, removed, or abandoned, digital photos, and completing the Pressure Main Sample Collection Submittal Form (see Appendix B). As indicated on the drawings, the Contractor shall collect coupons taken from line-stop operations, line taps, dry connection, or from any other operations such as where the pipe will be disconnected, removed or abandoned.

B. The submittal requirements are not considered complete unless all of the requirements described below are complete for each sample of pipe.

1. Complete the Pressure Main Sample Collection Submittal Form.

2. If applicable, note in the comments section of the form:
   a. The condition of the DIP external polyethylene wrap.
   b. Site observations relevant to work site of the sample (e.g. gas main in close proximity, AC pipe with areas of softness, etc.)

c. Visually inspect the exposed asbestos cement pipe and note if there are areas of softness

3. Pipe sample unique identification number as shown on the drawings:
   a. Shall be printed on a sturdy waxed tag affixed to each whole piece of pipe sample or legibly marked on the pipe sample with permanent marking pen.
   b. Wet-tap samples shall have a legibly written ID number on the exterior side and top of the sample.
   c. An additional digit will be added at the end to indicate where multiple samples were taken from a pipe with the same ID number.
4. Pipe sample requirements:
   a. Wet-taps from a tapping sleeve - the complete tapping coupon
   b. Dry connection – 12” length of pipe
   c. Abandoned pipe – 12” length of pipe at the beginning and the end if applicable
   d. Pipe repair – 12” length of pipe that was cut from the existing pipe representative of damage or typical conditions.
5. GPS coordinates of where the sample was taken shall be noted on the Submittal Form

6. Provide digital photographs for the following views:
   a. Overall Work site
   b. Exposed pipe before tap or abandonment
   c. Sample exterior
   d. Close-up of the edge (thickness of pipe)
   e. All photos shall bear the unique sample ID number shown on the drawings, date, and time.

C. Prior to submitting a monthly pay request that includes payment for taps, connections, replacement or abandonment of pipe, the Contractor’s requirements as specified herein shall be acceptable to the City.

END OF SECTION

SECTION 02761
CLEANING SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Work covered in this section consists of cleaning sewer lines and manholes prior to the internal television inspection(s) for new or existing wastewater systems.

B. Gravity Main and Sewer Lateral Cleaning: The intent of gravity main cleaning is to remove debris that may be causing a reduction in flow capacity, potential sewer backups, or that limits the ability to evaluate the structural condition of the pipe segment. On all sewers, the Contractor shall perform sewer-cleaning work to an acceptable level as necessary to perform a thorough television inspection of the sewer. An acceptable level is defined as the removal of all debris throughout the pipe segment cleaned. If the pipe condition is such that cleaning may cause a potential collapse, then the pipe shall be televised without attempting to clean it pending approval by the City.

C. Water for Cleaning: The Contractor will be responsible for obtaining a transient water meter and paying for water used during course of cleaning.

D. Recovering of Equipment: The Contractor will be responsible for recovering any equipment that becomes lodged or lost in the pipeline. The Contractor will be responsible for all costs associated with required evacuation, restoration of roads and easements, and repairs to pipes and manholes as needed to restore the pipeline and appurtenances back to their original conditions.

1.02 CLEANING EQUIPMENT

A. Hydraulically Propelled Equipment: The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery for grease removal. Special precautions to prevent flooding of the sewers and public or private property shall be taken at all times.

B. High-Velocity Jet (Hydro-Cleaning) Equipment: All high-velocity sanitary sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of 2 or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15° to 45° (degrees) in all size mains. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tanks, auxiliary engines, pumps, and hydraulically driven hose reel.

C. Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient power to perform the Work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be used. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750-feet of rod. The rod shall be heat-treated steel. To ensure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

D. Vacuum machines may be used for removal of materials from manholes when other cleaning equipment is used to dislodge and transport material to the access point.

E. Combination Cleaner: For cleaning small and large diameter sewer, the Contractor may use a combination hydraulic high volume water and solids separation system. Water volume of up to 250-gpm at or above 2,000-psi will move solids to the downstream manhole in high flow conditions. The separation system will dewater solids to 95 % (passing a paint filter test) and transfer them to a dump truck, if needed, for transport to a water reclamation facility, approved landfill, or other location specified by the City or designee. Wash water will be filtered to a point where it can be used in the pump for continuous cleaning. No bypassing of sewer flows will be necessary. The unit shall be capable of 24-hour operation and the unit shall not leave the manhole until a section is fully cleaned.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the EOR for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. A daily log shall be maintained to record the location of the manholes and sewer lines, lengths of the lines cleaned, method of cleaning, line sizes, identify type of cleaning (light, medium, or heavy), and type of debris moved. Observations are to be recorded on a cleaning report form.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix B "List of Approved Products" appended to these technical specifications.

B. The equipment shall remove dirt, grease, rocks, sand, other materials, and obstructions from the sewer mains, laterals, and manholes.

C. A high-velocity sewer cleaner will be used for the majority of the cleaning work. Other equipment, such as bucket machines, rod machines, hydraulic root cutters, vacuum trucks and balling equipment shall be available.

3.02 CLEANING PRECAUTIONS

A. All necessary precautions shall be taken to protect the sewer from damage during all cleaning and preparation operations. Precautions shall also be taken to ensure that no damage is caused to public or private property adjacent to or served by the sewer or its branches. The Contractor shall pay for and restore, at no additional costs to the City, any damage caused to public or private property because of such cleaning and preparation operations.

B. Satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant. All requirements shall be met when accessing a fire hydrant including but not limited to meters, backflow preventers, and properly trained personnel. It shall be the Contractor's responsibility to meet all state and local requirements.

3.03 CLEANING

A. If cleaning of an entire sewer section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning attempted again. If results of the cleaning are favorable, the Contractor will proceed with the TV inspection. All sludge, dirt, sand, rocks, and other solid or semisolid materials resulting from the cleaning operation shall be removed from the downstream manhole of the section being cleaned. The Contractor shall not be responsible for removing mortar or other material that is securely attached to the pipe walls or joints.

B. Materials shall be disposed of from the site at least once at the end of each workday. The Contractor will be responsible for the disposal of materials removed from the sewer system. All sewer-cleaning efforts shall require documentation of all quantities and types of materials removed during cleaning.

C. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment approved by the City. Cleaning shall consist of normal hydraulic jet cleaning to facilitate the internal CCTV inspection.
   1. Types of cleaning of sanitary sewers:
      a. Light cleaning of sewers consists of a maximum of 1 pass of the jet nozzle. Light cleaning of laterals will consist of flushing water into a cleanout.
      b. Medium cleaning of sewers consists of 2 to 4 passes of the jet nozzle. Medium cleaning of laterals will consist of 1 to 4 passes with a jet nozzle.

c. Heavy cleaning consists of 5 or more passes of the jet nozzle such as removing heavy grease, debris, and roots.
d. Descaling of Ductile Iron pipe: Multiple passes with mechanical equipment to remove scale build up to restore pipe to original inside diameter.

2. Selection of the equipment used shall be based on the conditions of lines at the time the Work commences. The equipment and methods selected shall be satisfactory to the City. The equipment shall be capable of removing dirt, grease, rocks, sand, debris, other materials, and obstructions from the sewer lines, laterals, and manholes.
3. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. The intent of preparatory cleaning is to provide sufficient cleaning to ensure camera passage and the internal conditions of the pipeline can be fully assessed.
4. If the City establishes that a particular section of the pipeline cannot be adequately cleaned due to broken, collapsed, or void areas, then the inspection will be attempted up to the obstruction.

3.04 ROOT REMOVAL

A. Roots shall be removed in the designated sections and manholes where root intrusion is a problem and where authorized by the City. Special attention should be used during the cleaning operation to remove roots from the joints. Any roots that could prevent the proper application of chemical sealants, or could prevent the proper seating and application of cured-in-place liners shall be removed. Procedures may include the use of mechanical equipment such as, rodding machines, bucket machines, winches using root cutters, porcupines, and equipment such as high-velocity jet cleaners. Chemical root treatment shall be used before or following the root removal operation, depending on the manufacturer's recommendation. The Contractor shall capture and remove all roots from the line.

3.05 CHEMICAL ROOT TREATMENT

A. To aid in the removal of roots, manhole sections that have root intrusion shall be treated with an acceptable herbicide. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation. Any damaged vegetation, so designated by the City, shall be replaced by the Contractor at no additional cost to the City. All safety precautions as recommended by the manufacturer shall be adhered to for handling and application of the herbicide.

3.06 MATERIAL REMOVAL AND DISPOSAL

A. All sludge, dirt, sand, rocks, grease, roots, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Contractor shall provide appropriate screening to stop passing of materials into downstream sewers. All solid or semisolid materials dislodged during cleaning operations shall be removed from the sewer by Contractor at the downstream manhole of the sewer section being cleaned. The passing of dislodged materials downstream of the sewer segment being cleaned shall not be permitted. In such an event, as observed or detected by the City or any third party, Contractor shall be responsible for cleaning the affected downstream sewers in their entirety, at no additional cost to the City.

B. These materials shall become the property of the Contractor, shall be removed from the site at the end of each workday, and shall be disposed of by the Contractor. Copies of records of all disposals shall be furnished to the City, indicating disposal site, date, amount, and a brief description of material disposed. Disposal manifests from the licensed disposal facility shall be submitted with invoices.

C. The Contractor shall keep his haul route and work area(s) neat, clean, and reasonably free of odor, and shall bear all responsibility for the cleanup of any spill.

3.07 ACCEPTANCE OF CLEANING OPERATION

A. Acceptance of sanitary sewer cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the City. If television inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line at no additional cost until the cleaning is shown to be satisfactory.

B. In addition, on all sanitary sewers which have sags or dips, to an extent that the television camera lens becomes submerged during the television inspection, the Contractor shall use a high pressure cleaner to draw the water out of the pipe, or other means, to allow the full circumferential view of the pipe and identification of pipe defects, cracks, holes, and location of service connections.

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DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02762

TELEVISING SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Work covered within this Section is for the internal closed circuit television (CCTV) inspection of sanitary sewer pipes. The Contractor shall perform sewer-televising work as necessary to thoroughly document the condition of all sewers, service lateral connections, and manhole corbel, barrel and cone-sections in the study area. The sanitary sewer and service laterals shall be carefully inspected to determine alignment, grade variations, separated joints, location and extent of any deterioration, breaks, obstacles, obstructions, debris, quantities of infiltration/inflow and the locations of service connections.

The quality of all Work specified in this Section shall meet or exceed the requirements of the National Association of Sewer Service Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation (latest edition), except as described in this Section. Applicable portions of this Section that inadvertently fall below those standards shall be corrected and maintained at the NASSCO standards as a minimum requirement, at no additional cost to the City.

1.02 REQUIREMENTS

A. The Contractor shall inspect the sewer interior using a color closed circuit television camera (CCTV) and document the inspection on a digital recorder. All inspection video shall be captured in either MPEG or Windows Media Video (.WMV) file format and saved portable hard drives for submittal. Each inspected main line sewer reach, referenced manhole to manhole, and each inspected sewer lateral referenced to the property address and corresponding sewer main should have an associated MPEG or WMV file. Digital photographs (.JPG files), inspection reports (.PDF files) and any handwritten inspection logs or field maps shall accompany the video inspections for each sewer reach (manhole-to-manhole) or lateral inspected.

B. Contractor shall provide inspection video, data and reports in accordance with the requirements specified herein. Contractor shall provide all video on portable hard drive as specified. All Work will conform to current NASSCO Pipeline Assessment Certification Program (PACP) coding conventions and all software used by the Contractor will be PACP compliant. An electronic database will be provided by the Contractor in a PACP exported format approved by the City.

C. The Contractor shall provide comments as necessary to fully describe the existing condition of the sewer on the inspection forms.

D. Contractor shall be responsible for modifications to equipment and/or inspection procedures to achieve report material of acceptable quality.

E. No Work shall commence prior to approval of the submitted material by the City. Once accepted, the report material shall serve as a standard for the remaining Work.

1.03 QUALITY ASSURANCE

A. Each CCTV field inspection supervisor shall be NASSCO PACP certified. Use of PACP certified technicians to review/document defects in the office (post process) is not acceptable.

B. The inspection Contractor must have an internal quality assurance/quality control program in place and all inspection data shall be subjected to the procedures prior to submittal to the City. The City will perform QA/QC audits on submitted data.

C. QA/QC shall be performed by NASSCO PACP certified personnel.

1.04 SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. The following deliverables shall be submitted on a portable hard drive at the completion of inspection:
   1. Inspection videos saved in MPEG format or Windows Media video format
   2. Electronic version (.pdf) of the pipe inspection reports
   3. PACP export pipe inspection database (.mdb)
   4. Inspection digital photographs in JPEG format
   5. Map of sub area depicting area inspected, inspection status, asset identification numbers and mark ups
   6. QA/QC report

C. The above deliverables shall be submitted monthly to the City for approval. Application for payment shall be made after review and approval by the City.

D. The sewer inspection video, report documents, and sewer inspection database shall be in accordance with City data standards and NASSCO PACP.

1.05 NOTIFICATION

Contractor shall notify the City a minimum of 48-hours prior to performing any inspection work. No payment will be made for inspections performed without proper notification.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Closed Circuit Television Camera: The television camera used for the inspection shall be one specifically designed and constructed for sanitary sewer inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100 % humidity/submerged conditions. The CCTV camera equipment will provide a view of the pipe ahead of the equipment and of features to the side of the equipment through turning and rotation of the lens. The camera shall be capable of tilting at right angles along the axis of the pipe while panning the camera lens through a full circle about the circumference of the pipe. The lights on the camera shall also be capable of panning 90° (degrees) to the axis of the pipe.

The radial view camera must be solid-state color and have remote control of the rotational lens. The camera shall be capable of viewing the complete circumference of the pipe and manhole structure, including the cone-section or corbel. Cameras incorporating mirrors for viewing sides or using exposed rotating heads are not acceptable. The camera lens shall be an auto-iris type with remote controlled manual override.

If the equipment proves to be unsatisfactory, it shall be replaced with adequate equipment. The camera unit shall have sufficient quantities of line and video cable to inspect 2 complete, consecutive sewer reaches with access approximately 750-feet apart.

The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the City. The television camera, electronic systems and monitor shall provide an image that meets the following specifications, or approved equal:

1. The gray scale shall show equal changes in brightness ranging from black to white with a minimum of five stages.
2. With the monitor control correctly adjusted, the 6-colors; Yellow, Cyan, Green, Magenta, Red, and Blue, plus black and white shall be clearly resolved with the primary colors in order of decreasing luminance. The gray scale shall appear in contrasting shades of gray with no color tint.
3. The picture shall show no convergence or divergence over the whole of the picture. The monitor shall be at least 13-inches diagonally across the picture tube.
4. The live picture on the CCTV monitor shall be capable of registering a minimum of 470 lines horizontal resolution and be a clear, stable image with no interference.
5. Lighting intensity shall be remote controlled and shall be adjusted to minimize reflective glare. Lighting and camera quality shall provide a clear in-focus picture of the entire inside periphery of the sewers and laterals for all conditions except submergence. Under ideal conditions (no fog in the sewer) the camera lighting shall allow a clear picture up to 5 pipe diameter lengths away for the entire periphery of the sewer. The lighting shall provide uniform light free from shadows or hot spots.
6. The camera light head shall include a high-intensity side viewing lighting system to allow illumination of internal sections of lateral sewer connections.

7. Camera focal distance shall be remotely adjustable through a range of 6-inches to infinity.
8. Picture quality and definition shall be to the satisfaction of the City.
9. The monitor and software shall also be able to capture and save screen images of typical sewer details and all defects. Screen images shall be embedded into the pipe inspection report document submitted with the inspection video.
10. The video camera shall be capable of displaying on screen data as specified in paragraph 3.08 herein.
11. Depth gage: The camera shall have a depth gage or approved method to measure deflection in the pipe and joint separation approved by the City.
12. The camera shall have zoom capabilities to be able to view the entire depth of a 20-foot deep manhole from the bottom during inspection.

B. Lateral Video Camera

Lateral cameras may be push type or launched from the sewer main line. Lateral cameras shall be color, shall be self-leveling, and equipped with a footage counter to provide on-screen display of footage measurement. Monitor resolution shall be as specified above in paragraph 2.01 A Close Circuit Television Camera, or approved equal

C. Video Capture System

The video and audio recordings of the sewer inspections shall be made using digital video equipment. A video enhancer may be used in conjunction with, but not in lieu of, the required equipment. The digital recording equipment shall capture sewer inspection on DVD disks or hard drive, with each sewer reach inspection recorded as an individual movie file (.MPEG, .MPG, or .WMV) or approved equal. The video files will be named in accordance with the City file naming convention contained in paragraph 3.11 herein.

1. The video file names will be referenced in the inspection database and in an inspection report generated in PDF format. The pipeline collection and real time video capture and data acquisition systems shall be provided.
2. The system shall use the most current PACP compliant application software and shall be fully object oriented or approved equal. It shall be capable of printing pipeline inspection reports with captured images of defects or other related significant visual information on a standard color printer.
3. The imaging capture system shall store digitized color picture images and be saved in digital format on a DVD, hard drive or approved equal. Also, this system shall have the capability to supply the City with inspection data reports for each line segment.
4. The Contractor shall have the ability to store the compressed video files in industry standard and approve City format and be transferable with the PACP compliant inspection database.
5. The Contractor's equipment shall have the ability to "Link". "Linking" is defined as storing the video time frame code with each observation or defect with the ability to navigate from/to any previously recorded observation or defect instantaneously.
6. The system shall be able to produce data reports to include, at a minimum, all observation points and pertinent data. All data reports shall match the defect severity codes in accordance with PACP naming conventions

7. The data-sorting program shall be capable of sorting all data stored using generic sort key and user defined sort fields.
8. Camera footage, date & manhole numbers shall be maintained in real time and shall be displayed on the video monitor as well as the video character generators illuminated footage display at the control console.
9. Digital video shall be defined as ISO-MPEG Level 1 (MPEG-1) coding having a resolution of 352 pixels (x) by 240 pixels (y) (minimum) and an encoded frame rate of 29.97 frames per second. The digital recording shall include both audio and video information that accurately reproduces the original picture and sound of the video inspection. The video portion of the digital recording shall be free of electrical interference and shall produce a clear and stable image. The audio portion shall be sufficiently free of background and electrical noise so as to produce an oral report that is clear and discernible.
10. Inspection software shall be PACP compliant versions of CUES Granite XP, WinCan, Flexidata, or approved equal.
11. The CCTV equipment/software shall be capable of producing digitized images of all sewer line defects, manhole defects, and sewer line service connections in .jpeg format. Contractor shall plan to take digital still images of each defect, construction features and service connection to clearly depict it. More images may be necessary depending upon the condition of the pipe.

2.02 REPORTING CAPABILITIES

A. The CCTV system shall be capable of printing pipeline inspection reports with pipeline schematics and captured images of defects and other related significant visual information. The system shall have the ability to display any combination of the following formats and features simultaneously.

The following information is mandatory for all inspections:

1. Inspection Information: Refers to the area of pipe to be inspected between 2 manholes or the address of the lateral to be inspected.
   a. Project Name
   b. Surveyed by (Operator/Surveyor's name)
   c. Operator/Surveyor Certificate number
   d. System Owner
   e. Date
   f. Drainage Area (tributary pump station number)
   g. Time
   h. Sheet number (report sheet number
   . Street Name and Number
   j. Locality (City of Everglades City)
   k. Additional Location Information (e.g. backyard, parking lot, etc)
   l. Upstream Manhole Number (City standard Asset Number)
   m. Upstream MH rim to invert (depth)
   n. Downstream Manhole Number (City standard Asset Number)
   o. Downstream MH rim to invert (depth)
   p. Direction of inspection (Upstream or Downstream)

q. DVD Identification Number
r. Flow control (e.g. plugged, lift station, bypassed, not controlled)
s. Type of Pipe
t. Pipe Height
u. Pipe Width
v. Pipe Shape
w. Pipe Material
x. Lining Material (for lined sewers)
y. Pipe Joint Length
z. Purpose of Inspection (new line, year-end warranty, CIP R/R project, etc.)
aa. Pre Cleaning (jetter, heavy cleaning, no pre-cleaning)
bb. Media Number (Video file name)
cc. Weather
dd. Additional information/Comments

2. Observation Data: Refers to the portion of pipe where an observation is discovered. Observations shall be noted by text descriptions and defect code number using PACP defects codes, still frame pictures and video clips captured and recorded. Each observation shall include the following:
   a. Actual observation footage
   b. Video reference
   c. Location of defect; clock position
   d. Code (Group/Descriptor/Modifier/Severity)
   e. Whether it is a continuous defect
   f. Whether the defect occurs at a joint
   g. Severity level
   h. DVD Identification number
   i. DVD counter
   j. Final footage
   k. Video clip ID for each observation
   l. Image reference (file name of photos)
   m. Remarks (as appropriate or needed)
3. Formats: Standard and/or custom designed reports shall have the following formats available and shall be able to be produced in hard copy or viewed on the monitor.
   a. Site Observation: Displays detailed site observation reports in landscape or portrait views.
   b. Directory Report: Displays a list of all the projects sorted by pump station number and manhole number.
   c. Picture Reports: Displays site data and include full size single photos or half size double photos of discrepancies.
   d. Pipe Run: Displays a graphical display of the site indicating footage, observations, and comments.
   e. Project Data: Displays the project, client, and Contractor information.
   f. Custom Sort: Creates user-defined reports of selected site, project, and observation data.

PART 3 - EXECUTION

3.01 GENERAL

A. Prior to inspection the Contractor shall obtain pipe and manhole asset identification numbers from the City to be used during inspections. Inspections performed using identification numbers other than the City assigned numbers will be rejected.

B. Inspection shall not commence until the sewer section to be televised has been completely cleaned in conformance with Specification Section 02761 "Cleaning Sanitary Sewer Systems."

C. Inspection of newly installed sewers (not yet in service) shall not begin prior to completion of the following:
   1. Pipe air testing
   2. All manhole work, including installation of inverts
   3. Installation of all lateral services
   4. Vacuum tests of all manholes

D. After the sewer main and/or lateral cleaning operation is completed, the line sections shall be visually inspected internally by means of color closed-circuit television. The television inspection shall be performed one line section at time.

E. CCTV inspection shall require a minimum of 2 certified personnel with PACP certifications.
   1. One (1) person shall have PACP certification that will lead or supervise each field CCTV crew for inspection and a minimum of 2-years in the role of a lead person.
   2. One (1) person shall have PACP certification serving in the role as a QA/QC management supervisor

F. Contractor shall perform sewer-televising work within 24-hours of said sewer being cleaned. If said sewer is not televised within the required 24-hour time limit, the sewer shall be re-cleaned prior to televising at no additional expense to the City.

G. The Contractor shall also inspect and document all manholes included in this Work. The video recording shall begin as the camera is lowered down the manhole all the way to the preset footage and continuously throughout the pipe reach until the down stream manhole is reached.

H. The Contractor shall lower the camera into the start manhole and record the camera entry into the sewer, observing the manhole as the camera enters.

I. The camera shall pan the periphery of the start and finish manhole from casting to invert. To achieve this, the CCTV camera operator shall pan and zoom the manhole to obtain the best possible image of the manhole, including the wall, cone and chimney section(s).

J. The depth of each manhole shall be measured to the nearest 1/10th of a foot and documented on the inspection forms. Estimates of manhole depths will not be accepted.

K. The CCTV camera shall be positioned as close to the spring line as possible while maintaining the required equipment stability.

L. Wherever possible the inspections shall be performed in the upstream to downstream direction. All sewer segments shall be recorded in a logical order in the same direction they are cleaned and televised.

M. In the event that access to some manholes is restricted, permission may be granted by the City to direct the camera through the sewer in an upstream direction, against the flow.

N. When sewer conditions prevent forward movement of the camera, the camera shall be withdrawn, and Contractor shall televise the line from the opposite direction.

O. The camera shall be directed through the sewer in a downstream direction, with the flow, at a uniform, slow rate. In no case will the video camera record while moving at a speed greater than 30-feet per minute. If, during the course of the Project, the inspection is rejected due to camera speeds exceeding 30-feet per minute, the inspection recordings shall be redone, at no additional cost to the City.

P. If a new manhole is discovered in the field that was not on current maps, a new manhole identification number will be assigned by City. The City shall assign the manhole the next number above the highest manhole number within the sub area. The data / video files shall then be re-named to include the new MH ID, and a new CCTV inspection shall be started from the new MH ID. Contractor shall consult with the City for assignment of new manhole identification numbers. Contractor shall note in the inspection form comments that a new manhole ID has been assigned as well as provide a marked up map indicating the newly found manhole and assigned manhole ID.

Q. Flow levels within existing sewers to be inspected shall not exceed 5% of the pipe diameter. If water levels prevent adequate televising of the sewer, then conducting the Work during low flow periods or other methods like plugging and bypass pumping shall be implemented.

R. For inspection of new sewers (not yet in service), the Contractor shall introduce clean water into the upstream manhole and keep water flowing until flow is observed at the downstream manhole location.

S. The survey unit shall be slowed, stopped, or backed up to perform detailed inspections of significant features. The camera shall be stopped at all defects, changes in material, water level, size, side connections, manholes, junctions, or other unusual areas. When stopped at the defect or feature, the operator shall pan the camera to the area and along the circumference of the pipe.

T. The camera unit shall be paused long enough at areas suspected of leaking to determine if a leak exists currently or if deposits have occurred.

U. The operator shall also record audio of the type of defect or feature, clock position, footage, extent or other pertinent data.

V. Digital photographs or screen captures shall be taken at all laterals; defects and general condition photographs shall be taken at least every 200-feet.

W. At the Contractor's discretion or direction of the City, the camera shall be stopped or backed up (when conditions allow) to view and analyze conditions that appear to be unusual or uncommon for a sound sewer. The lens and lighting shall be readjusted, if need be, in order to ensure a clear, distinct, and properly lighted feature.

X. Audio shall be recorded during each inspection by the operating technician, electronic voice text recognition or approved equal on the inspection video as the sewer is inspected and shall include the sewer location, identification of beginning and terminating manholes including location (address or cross streets), inspection direction, length of inspection, side sewer identification, flow information, complete descriptions of the sewer line conditions as they are encountered, description of the rehabilitation work, reason for termination, and other relevant commentary to the inspections. Voice descriptions should be made:

1. At points of pipe failure or weakness
2. At points of infiltration
3. At the location of service connections
4. At points where unusual conditions are noted, and
5. At points where digital still photos are taken.

In addition, the audio reports shall include the distance traveled on the specific run, a description of abnormal conditions in the sewer and side sewer connections as they are encountered, explanations for pausing, backing up, or stopping the survey, and the final measured center to center distances between consecutive manholes. The audio portion of the composite video shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report. Audio dubbing after the inspection is prohibited.

Y. Video recordings shall include a continuous video display/readout of similar information, as described in paragraph 3.08 herein. A separate digital video file shall be made for each pipe reach inspected.

Z. Contractor shall coordinate with the City prior to commencement of Work to ensure inspection is accomplished in a manner acceptable to the City.

AA. If the video and/or audio recording is of poor quality, the City has the right to require a re-submittal of the affected sewer sections and no payment will be made until an acceptable video and audio recording is made, submitted to, and accepted by the City.

BB. Measurement for location of defects and actual length of pipe shall be by means of a calibrated meter on the camera with a digital readout on the video monitor. This readout shall be included in the video recording. Marking on cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement will be accurate to 1-foot per 100-feet of inspected pipe.

CC. The Contractor inspection units shall be equipped with adequate back up equipment and spare parts so field repairs to equipment can be made and down time is minimized.

DD. The Contractor shall be responsible for all traffic control measures required to perform the Work.

EE. Lateral inspections shall be performed from the main line using a lateral launch camera or shall be pushed from cleanouts to the sewer main using sewer rods. Lateral camera travel measurements shall be displayed on screen and on the captured video.

FF. If lateral inspections are performed from the sewer main as part of the main line inspection, the lateral shall be logged in the main line inspection report per PACP requirements and the "comment" field of the main line inspection report shall be used to document the lateral identification number, defects observed, footage of all lateral defects, connecting pipes and clean outs. If lateral inspections are not performed as part of the main sewer inspection, a separate PACP pipe inspection record shall be created for each lateral. Refer to paragraph 3.10 for numbering requirements.

3.02 PRE-CONSTRUCTION INSPECTION

A. Procedure

1. Prior to any repair work, the entire sewer line (from manhole to manhole) shall be televised. The pre-construction inspection shall be used to determine whether the line has been cleaned sufficiently; to confirm the location and nature of defects; and to confirm that the proposed method of repair is proper method for the defects observed.
2. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30-feet per minute. Manual winches, power winches, TV cable, and power rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole (reverse set-up).
3. When manually operated winches are used to pull the television camera through the line, telephones, radios or other suitable means of communication shall be set up between the 2 manholes of the section being inspected to insure good communication between members of the crew.
4. The importance of accurate distance measurements is emphasized. The location of defects shall be within ± 2 feet.
5. During the internal inspection the television camera shall be temporarily stopped at each defect along the line. The Contractor shall record the nature and location of the defect. Where defects are also active infiltration sources, the rate of infiltration in gallons per minute shall be estimated by the Contractor and recorded. The camera shall also be stopped at active service connections where flow is discharging. Flows from service connections that are determined to be infiltration/inflow shall also be recorded.

B. Documentation of Television Inspection
   1. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as locations of building sewers, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the City. The Contractor shall record all visuals observations on a "Television Inspection Report" form.
   2. Once recorded, the digital data shall be labeled and become the property of the City. The Contractor shall have all readings and necessary playback equipment readily accessible for review by the City during the Project.

3.03 POST CONSTRUCTION INSPECTION

A. Procedure
   1. After the sewer line rehabilitation has been completed, the entire sewer line from manhole to manhole shall be televised. The post construction inspection shall be used to determine whether or not all of the approved sewer line defects and infiltration sources previously located have been fully repaired to the satisfaction of the City.
   2. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30-feet per minute. Manual winches, power winches, TV cable, power rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole or direction.(reverse-setup)
   3. When manually operated winches are used to pull the television camera through the line, telephones, radios or other suitable means of communication shall be set up between the 2 manholes of the section being inspected to insure good communication between members of the crew.
   4. The importance of accurate distance measurements is emphasized. The location of defects shall be within 1-foot.
   5. During the internal inspection the television camera shall be temporarily stopped at each repair. The camera shall also be stopped at any unnoticed or non-repaired point source of infiltration.

3.04 SEWER BYPASSING AND DEWATERING

Contractor shall be responsible for bypassing sewer flow around his work and dewatering of sewer lines in accordance with the requirements of Section 01516 "Collection System Bypass". Where sags or submerged sections of the sewer are encountered during TV inspection, the Contractor shall first complete inspection of the entire reach to determine the extent of such areas prior to dewatering the sewer. Dewatered sections of the sewer shall then be TV inspected.

On all sewer mains which have sags or dips, to an extent that the television camera lens becomes submerged during the television inspection, the Contractor shall use a high pressure cleaner to draw the water out of the pipe, or other means, to allow inspection of the pipe and identification of pipe defects, cracks, holes and location of service connections.

3.05 LINEAR MEASUREMENT

The CCTV camera location footage counter shall be zeroed at the beginning of each inspection. The survey unit location entered on the footage counter at the start of the inspection shall allow for the distance from the accepted start of the length of the sewer to the initial point of observation of the camera (pre-set footage). In the case of resuming an inspection at an intermediate point within a sewer reach, the footage counter shall be set to start at the distance from the upstream maintenance hole to that point, as previously recorded by the counter. The Contractor shall ensure that the footage counter starts to register immediately when the survey unit starts to move.

The lateral camera shall be pushed from cleanouts to the sewer main and be equipped with a footage counter to display and record inspection footage. Maximum rate of travel shall be 30-feet per minute when recording.

Prior to commencing inspections, the Contractor shall demonstrate compliance with the linear measurement tolerance specified below:

A. The equipment shall measure the location of the camera unit in 1-foot increments from the beginning (upstream end) of each continuous section. This footage location must be displayed on the CCTV monitor and recorded on the videotapes.

B. The accuracy of the measured location shall be within + 0.5% of the actual length of the sewer-reach being surveyed, or 1-foot, whichever is greater.

3.06 MEASUREMENT OF SAGS

The CCTV camera shall be equipped with a measuring device capable of accurately measuring the depth of standing water up to 3-inches. The measuring device shall be mounted to the front of the unit and be capable of being read as the unit advances through the pipe.

3.07 CCTV MONITOR DISPLAY

The images displayed on the CCTV monitors will be a view of the pipe above the water surface as seen by the CCTV camera as the unit is conveyed through the sewer.

The camera lighting shall be fixed in intensity prior to commencing the survey and the white balance set to the color temperature emitted. In order to ensure color constancy, no variation in illumination shall take place during the survey.

The video equipment shall be checked using an approved test card with a color bar prior to commencing each day's survey. The camera shall be positioned centrally and parallel to the test card at a distance where the full test card just fills the monitor screen. The card shall be illuminated evenly and uniformly without any reflection.

3.08 DATA DISPLAYS

A. The CCTV images shall include an initial data display that identifies the sewer reach being surveyed and a survey status display that provides continuously updated information on the location of the survey unit as the survey is being performed. These data displays shall be in alphanumeric form. The size and position of the data shall not interfere with the main subject of the monitor picture.

B. The on-screen display should be white during inspections where the background behind the display is dark and, conversely, black where the background is light.

C. At the beginning of each reach of sewer being inspected, the following information shall be electronically generated and displayed on the CCTV monitors as well as included in the audio track:
   1. Date of survey
   2. Inspection company name and inspector
   3. Street name or location
   4. Manhole number to manhole number (in order of inspection)
   5. Direction of survey (upstream or downstream)
   6. Time of start of survey

D. During inspections, the following information shall be electronically generated, automatically updated, and displayed on the CCTV monitors:
   1. Survey unit location in the sewer line in feet and tenths of feet from adjusted zero
   2. Sewer diameter
   3. Upstream and downstream manholes reference numbers as per approved Drawings or City GIS.
   4. During Lateral inspections the video display shall contain the lateral location and the footage of the camera within the lateral.

3.09 PHOTOGRAPHS

During CCTV inspections, screen captures will be taken from the monitor images and saved electronically by the in-sewer inspection crew of typical conditions every 200-feet and at all defects, construction features, manholes and laterals. The screen capture shall have the pipe reach (identified by the upstream and downstream manholes), survey direction, footage, and date when photograph was taken. The annotation shall be clearly visible and in contrast to its background, shall have a figure size no greater than 1/4-inch, and shall be type-printed. The annotation shall be positioned on the front of the photograph so as to not interfere with the subject of the photograph. Photograph files shall be named by the video capture system and automatically referenced to the logged defect.

The image of the sewer shall fill the photographic image. Photographs must clearly and accurately show what is displayed on the monitor, which shall be in proper adjustment. Where significant features exist within 6-feet of each other, 1 photograph shall be made to record these features. Where there is a continuous feature, photographs shall not be taken at intervals of less than 6-feet unless absolutely necessary to show a change in the feature.

The images shall be kept electronically, copied to a hard drive, and submitted with the inspection videos, database and reports.

3.10 MANHOLE NUMBERING, INSPECTION FORMS AND DEFECT CODES

A. The Contractor will be required to use the manhole numbering as shown on sewer maps provided by the City when performing the inspections for this project.

B. The City inspection forms and standard defect codes shall be used. The defect codes, inspection forms, inspection database and inspection protocols shall be in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP).

C. When lateral inspections are performed as part of the main sewer inspection, lateral numbers shall be referenced in the "comment" field of the main sewer PACP report. The lateral number shall be as follows:

<Upstream Manhole ID>_<footage>_<clock position>_<L>

Example: 39550020_212_02_L

D. When lateral inspections are not performed as part of the main sewer inspection, the main sewer inspection shall be performed first to obtain the footage and clock positions needed to identify the lateral.

3.11 DELIVERABLES

The Contractor will be required to submit the following deliverables at the completion of the post construction video inspection. The pre-construction video inspection deliverables shall be as defined in 3.02 of this specification.

A. Inspection Reports to include:
   1. Inspection session header information (see required fields above)
   2. Defect log report including photo captures from CCTV video
   3. Schematic drawing of pipe showing defects
   4. Format:
      a. Adobe Acrobat PDF files: 1 report PDF per pipe
      b. Main sewer inspection report file name:

<upstream MH ID>_<downstream MH ID>_<Date (year_mo_day format)>.PDF

Example: 30060002_30060001_2010_02_16.pdf

c. Lateral inspection report file name:

<upstream MH ID>_<footage>_<clock position>_<L>_<Date (year_mo_day format)>.PDF_

Example: 30060002_210_02_L_2010_02_16.pdf

B. Inspection video files on portable hard drive, typed labels shall be attached to the face of each hard drive. The typed index labels shall include the following information:
   1. Content (CCTV)
   2. Contractor name
   3. Purpose of Survey
   4. Tributary Pump station number
   5. Reaches included (from Manhole Number ## to Manhole Number ##)
   6. Date of survey
   7. Contract Number / Delivery Order Number (if applicable)

C. Main sewer video files shall be MPEG or Windows Media File named according to the following standard:

<Upstream MH ID>_<Downstream MH ID>-<Inspection>_<Date (year month day)>.wmv

Example: 39540008-39540007_20090805.wmv

In instances where a reverse set up is necessary to perform or complete the inspection the file name shall incorporate a "R" at the end of the file name to indicate "reverse" direction. Using the file example above, if the inspection from the upstream end was halted due to an obstruction and the pipe was televised from the opposite end, the video file from the downstream to upstream direction would be assigned the following file name:

Example:39540008-39540007_20090805_R.wmv

D. Lateral connection inspection video files shall be MPEG or Windows Media File named according to the following standard:

<Upstream MH ID>_<footage>_<clock position>_<L>_<date (year_mo_day format)>.wmv

Example: 39540008_145_10_L_2009_08_05.wmv

E. Electronic Inspection Data stored and exported in a NASSCO Pipeline Assessment and Certification Program (PACP) compliant Microsoft Access database (.MDB) version 4.4 or newer delivered on DVD or portable hard drive.

F. Inspection photograph digital files (jpeg) indexed to NASSCO PACP compliant database.

G. Map of sub area depicting area inspected, inspection status, asset identification numbers and mark ups,

H. Acceptable media for the video recordings portable hard drive.

I. Inspection data noted above shall be provided to the City weekly throughout the inspection work.

J. Contractor Quality Control report detailing data validation performed, pipe inspection records reviewed and results.

K. All inspection data shall be submitted on a portable hard drive. Each hard drive shall be filled with as much data as practical to minimize the number of hard drives submitted. Sections of a single segment of sewer main shall not be recorded to more than 1 hard drive. Video footage of recorded segments shall be grouped by area and shall be submitted in sequential order relating to the area mapping designation.

L. Upon approval by the City of all, or portions of, the data delivered via the portable hard drives, the approved CCTV data shall be delivered to the City on a portable hard drive labeled with project information. The hard drive shall clearly indicate the date of the inspection, the designated segment(s) of sewer mains(s) contained on the disk, the name of the project, the project CIP number, the pump station number, and Contractor name. The hard drive shall contain separate digital files for each manhole-to-manhole section.

M. The database shall be comprehensive for the entire project, and additional data shall be added to the database each week.

3.12 ACCEPTANCE

A. Inspection deliverables will be validated to check conformance with the specified requirements for file names, formats, quantity, resolution, data table references, in addition to checks for null fields, asset numbers, duplicate records, connectivity, material, size, and depth. Any data not passing the data validation checks will be returned to the Contractor for resubmittal.

B. Inspection submittals will be reviewed for quality control. A minimum of 5% of the submitted inspections will be randomly reviewed. A quality control check will be performed for each CCTV operator and each operator must exceed 90% accuracy.

C. Throughout the duration of the project, should the City discover inaccuracies in data or quality issues with any of the videos, Contractor shall re-inspect those segments at no additional cost to the City. The City will provide comments regarding acceptance of the data within 21-days of receiving the data from the Contractor. Neither the CCTV inspections nor the WORK inspected is accepted by the City until such time that an acceptance letter is issued by the City.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02763

TELEVISION SANITARY SEWER LATERALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work consists of furnishing all labor, materials, accessories, equipment, tools, transportation, services and technical competence for performing all operations required to execute the internal closed circuit television (CCTV) inspection to inspect service lateral after lateral clean outs have been installed.

B. The CCTV inspection shall show all defects and determine amount of infiltration entering the service laterals.

C. The post CCTV lateral inspection shall also be performed for any laterals after the laterals have been lined or replaced.

1.02 GENERAL

A. After cleaning as specified in Section 02761 "Cleaning Sanitary Sewer Systems" (including special cleaning involving the mechanical removal of roots, grease, and/or tuberculation where authorized), and before and after repair/replacement work, the lateral shall be visually surveyed by means of closed circuit television. The CCTV inspection shall be performed 1 lateral at a time.

B. Pre and post construction survey video shall be delivered to the City on DVD or portable hard drive accompanied with the corresponding TV logs for sewer laterals surveyed. The video shall be direct from a live video source into a video file, MPEG or Windows Media File format and of good quality for viewing. The recording of multiple laterals on a single DVD or hard drive is acceptable.

1.03 SOFTWARE

A. The Contractor shall utilize a NASSCO Pipeline Assessment Certification Program (PACP compliant software to capture the lateral inspections), unless otherwise approved by the City.

1.04 EQUIPMENT

A. The television camera used for the lateral survey shall be one specifically designed and constructed for such survey. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 700-line resolution color video picture. The Contractor shall maintain the camera in clear focus at all times. Picture quality and definition shall be to the satisfaction of the City, and if unsatisfactory, equipment shall be removed and replaced with adequate equipment at no additional cost to the City.

B. The camera used from a cleanout shall be able to be launched from the cleanout and travel down to the sewer mainline up to 100-feet. The camera system shall be able to inspect 3, 4, and 6-inch lateral connections.

C. The video camera shall include a titling feature capable of displaying on the video the following information.
   1. City
   2. Date/Time
   3. Contractor's Name
   4. Pipe Size (Diameter) and Material
   5. Lateral ID (provided by City)
   6. On-going Footage Counter

1.05 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. The Contractor's submittals shall include description of the software to be used and a sample of the video titles to be used, along with a sample of the television survey log to be used.

1.06 QUALIFICATIONS

A. The qualifications of the CCTV Contractor shall be submitted and shall include detailed descriptions of the following:
   1. Name, business address and telephone number of the CCTV Contractor
   2. Name(s) of all supervisory personnel to be directly involved with this Project
   3. NASSCO PACP certification of on-site operator performing inspections or subject to City approval, resume of proposed CCTV operator displaying similar inspection experience
   4. The Contractor shall sign and date the information provided and certify that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel will be directly involved with and used on this Project. Substitutions of personnel and/or methods will not be allowed without written authorization of the City.

5. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the City.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All material supplied shall be one of the products specified in Appendix B "List of Approved Products" appended to these technical specifications.

B. All inspection information and data (including video) shall be written to digital media (DVD or portable hard drive).

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION SURVEY

A. Procedure
   1. Prior to any repair work, the entire service lateral (from mainline to property line or cleanout, whichever is farther from the mainline) shall be televised.
   2. Measurement for location of defects shall be above ground by means of a meter, roll-a-tape, or other suitable device. Linear footage shall be shown on screen during recording.
   3. Movement of the television camera shall be temporarily halted for a minimum of 10-seconds at each visible defect or point of flow until the source and flow rate from that point are determined.
   4. The inspection shall be performed from either the main sewer or the cleanout with the proper equipment.

B. Field Documentation
   1. Television CCTV Logs: The Contractor shall obtain lateral identification numbers from the City. All inspection logs shall reference the applicable lateral ID. In addition, the upstream manhole number, distance from the upstream manhole, lateral connection to the main line (left, center or right), and address of the customer serviced by the lateral shall be noted on the television survey log. Inspections shall be recorded in NASSCO PACP/Lateral Assessment Certification Program compliant software unless otherwise approved by City. Reports shall be generated from the software. Printed and electronically stored location records shall be kept by the Contractor and will clearly show the location in relation to the cleanout or the mainline of each infiltration point observed during survey. Footage shall be shown on the log. In addition, other points of significance such as unusual conditions, roots, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to City.
   2. Photographs: Digital photographs of the television picture of problems shall be taken by the Contractor upon request of City.

3. Video Recordings: Individual video files shall be created for each lateral inspected. Each file shall be in MPEG or Windows Media video format. Video files shall be named with the lateral ID and date of inspection. Video files shall be submitted on DVD or portable hard drive. The purpose of video recording shall be to supply a visual and audio record of problem areas in the lines which may be replayed. Once recorded, the video shall become the property of the City.
4. Audio: All lateral inspection videos shall have an audio record. As a preamble, at the beginning of the inspection, the Contractor shall state the following "(Contractor's Name) is performing a pre/post TV survey of laterals for (each sub area)". State date, time, operator's name, area, pipe size and material, upstream City asset manhole number, and depth. The Contractor shall verbally state the position of the lateral with respect to the upstream manhole and describe defects. At the end of each line, state: "end of line and total linear footage".

3.02 POST CONSTRUCTION SURVEY

A. Procedure
1. The same procedure shall be used as indicated in sub-section "3.01 Preconstruction Survey."
2. In addition, the Contractor shall stop the camera at all point repairs and inspect entire repaired pipe sections.
3. The Contractor shall invert white foreground to black as needed in line sections with light background.
4. In the case of a post liner survey, the Contractor shall fully televise both ends of the liner so that the fit of the liner to the host pipe can be evaluated.
5. The post liner and/or replaced lateral and/or point repaired lateral CCTV inspection shall be done within 2-weeks of installation.

B. Documentation

The same documentation shall be provided as indicated in paragraph 3.01 "Preconstruction Survey" of these specifications.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02764

TELEVISING EXISTING MANHOLES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall perform visual inspections of the existing manholes and record any defect discovered. The visual inspection shall include surface photo, manhole cover and frame, chimney, walls, invert, and all appurtenances.

B. The nature of the inspections shall be to verify the physical condition of the manhole and to provide a permanent record of the existing condition as it relates to dimensions, materials, obstructions, breakage, connections, and deterioration. Inspections may be performed by personnel entry or from the surface utilizing pole mounted camera equipment to visually inspect the chimney, cone, wall, bench, pipe seals and invert conditions, and conditions of connecting pipes.

1.02 REQUIREMENTS

A. The Contractor shall inspect the manhole surroundings and the manhole interior using visual means and a digital camera for documentation.

B. All inspections shall be recorded on standard manhole forms.

C. All inspection forms shall be scanned and submitted as .PDF files.

D. All inspection data shall be entered into a NASSCO Manhole Assessment Certification Program (MACP) compliant database provided by the City. The database shall be submitted along with the scanned .PDF files and all digital photographs in .JPG format.

E. The inspection photographs, report documents, and inspection database shall be in accordance with City data standards and NASSCO MACP. Where discrepancies exist between MACP and City standards, the City standards shall be used.

F. Contractor shall maintain a copy of all report materials. The Contractor shall provide comments as necessary to fully describe the existing condition of the manhole on the inspection forms.

G. Contractor shall be responsible for modifications to equipment and/or inspection procedures to achieve City report requirements.

H. No Work shall commence prior to approval of the submitted materials by the City. Once accepted, the report materials shall serve as a standard for the remaining work.

1.03 QUALITY ASSURANCE

A. Refer to Section 01101 "Special Requirements (Gravity Inspection Only)" for Contractor's qualification requirements.

B. Each inspection supervisor shall be NASSCO PACP/MACP certified. Use of PACP/MACP certified technicians to review/document defects in the office (post process) is not acceptable.

C. The CCTV Contractor must have an internal quality assurance/quality control (QA/QC) program in place and all inspection data shall be subjected to the procedures prior to submittal to the City. The City will perform QA/QC audits on submitted data.

A QA/QC shall be performed by NASSCO MACP and PACP certified personnel.

1.04 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. The following deliverables shall be submitted at the completion of inspection:
   1. Electronic version (.pdf) of the manhole inspection reports
   2. Populated City Standard manhole inspection database (.mdb or Excel) saved on CD-R's, DVD, or portable hard drives.
   3. Inspection digital photographs in JPEG format saved on CD-Rs, DVD or portable hard drives.
   4. QA/QC report

C. The above deliverables shall be submitted to the City for approval.

D. The manhole inspection reports and database shall be in accordance with City data standards and NASSCO MACP.

1.05 NOTIFICATION

The Contractor shall notify the City a minimum of 48-hours prior to performing any inspection work. The City may be present during part or all of the inspections. No payment will be made for inspections performed without proper schedule notification.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix B "List of Approved Products" appended to these technical specifications.

2.02 DIGITAL CAMERA FOR REMOTE INSPECTIONS

All manhole photographs required as part of this specification shall be obtained using a minimum 2-megapixel digital camera with strobe flash capable of producing digital images with minimum resolution of 640 x 480.

PART 3 - EXECUTION

3.01 GENERAL

A. The inspection crew shall mobilize to the site of the manhole inspection and immediately establish traffic control measures per City and Florida Department of Transportation (FDOT) requirements as well as any measures required to protect pedestrians. The crew shall inspect each manhole and record required information.

B. All manhole structures shall be located. Metal detectors shall be used to locate buried manholes. Once a buried manhole has been located, it shall be marked with paint and/or flagging, if necessary. All pertinent information available shall be recorded including area photo, address, etc. Contractor shall notify the City weekly with a list of those manholes that could not be fully inspected due to access issues. The City may arrange to have some or all these manholes exposed, or otherwise made accessible for full inspection. The City will notify Contractor of the status and may authorize re-inspection.

3.02 MANDATORY INSPECTION HEADER INFORMATION

A. Once the manhole is located, the following mandatory information shall be recorded on the inspection form (template is located in the forms section). Note that the mandatory fields noted below are more inclusive than the MACP requirements. All available information shall be collected and recorded for those manholes that are buried, could not open, surcharged, etc.
   1. Manhole Number City standard Asset Number)
   2. Sheet number
   3. Purchase Order No.
   4. Date
   5. Time
   6. Surveyor's Name
   7. Certification Number
   8. System owner
   9. Locality (City of Everglades City)
   10. Drainage area (tributary Pump Station Number)
   11. Map number
   12. Location (street number and name)
   13. Downstream pipe length (feet)
   14. Rim to grade (nearest 0.1 foot)
   15. Pre-cleaning method (using approved MACP codes)

16. Location code (using approved MACP codes)
17. Manhole surface type (using approved MACP codes)
18. Potential for runoff (using approved MACP codes)
19. Access point type (using approved MACP codes)
20. Inspection status (using approved MACP codes)
21. Area photo image reference (using City standard naming convention)
22. Internal photo image reference(using City standard naming convention)

3.03 MANHOLE COMPONENT OBSERVATIONS

A. The inspection crew shall complete all fields within the manhole component/observation section of the inspection form. The following information shall be collected:
   1. Cover type (solid, vented, bolted)
   2. Cover size (top surface diameter in inches)
   3. Cover material
   4. Number of vent holes
   5. Cover/Frame fit (cover to frame fit, MACP codes)
   6. Cover condition (MACP codes)
   7. Cover insert type
   8. Cover insert condition
   9. Frame condition
   10. Frame seal condition
   11. Frame offset distance
   12. Frame seal inflow
   13. Wall material
   14. Interior wall coating
   15. Wall diameter
   16. Bench present
   17. Channel installed
   18. Additional remarks relevant to the manhole

3.04 MANHOLE INTERIOR INSPECTION

A. The inspection crew shall determine the types of defects within the manhole, document each defect on the manhole form and take a photograph of each defect. The manhole chimney, cone, wall, bench, and channel shall be inspected for structural integrity, signs of I/I and the presence of roots. All documentation shall follow NASSCO MACP standards. Each defect will be documented on the inspection form with the following information:
   1. Defect number
   2. Component of manhole containing defect
   3. Defect code (using approved MACP codes)
   4. Image Reference (using City approved file naming structure)

3.05 CONNECTING PIPE DETAILS

A. Each pipe entering and exiting the manhole shall be photographed where possible and inspected to determine diameter, pipe material, debris levels, and rim to invert distance (to 0.1-feet). The pipe inspection will include the following information:
   1. Pipe photo (using City approved file naming structure)
   2. Pipe direction (incoming or outgoing)
   3. Pipe clock positions (6:00 position = outgoing)
   4. Pipe diameter
   5. Pipe material (using PACP codes)
   6. Rim to invert distance (measured to nearest 1/10th of a foot)
   7. Pipe special condition (drops, force mains, etc. using approved MACP codes)
   8. Debris depth
   9. Connecting structure number; if manhole or cleanout, service line clock position, stubout clock position, etc.
   10. Pipe seal condition (using approved MACP codes)
   11. Pipe seal roots (using approved MACP codes)
   12. Observed pipe defects, obstructions, roots, etc. (using PACP codes)

3.06 MANHOLE SKETCH, MAP UPDATE, AND NOTES

The inspection crew shall complete the manhole plan view sketch noting all connecting pipes. Any special observations or notes may be added to the profile sketch on the field form.

Influent and effluent lines in each manhole shall be compared to the existing map and corrections noted in the sketch section of the field form.

3.07 NOTIFICATION OF EMERGENCY CONDITIONS

Inspection crews shall immediately notify the City and/or on-site inspector of any defects posing imminent danger to the public (missing lids, covers broken during inspection, sink holes, etc.) and any observed pipe blockages or potential overflow conditions.

3.08 COMPLETION

A. Once the inspection is complete the field crew shall make certain the ring is clean and does not have any debris preventing a proper cover fit. The manhole lid shall be replaced and any displaced items moved back into place.

B. A list of manholes that could not be fully inspected, along with the problem explanation, shall be forwarded to the City weekly throughout the inspection work.

C. If the Contractor has completed accessible inspections, and the City authorizes, then Contractor may be required to re-mobilize at the same unit price and complete the requested inspections. All re-inspections will be at the same contracted unit price.

D. Any map updates shall be consolidated and forwarded to the City with the submitted inspections.

3.09 PHOTOGRAPH REQUIREMENTS

A. During each inspection the following series of photographs shall be taken:
   1. Area Photograph: During the inspection, a photograph shall be taken of the manhole cover showing location within the roadway, shoulder, or easement as appropriate. Photographs shall be taken of any indications of previous overflows such as watermarks and paper or other debris typical of sewer overflows. Surface photographs shall be oriented in the direction of the outgoing pipe to show the pipeline cover and easement condition. The area photographs should show the manhole visible in the foreground where possible. A minimum of 1 area photo is required.
   2. Internal Photograph: Take a photograph of the manhole interior in plan view showing the general arrangement of the incoming and outgoing sewers, manhole walls, and other appurtenances. The internal condition photograph shall be oriented with the direction of the outgoing main line flow at the bottom of the photograph (6:00 position). A minimum of 1 internal photograph is required.
   3. Manhole Defect Photographs: During manhole inspections digital photographs shall be taken of all defects. Photographs must clearly and accurately show each defect and correspond to defects and photo numbers logged on the manhole inspection form. A minimum of 1 photo for each observed defect is required.
   4. Connecting Pipe Photographs: The camera should then be pointed into all incoming and outgoing pipes where possible to capture general conditions within the pipes. Any obvious blockages or defects should be noted using PACP defect codes. A minimum of 1 photo of each incoming or outgoing pipe is required.

B. During inspections manholes shall be free of steam, fog, water vapor, or other conditions that will impact the quality of photographs.

C. All photographs shall adequately capture the manhole conditions and details of defects. Lighting and camera quality shall provide a clear, in-focus picture of the manhole interior, manhole defects, and manhole. The lighting shall provide uniform light free from shadows or hot spots.

D. If larger than 640 x 480 resolution, then photo will be converted to 640 x 480. Photos less than 640 x 480 are not acceptable and converting upward to 640 x 480 is not acceptable. All photographs shall be resized to 640 x 480 resolution to minimize file size.

E. The images shall be kept electronically, copied to a CD, DVD, or external hard drive, and submitted with the inspection forms per paragraph 3.06. Photographs shall be named according to the photograph naming conventions included herein.

F. All digital photographs shall be referenced on the manhole inspection form and electronic spreadsheet/database.

G. All digital photographs shall be renamed in accordance with the following photo file naming convention:
   1. Area Photo = Manhole ID, A, Photo Number, jpg
      Example: 3965002A0001.jpg
      Manhole: 39650002
      A=Area Photo
      Photo No.0001
   2. Internal Photo = Manhole ID, I, Photo Number, jpg
      Example: 3965002I0001.jpg
      Manhole: 3965002
      I=Internal Photo
      Photo No.0001
      (Note: Photo oriented with the outgoing pipe on the bottom)
   3. Manhole Defect Photo = Manhole ID, M, Photo Number, jpg
      Example: 3965002M0015
      Manhole: 3965002
      M=Manhole Defect Photo
      Photo No. 0015
   4. Pipe Photo = Manhole ID, P, Photo Number, jpg
      Example: 3965002P0002.jpg
      Manhole: 3965002
      P=Pipe Photo
      Photo No. 0002

3.10 MANHOLE NUMBERING, INSPECTION FORMS AND DEFECT CODES

The Contractor shall use the City manhole numbering system when performing the inspections for this Project. Manhole numbers will be provided by the City.

Defect codes shall conform to those specified in the NASSCO MACP specification.

3.11 SITE RESTORATION

After inspecting manholes in an area, the work site shall be cleaned and restored to pre-Work conditions. If manhole is buried and exposed, then restore site by placing material back over exposed manhole. No re-sodding is anticipated or included in the pricing.

3.12 DELIVERABLES

The Contractor will be required to submit the following deliverables at the completion of inspection.

A. Scanned Field Inspection Reports to include:
   1. Inspection session header information (see required fields above)
   2. Component observations

3. Manhole inspection details including defects observed and photo image references
4. Connecting pipe details
5. Manhole plan view sketch
6. Format:
   a. Adobe Acrobat PDF files: 1 report PDF per manhole
   b. File name: <MH ID> <Date (year_mo_day format)>.PDF

      Example: 30060002_2010_02_16.pdf

B. Inspection digital photograph in City approved format and resolution, and assigned file names in accordance with the City standard.

C. Electronic Inspection Data stored and exported in City approved NASSCO Manhole Assessment and Certification Program (MACP) compliant Microsoft Access database (.MDB) version 4.4, or Excel file delivered on DVD or portable hard drive.

D. Marked up field maps detailing map corrections and/or discrepancies noted during inspection.

E. All digital files shall be submitted on DVD or portable hard drive, labeled as follows:
   1. DVD/Hard drive Labels: Typed labels shall be attached to the face of each DVD. The typed index labels shall include the following information:
      a. Content (Manhole Inspections)
      b. Contractor name
      c. Purpose of Survey (CIP R/R)
      d. Tributary Pump station number
      e. Manholes included (listing of manholes using City standard Asset Numbers)
      f. Date of survey
      g. Contract Number / Delivery Order Number (if applicable)
      h. QA/QC report including listing of manhole inspections reviewed and results.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02771

CURE-IN-PLACE FOR SANITARY SEWER RENEWAL

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The Work within this Section consists of the installation and testing cured-in-place pipe (CIPP). The CIPP shall provide a structurally sound, joint-less and water-tight new pipe within a pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP using the system selected by the Contractor.

B. The finished liner shall extend over the installation length in a continuous, tight fitting, watertight pipe-within-a-pipe and shall be fabricated from materials which, when installed, will be chemically resistant to withstand internal exposure to domestic sewage.

C. Neither the CIPP system, nor its installation, shall cause adverse effects to any of the City's facilities or processes. The use of the product shall not result in the formation or production of any detrimental compounds or by-products at the treatment facilities. The Contractor shall test and monitor the levels of by-products produced as a result of the installation operations. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.

1.02 INSTALLER EXPERIENCE AND QUALIFICATIONS

A. The Contractor's staff experience shall meet as a minimum the following requirements. The inability to document such experience may be grounds for rejecting the proposed installer's staff.

1. The proposed Superintendent must have a minimum of three (3) years of CIPP lining supervisory field experience on projects totaling a minimum of 150,000 LF of 8-inch or greater CIPP liner installation using the methods and materials proposed for this Work, as documented by verifiable references. Superintendent's resume of projects. Each reference project shall include the pipe dimensions, length of installation, size/type of flow control required to perform the Work, description of the actual work performed including installation method, owner's name, telephone number and contact person, date of installation. It is required that the Superintendent(s) named are the Superintendent(s) assigned to this project and on site during construction. The Contractor is required to have at least 1 qualified Superintendent on site at all times during the construction activities. All referenced experience shall be for

projects completed within the United States or Canada and shall have used the same installation method, CIPP liner and resin combination proposed for this project. References will be checked.

2. Installation Crew: At least 1 person other than the Superintendent from the CIPP installation crew shall have a minimum of 1-year of CIPP experience totaling at least 20,000 lineal feet of 8-inch or greater installed liner. The crewmember with listed qualifications must be on the project site during all installation activities.
3. Boiler Technician: Contractor shall provide the name and information for the boiler technician who will perform the actual Work. The boiler technician must have a minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in which a similar position was held.
4. Lateral Cutter Technician: Contractor shall provide the name and information for the technician who will perform the actual Work. The lateral cutter technician must have a minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in which a similar position was held.
5. Lead CCTV inspector shall be NASSCO PACP certified to report liner defects.
6. The final decision to accept or reject the product, manufacturer, and/or installer lies solely with the City. The named Manufacturer, Field Superintendent, CIPP Lead Installer, Boiler Technician, and Lateral Cutter must be employed to perform the Work, unless changes are specifically authorized by the City.

1.03 PERFORMANCE WORK STATEMENT

A. The Contractor shall submit, before any lining WORK is performed, to the City a Performance Work Statement (PWS) which clearly defines the CIPP product delivery in conformance with the requirements of these contract documents. The PWS shall contain at a minimum the following:

1. Contractor's certificate of compliance that clearly indicates that the CIPP will conform to the project requirements as outlined in Specification Section 01010 Summary of Work and as delineated in these specifications.
2. A detailed installation plan describing:
   a. All preparation work (cleaning operations, pre-CCTV inspections, by-pass pumping, and traffic control)
   b. Installation procedure and method of curing
   c. Service reconnection
   d. Quality control and testing to be performed
   e. Post-CCTV inspection
   f. Warrantees
   g. Description of the proposed CIPP lining technology.
3. A detailed plan for identifying all active service connections during mainline installation.
4. The qualifications of the Contractor.
   a. Name, business address and telephone number

b. Personnel names, experience, and certifications for Field Superintendent, CIPP lead Installer, Lateral Cutter, Boiler Technician, and Lead CCTV NASSCO PACP Certificated Inspector to be directly involved with this project. The Contractor shall sign and date the information provided and "certify that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel will be directly involved with and used on this project". Substitutions of personnel and/or methods will not be allowed without written authorization of the City.
c. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the City/Professional.

5. Proposed manufacturer's technology data shall be submitted for all CIPP products and all associated technologies to be furnished.
6. All tools and equipment required for a complete installation of the CIPP.
   a. Clearly describe all equipment including proposed back-up equipment to be furnished for this project.
   b. Identify redundant tools and equipment to be kept on the job site in the event of equipment breakdown.
   c. The Contractor shall outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process for the CIPP.
7. A detailed description of the Contractor's proposed procedures for the removal of any existing blockages in the pipeline that may be encountered during the cleaning process.
8. Detailed public notification plan for stage notification to residences affected by the CIPP installation.
9. An odor control plan that will ensure that project specific odors will be minimized at the project site and surrounding area.
10. Outline specific repair or replacement procedures for potential defects that may occur in the installed CIPP. Repair or replacement procedures shall be as recommended by the CIPP system manufacturer and shall be submitted prior to any Work.
    a. Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on the manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of the specifications.
    b. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.

1.04 REFERENCES

A. Codes, Specifications, and Standards

1. Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply, unless otherwise shown or specified.

2. All American Society for Testing and Materials (ASTM) Standards noted below shall be to the latest revised version.
   D543 – Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents
   D638 – Standard Test Method for Tensile Properties of Plastics
   D790 – Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials
   D792 – Standard Test Methods for Density and Specific Gravity of Plastics by Displacement
   D2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
   D2837 – Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
   D2990 – Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
   D3567 – Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
   D3681 – Standard Test Method for Chemical Resistance of "Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe and Fittings
   D5813 – Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe
   F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of a Resin-impregnated Tube
   F1743 – Standard Practice for Rehabilitation of existing pipelines and conduits by pulled-in-place installation of cured-in-place thermo setting resin pipe
   F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-inPlace Thermosetting Resin Pipe (CIPP)
   F2561 - Standard Practice for Rehabilitation of a Sewer Service lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner

1.05 PRE-TREATMENT OF REGULATED CHEMICALS TO DISCHARGE INTO SEWER

A. CIPP liner systems using resins containing styrene or other regulated chemicals that will be discharged into the wastewater system shall be required to reduce the concentration of Styrene in the cure water prior to discharge to the sanitary sewer. The discharge limits are as follows:

	Discharge Limits to South WRF Service Area		Discharge Limits to Northwest WRF Service Area		Discharge Limits to Eastern WRF Service Area	
Total Gallons of Discharge Including Water Added for cool down	Maximum Styrene Concentration Limit for Discharge to South WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to South WRF (Pounds/Day)	Maximum Styrene Concentration Limit for Discharge to Northwest WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to Northwest WRF (Pounds/Day)	Maximum Styrene Concentration Limit for Discharge to Eastern WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to Eastern WRF (Pounds/Day)
< 500,000	7	29	1	4	3.5	14
< 250,000	14	29	2	4	7.0	14
< 100,000	35	29	5	4	17.5	14

1. A single day's or line segment water discharge in excess of 500,000 gallons per day shall require approval by the City 's Environmental Compliance Section for separate concentration limit evaluation and approval."

B. CIPP liner systems using resins containing styrene or other regulated chemicals that will be discharged into the wastewater system shall require a pre-treatment plan to remove the regulated chemicals to acceptable levels prior to discharge. The Contractor shall submit the pre-treatment plan to the City for approval prior to discharge. The information required shall include:

1. MSDS for all chemicals used in the process and that will be discharged into the wastewater system
2. Representative analytical data that was performed in the past for the proposed process, as collected from the wastewater stream
3. The addresses and mapped locations of the discharge
4. The total duration of discharge request
5. The anticipated discharge temperature. Discharges in excess of 140°F are not permitted
6. The Contractor shall submit for approval a summary table of pre-treatment design calculations in Excel containing the following information: a. Dates of discharge of each section
   b. Lining section numbers using the OCUD numbering system
   c. Length and diameter of each section
   d. Volume (in gallons) of inversion water of each section
   e. Volume (in gallons) of cool down water of each section
   f. Total volume (in gallons) of inversion and cooling water of each section
   g. Regulated chemical (in pounds) in discharge volume of each section
   h. Reduction chemical (in pounds) to meet post-treatment concentration limit . Reaction time period (in hours) to achieve post-treatment concentration limit j. Cool down time period (in hours)
   k. Regulated chemical post-treatment concentration limit (in PPM)

7. The Contractor shall provide pre-treatment and post-treatment sampling and laboratory analysis of the process wastewater and submit the results to the City for verification.

C. After curing, the Contractor shall obtain a post-treatment cure water sample at each site and submit for laboratory analysis.
   1. The following laboratory analysis is required:
      a. One (1) sample to be collected from the treated water line segment and analyzed for "Styrene" using EPA Method 8260.
      b. One (1) "Trip Blank" sample, analyzed for "Styrene" using EPA Method 8260.
   2. The Contractor shall submit the analytical report to the City for approval.
   3. The Contractor shall be responsible for all costs related to laboratory analytical testing of the water samples collected.
   4. Sampling shall continue for each successive lining segment until the laboratory results verify the Contractor's competency in determining the amount of styrene reduction tablets/material required for a given water volume. Competency will be determined by meeting the stated discharge limits.
   5. Once the sample results demonstrate that the discharge limits have been met the Contractor shall follow similar styrene reduction procedures for subsequent lining segments, but sampling will not be required.
   6. Should samples from three locations not meet the discharge limits, the City may require the Contractor to hold cure water in place until laboratory results confirm the water is below the discharge limits.
   7. The City reserves the right to obtain samples at any site on any line segment to ensure compliance with the discharge limits."

D. The service areas for each of the proposed lining subareas are as follows:
   1. (Subarea Name) (Subarea Number) is/are located in the Eastern WRF service area.
   2. (Subarea Name) (Subarea Number) is/are located in the South WRF service area
   3. (Subarea Name) (Subarea Number) is/are located in the Northwest WRF service area.

1.06 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

A. It shall be the responsibility of the Contractor to schedule and perform his work so as to result in no overflows or spills of sewage or combined sewage from the system. If sewage flows are such that they interfere with the Contractor's ability to perform work, the Contractor shall be responsible for scheduling his work during low flow periods or provide bypass pumping. Bypass pumping shall be provided only with the specific written approval of the City.

B. In the event of overflows caused by the Contractor's work activities, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the spillage, disinfect the area affected by the spill, and notify the City in a timely manner.

C. Contractor will indemnify and hold harmless the City for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or

partially the responsibility of the Contractor. Should fines subsequently be imposed as a result of any overflow for which the Contractor is fully or partially responsible, the Contractor shall pay all such fines and all of the City 's legal, engineering, and administrative costs in defending such fines and claims associated with the overflow.

D. If the Contractor is required to hold cure water due to unacceptable styrene testing results, the Contractor shall be required to provide bypass pumping or other means to insure wastewater service is not disrupted during the hold period.

1.07 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals." Submittals shall include the following:

1. Performance Work Statement shall be provided with a table of contents and tabbed sections.
2. Product:
   a. A list of projects from the Manufacturer that total a minimum of 500,000 linear feet of liner installed in the United States. An Excel spread sheet shall be included listing as a minimum the name of projects, linear footage of main, completion date, contract amount, name of owner, address, contact person, and phone number.
   b. Fabric tube – manufacturer and description of product components
   c. Flexible membrane (coating) material and recommended repair (patching) procedure if applicable
   d. Raw resin data – manufacturer and description of product components
   e. Manufacturer's shipping, storage and handling recommendations for all components of the CIPP system
   f. All MSDS sheets for all materials to be furnished
   g. Tube wet-out and cure method including:
      (1) A complete description of the proposed wet-out procedure for the proposed technology
      (2) The manufacturer's recommended cure method for each diameter and thickness of CIPP liner to be installed including the curing medium and the method of application
3. Quality Control Plan
   a. Defined responsibilities of the Contractor's personnel for assuring that all quality requirements are met. These will be assigned by the Contractor to specific personnel.
   b. Proposed procedures for quality control, product sampling and testing shall be defined and submitted as part of the Plan.
   c. Proposed methods for product performance controls, including the method of and frequency of product sampling and testing both in raw material form and cured product form.

d. Inspection forms and guidelines for quality control inspections shall be prepared in accordance with the standards specified within this specification.
e. The manufacturer shall furnish a check list containing key elements of the CIPP installation criteria that is important for the City to ensure that quality control and testing requirements are performed in accordance with these specifications.

4. Engineering design calculations shall be submitted in a timely fashion prior to construction, in accordance with the Appendix of ASTM F-1216, for each length of liner to be installed including the thickness of each proposed CIPP. It will not be acceptable for the Contractor to submit a design for the most severe line condition and apply that design to all of the line sections. All calculations shall include data that conforms to the requirements of these specifications.
   a. These calculations shall be performed and certified by a Professional Engineer registered in the State of Florida.
   b. The manufacturer shall certify as to the compliance of its materials to the values used in the calculations.
5. The liner manufacturer shall submit a tabulation of time versus temperature. This tabulation shall show the lengths of time that exposed portions of the liner will endure without self-initiated cure or other deterioration beginning. This tabulation shall be at 5°F (degrees Fahrenheit) increments ranging from 70°F to 100°F. The manufacturer shall also submit his analysis of the progressive effects of such "pre-cure" on the insertion and cured properties of the liner
6. Certified copies of test reports of factory tests required by the applicable standards and this Section.
7. Manufacturer's installation instructions and procedures.
8. CIPP Installation Record (Shot Record) to include shot number and corresponding manhole to manhole pipe reaches for each scheduled installation, design thickness, actual thickness delivered to the site, pipe diameter, rechlength, total length of shot, and number of laterals.
9. Wastewater pre-treatment plan including data, measurements, assumptions, calculations and procedures for the pre-treatment of CIPP process wastewater containing regulated chemicals.
10. Manufacturer's detailed procedures for repairing liners that have been installed incorrectly or that have failed during installation.
11. Contractor's procedures and materials for service renewal including time and duration of sewer service unavailability and a complete description of the methods he intends to use to reconnect the existing laterals.
12. Sampling procedures and locations for obtaining representative samples of the finished liner.
13. Sampling tests for compliance by an independent laboratory shall be made according to the applicable ASTM specification and the manufacturer's quality control program.

B. A final certificate of compliance with this specification shall be provided by the manufacturer for all lining material furnished.

1.08 WARRANTY

A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The Contractor shall warrant the liner material and installation for a period of one (1) year. During the Contractor warranty period, any defect which may materially affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the Contractor's expense in accordance with procedures in these specifications and as recommended by the manufacturer.

B. On any work completed by the Contractor that is defective and/or has been repaired, the Contractor shall warrant this work for an additional one (1) year.

1.09 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products. No products shall be shipped to the job site without the approval of the City.

B. Keep products safe from damage. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

C. The wet-out facility shall write the Shot number, total wet-out length, thickness, pipe width, and resin type on each bag delivered to the project.

PART 2 - PRODUCTS

2.01 GENERAL

A. The materials used shall be designed, manufactured, and intended for sanitary sewer pipe relining and the specific application in which they are used. The materials shall have a proven history of performance in sewer relining and rehabilitation.

B. Pipelining products pre-approved by the City include: BLD Full Circumference Liner of BLD Services LLC in accordance with ASTM F2561, or approved equal.

C. All materials, shipped to the project site, shall be accompanied by test reports certifying that the material conforms to the ASTM listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP system manufacturer to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage locations, shall be approved by the City. All damaged materials shall be promptly removed from the project site at the Contractor's expense and disposed of in accordance with all current applicable agency regulations.

D. The finished pipe liner in place shall be fabricated from materials which when complete are chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and temperatures up to 150ºF.

E. Take all necessary field measurements of the existing pipe (including diameter, ovality and length) prior to manufacturing liners.

F. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance from the inlet to the outlet of the respective manholes unless otherwise specified. The Contractor shall verify the lengths in the field before manufacturing.

2.02 STRUCTURAL REQUIREMENTS

A. Each CIPP shall be designed to withstand internal and/or external loads as dictated by the site and pipe conditions. The CIPP design shall assume no bonding to the original pipe wall.

B. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. The long-term modulus shall not exceed 50 percent of the short-term value for the resin system and shall be verifiable through testing. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.

C. The Contractor shall submit, prior to installation of the lining materials, certification of the compliance with these specifications and/or the requirements of the CIPP system. Certified material test results shall be included that confirm that all materials conform to these specifications. Materials not complying with these requirements will be rejected.

D. The design thickness of the CIPP shall be arrived at using standard engineering methodology as found in ASTM F1216 and the physical properties. In no case shall the finished thickness of the cured liner be less than 4.5 millimeters. The required cured structural CIPP wall thickness shall be based, as a minimum, on the physical properties described in TABLE 02771 - 1 Minimum Physical Properties and per the design of the Professional Engineer and in accordance with the design equations in ASTM F 1216 Appendix X1 and the following design parameters:

Design Considerations	Criteria
Tube Design	ASTM F 1216 Appendix X1
Hydrostatic Buckling	ASTM F 2561 Section 6.1 and 6.1.1
Design Safety Factor	2.0
Retention Factor for Long Term Flexural Modulus to be used in Design	50 % of the short-term value of the resin system

Ovality	2 %
Groundwater Depth*	100% depth from pipe invert to surface
Soil Depth*	As indicated on the plans
Lining enhancement factor (K)	7
Soil Modulus**	1,000 psi
Soil Density**	120 pcf
Live Load**	One (1) H20 passing truck
Design Condition	Fully deteriorated
Minimum Long-Term Life	50 years

*Denotes multiple line segments may require a table of values
**Denotes information required for fully deteriorated design conditions

TABLE 02771-1
Minimum Physical Properties

Property	Standard	Cured Composite per ASTM F1216 (PSI)
Flexural Strength (short term)	ASTM D790	4,500
Flexural Modulus of Elasticity (short term)	ASTM D790	250,000

E. When multiple layers are present, the layers of the finished CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or such that the knife blade moves freely between the layers. If separation of the layers occurs during testing of the field samples, new samples will be cut from the work. The composite of the materials will, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing Methods. Any reoccurrence may be cause for rejection of the work.

2.03 CURED-IN-PLACE LINER

A. Fabric
   1. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.
   2. The sewn tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F-1216, ASTM F1743, or ASTM D5813. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.

3. The wet out tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design CIPP wall thickness.
4. The flexible tube shall be fabricated to a size that when installed will neatly fit (minimum 99.75%) the internal circumference of the existing sanitary sewer lines (including services). Allowance shall be made for circumferential stretching during insertion so that the final cured product is snug against the wall of the host pipe.
5. The outside layer of the tube shall be coated with an impermeable, flexible membrane that will contain the resin and allow the resin impregnation (wet out) procedure to be monitored.
6. The tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
7. The wall color of the interior pipe surface of CIPP after installation shall be a relatively light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
8. Seams in the tube shall be stronger than the non-seamed felt material.
9. The tube shall be marked for a distance at regular intervals along its entire length, not to exceed five feet. Such markings shall include the Manufacturers name or identifying symbol.
10. Unless otherwise specified, the Contractor will use a polyester filter felt tube and a resin and catalyst system compatible with the inversion process and having the minimum physical properties for the cured pipe identified in Table 02771 - 1 Minimum Physical Properties.

B. Resin
1. The resin system shall be a corrosion resistant polyester or vinyl ester resin and catalyst system or epoxy and hardener system that when properly cured within the tube composite, meets the minimum requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties given herein these specifications Section 02771 and those, which are to be utilized in the design of the CIPP for this project.
2. The resin used shall not contain non-strength enhancing fillers.
3. The Contractor shall submit the resin characteristics, including filler identification, to the City for approval prior to lining activities.
4. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of the specification.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to any lining of a pipe so designated.
1. It shall be the responsibility of the Contractor to remove all internal debris and clean the existing sewer line and/or lateral in accordance with the recommendations of the liner

manufacturer prior to installation of the liner and in accordance with Section 02761 "Cleaning Sanitary Sewer Systems." Both mainline and lateral line shall be cleaned.

a. Preparation of the interior surface shall be accomplished by a thorough highpressure water-jet cleaning. The pipe shall be left free of all loose sand, rock, or other deleterious materials. Any roots in the pipe shall be either removed or cut off flush with the interior.
b. If conditions such as broken pipe and major blockages are found that will prevent proper cleaning or where additional damage would result if cleaning is attempted or continued, the Contractor shall notify the City immediately. The City will determine what course of action will be taken to complete the project.
c. Precautions shall be taken by the Contractor to ensure that no damage or flooding of public or private property is caused by the cleaning operation.
d. \The City shall inspect the prepared pipe for cleanliness and smoothness before the Contractor is authorized to proceed with pipelining operations.

2. Certified PACP personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform inspection of existing sewer lines. The interior of the line shall be carefully inspected in accordance with Section 02762 “Televising Sanitary Sewer Systems” to determine the location of laterals in any condition that may prevent proper installation of the liner pipe into the lines. Such conditions shall be noted so they can be corrected. A digital data video and a suitable log shall be prepared by the Contractor during the Work and provided to the Cityy a minimum of two weeks prior to liner installation.
3. The Contractor shall provide for the flow of sewage around the section or sections of pipe designated for lining as specified in Section 01516 "Collection System Bypass."
   a. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the sewer under repair.
   b. A sewer line plug shall be inserted into the sewer upstream from the section to be repaired. The plug shall be so designed that all or any portion of the sewage flows can be released. During the review, testing and installation portion of the operation, flows shall be shut off to properly install the cured-in-place pipe lining. The upstream manholes shall be constantly monitored for degree of surcharging. After the installation is complete, flows shall be restored to normal level.
   c. Wherever lines are blocked off and the possibility of backing up the sewage and causing harm to public and private property is foreseen, it shall be the Contractor's responsibility to bypass flow from manhole to manhole.
   d. Bypassing shall be accomplished using sewer plugs with pump connections, by pumping down surcharged manholes, or by other methods acceptable to the City. All bypassed flow must be discharged to a sanitary sewer. Bypassed flow shall not be allowed to enter any storm line, drainage ditch or street gutter.
   e. During a bypass operation, the pump shall be manned continuously; the Contractor shall maintain the pump and bypass equipment; and shall be responsible for any damages to public or private property due to the malfunction of same.
4. The Contractor shall clear the line of obstructions such as solids, dropped joints, protruding service connections or collapsed pipe that will prevent the insertion of the

liner pipe. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, then the City shall be notified immediately.

5. Do not install liner if ground water temperatures and/or ambient temperatures are excessive for the product installation procedures.
6. Notification of Public or Customers: Customers shall be notified by the Contractor with door hangers at least 3 days prior to the shutdown of any lateral services. The door hanger shall be approved by the City and advise the customers of when the Work will begin, expected date of completion, the type of work, and contact person for any questions and the door hanger. When it is necessary to shut down a private sewer lateral while work is in progress and before the laterals are reconnected, the customers shall be notified by the Contractor. No sewer or water service is to remain shut down for more than a period of 8-hours unless the Contractor provides substitute services for the residents. Commercial sewer services shall be maintained at all times that the business is open. No sewage from the services or main line shall be discharged on the ground or in waterways.
7. Contractor shall coordinate pump stations, force main and sanitary sewer operation, bypass and shutdown control with the City
8. Traffic Control: The Contractor shall provide all traffic control measures required for the safety of the public, workers and equipment during the Work and in accordance with FDOT and the City.
9. The Contractor shall provide critical backup equipment to ensure that the lining operation progresses without interruption. Required backup equipment shall include at a minimum 1 additional lateral cutter system and 1 additional CCTV camera system.

3.02 INSTALLATION OF LINER

A. The CIPP liner shall be installed and cured in the host pipe per the manufacturer's specifications as described and submitted in the Performance Work Statement. CIPP installation shall be in accordance with the applicable ASTM Standards with the following modification:

1. Prior to installation and as recommended by the manufacturer remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.
2. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat source. Another such gauge shall be placed between the impregnated reconstruction tube and the pipe invert at the remote manhole to determine the temperatures during cure. The resin manufacturer shall recommend temperature in the line during the cure period.
3. The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube shall be inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination

point. Sufficient excess resin will be provided to insure excretion into cracked pipe and/or joints of the host pipe after curing.

4. After inversion is completed, the Contractor shall supply suitable heat source and recirculation equipment. The equipment shall be capable of delivering the heat source throughout the section uniformly to raise the temperature above the temperature required to affect a cure of the resin. This temperature shall be determined by the resin/catalyst system employed. Temperatures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the manufacturer's recommended temperature levels. Copies of these records shall be given to the City at the completion of each installation.
5. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer's recommended cure schedule. The curing source input and output temperatures shall be monitored and logged during the cure cycles if applicable. The manufacturer's recommended cure method and schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM Standards as applicable, shall be taken into account by the Contractor.
6. For heat cured liners, if any temperature sensor or multiple sensors do not reach the temperature as specified by the manufacturer to achieve proper curing or cooling, the installer can make necessary adjustments to comply with the manufacturer's recommendations. The system computer should have an output report that specifically identifies each installed sensor station in the length of pipe, indicates the maximum temperature achieved and the sustained temperature time. Each sensor should record both the maximum temperature and the minimum cool down temperature and comply with manufacturer's recommendations.
7. For UV cured liners, all light train sensor readings, recorded by the tamper proof computer, shall provide output documenting the cure along the entire length of the installed liner. The cure procedure shall be in accordance with the manufacturer's recommendation as included in the performance work statement.
8. Temperatures and curing data shall be monitored and recorded by the Contractor throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP system manufacturer's recommendations.
9. The Contractor shall immediately notify the City of any delays taking place during the insertion operation. Such delays shall possibly require sampling and testing by an independent laboratory of portions of the cured liner at the City's discretion. The cost of such test shall be borne by the Contractor and no extra compensation will be allowed. Any failure of sample tests or a lack of immediate notification of delay shall be automatic cause for rejection of that part of the Work at the City's discretion.
10. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the cured-in-place inversion process, during which time the recirculation of the heat source and cycling of the heat exchanger to maintain the temperature continues.

Contractor shall retain a resin-impregnated sample (wick) to provide verification of the curing process taking place in the host pipe.

11. The Contractor shall cool the hardened pipe to a temperature below 100°F before relieving the static head in the inversion standpipe. Cool-down may be accomplished by the introduction of cool water into the inversion standpipe to replace water being drained and disposed per the approved pre-treatment plan. Care shall be taken in the release of the static head so that a vacuum will not be developed that could damage the newly installed pipe.
12. Seal the area where the line enters or leaves each manhole. Finish the inside of the manhole with a quick set cement grout to raise the invert to the grade of the liner pipe. Also use this grout to dress up around the end of the liner. This space may be sealed with a mechanical seal, chemical seal, or combination of both. The Contractor shall seal the liner at all manhole reconnections with an approved product, compatible with the liner, to completely seal any annular space present.
13. If the pipe liner fails to make a tight seal due to broken or misaligned pipe at the manhole wall or other reason, the Contractor shall apply a seal at that point.
14. The temperature of water discharged to the sewer system from processing liners shall not exceed 100°F maximum or the level allowed by State or Local standards. When draining water, care shall be exercised not to create a vacuum in the line.
15. After the liner has been installed, all active, existing services shall be temporarily reinstated. This shall be done without excavation in pavement areas, and in the case of non-man-entry pipes, from the interior of the pipeline by means of a 360° (degree) television camera and a cutting device that re-establishes the service connection. When a remote cutting device is used and a cleanout is available, then a mini-camera down the service may also be used to assist the operator in cutting or trimming. All coupons shall be recovered at the downstream manhole and removed.
16. The cost for maintaining sanitary sewer service for the property owners shall be included in the prices bid and no additional compensation will be allowed.

3.03 POST INSTALLATION

A. Service Lateral Renewal

1. The number of service connections on some sewer segments may exceed the number of buildings actually served. It is the Contractor's responsibility to determine through dye testing, or other acceptable methods, the services that are live and require reinstatement prior to commencing lining of the sewer main.
2. Inactive services to vacant parcels shall be renewed, unless otherwise directed by the City.
3. The exact location and number of service connections or side sewers shall be verified during the initial television inspection. It shall be the Contractor’s responsibility to accurately field locate all existing service connections or side sewers and establish means for access for flow control. The Contractor shall reconnect all service connections or side sewers to the liner pipe as indicated in accordance with the Contract Documents.

4. The Contractor shall be responsible for restoring/correcting, without any delay, all missed or faulty reconnections, as well as any damage caused to property owners for not reconnecting the services soon enough or for not giving notice to the property owners.
5. Any lateral not initially reinstated by the Contractor that proves to be active shall be reinstated by the Contractor at no additional cost to the City and the Contractor shall be responsible for any resulting property damage of floods.
6. All existing service connections shall be reconnected by a remote controlled cutting device directed internally by a television camera or by internal manual cutting. Cuts shall be made by experienced operators so that no blind attempts or holes are made in the liner pipe. Locations shall be verified carefully to match earlier tapes for accurate lateral location, especially where dimples are not well defined. The City reserves the right to require service connection by excavation at the Contractor's expense at any location if the quality or workmanship of the cut is not satisfactory.
7. A 2-pass process of utilizing a cutter to open the lateral followed by wire brush (or similar) attachment to complete the cutting flush with the lateral walls should be utilized, or approved alternate. It shall be properly aligned, invert to invert, to the existing connection with no obstructions to the flow. Resin slugs shall be removed as necessary from reinstated service connections. Any mis-cuts shall be repaired at no cost to the City and shall be performed utilizing an additional thinner liner to prevent water from entering behind the liner to the full satisfaction of the City. All coupons cut from the liner for reopening of lateral connections shall be retrieved from the sewer, accounted for by the Contractor, and turned over to the City.
8. Service connections shall be reinstated to at least 95% of the original area as it enters the host pipe.
9. All service connections and side sewers to be reconnected to the main sewer, shall be cleaned up to a length of 1-foot from the inside face of the existing wall of the main pipe. All deposits within the first foot of the service connection or side sewer in the service connections shall be removed and laterals reinstated.
10. Contractor shall provide a sound, smooth transition from laterals/side sewers to the main sewer. Contractor shall submit for approval a detailed repair plan for the permanent repair of any gaps between the installed liner and the face of the lateral/side sewer connections.
11. For PVC laterals or laterals that have been previously lined with cured-in-place pipe the Contractor shall take care during the reinstatement to avoid damage to the lateral pipe.

B. Each pipe lined shall be post-CCTV inspected in accordance with Section 02762 "Televising Sanitary Sewer Systems" as soon as practical after processing to assure complete curing.
   1. The Contractor shall not reactivate any section of lined sewer pipe until authorized to do so by the City. Segments not fully conforming to these Specifications must be immediately brought to the City's attention with a proposed method of correction.

2. Immediately prior to conducting the post-lining CCTV, the Contractor shall thoroughly clean the newly installed liner removing all debris and build-up that may have accumulated, at no additional cost to the City.
3. The post-CCTV inspection documentation shall be submitted within 5 working days of the liner installation. The City may at its discretion suspend any further installation of CIPP until the post-installation documentation is submitted.
   a. As a result of this suspension, no additional working days will be added to the contract, nor will any adjustment be made for increase in cost

C. Defects
1. The liner shall be continuous and free of all visual and material defects except those resulting from pre-lined conditions (such conditions shall be brought to the attention of the City prior to lining).
2. There shall be no damage, deflection, holes, delaminating, uncured resin or other visual defects in the liner.
3. The liner surface shall be smooth and free of waviness throughout the pipe.
4. No visible leakage through the liner or at manhole or service lateral connections will be allowed.
5. Any defects located during the inspection shall be corrected by the Contractor to conform to the requirements of the specifications and to the satisfaction of the City.
6. Defects in the installed CIPP shall be identified and defined as specified in Section 02762 Televising Sanitary Sewer Systems.
7. Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of these contract specifications.
8. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.

D. Manhole Connections
1. Where liners of any type are installed in 2 or more continuous manhole segments, the liner invert through the intermediate manholes shall be left intact. Final finishing of the installation in those intermediate manholes shall require removal of the top of the exposed liner and neat trimming of the liner edge where it touches the lip of the manhole bench.
2. Reinstate openings for all manhole drop assemblies after relining mainline sewer
   a. Outside drop assemblies shall be lined with a cured-in-place liner compatible with the mainline liner, for the full length of the drop assembly and bend.
   b. Inside drop assemblies are not required to be relined.
3. A seal consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole/wall interface in accordance with the CIPP system manufacturer's recommendations.

E. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the City.

3.04 TESTING

A. The physical properties of the installed CIPP shall be verified through field sampling and laboratory testing. All testing shall be furnished by the Contractor. All materials testing shall be performed at the Contractor's expense, by an independent third party laboratory selected by the City as recommended by the CIPP manufacturer. All tests shall be in accordance with applicable ASTM test methods to confirm compliance with the requirements in these documents.

B. The Contractor shall pay for all testing included in this section

C. The Contractor shall provide samples for testing from the actual installed CIPP liner. The Contractor shall determine sampling location and procedures to ensure representative samples are obtained from the finished liner, subject to the approval by the City. The contractor shall provide removable sizing sleeves, when possible, to collect liner samples, which accurately replicate the host pipe diameter.
   1. A minimum of 1 sample shall be taken of the first segment installed or as directed by the City.
   2. A minimum of 2 samples shall be taken for each 2,500 lineal feet of liner material installed or for each manufacturing lot, if less, or as directed by the City.
   3. A minimum of 6 samples per project shall be taken for each type of liner furnished or as directed by the City.
   4. A sample shall be cut from a section of cured liner that has been inverted or pulled through a like diameter pipe which has been held in place by a suitable heat sink such as sand bags.
   5. All curing, cutting, and identification of samples shall be witnessed by the City.

D. Tests of the samples shall be conducted in accordance with ASTM standards
   1. ~~Short term flexural properties~~: The initial tangent flexural modulus of elasticity and flexural strength shall be measured in accordance with test methods in ASTM D790.
   2. ~~Fiber reinforced flexural properties~~: specimens should be sampled in accordance with ASTM F1743, section 8.1.2 and flexural properties shall be determined in accordance with ASTM F1743, section 8.1.3 along the longitudinal and circumferential axis of the install CIPP.
   3. ~~Fiber reinforced tensile properties~~: Where the CIPP is reinforced with oriented continuous or discontinuous fibers to enhance the physical properties of the CIPP, specimens shall be sampled in accordance with ASTM F1743, section 8.1.2 and tensile properties shall be determined in accordance with ASTM D3039 and tested along the longitudinal axis and circumferential axis of the installed CIPP.

4. CIPP wall thickness shall be determined in a manner consistent with ASTM D5813, section 8.1.2. Thickness measurements shall be made in accordance with the practice in ASTM D3567 for ASTM D5813, section 8.1. Deduct from the measured values the thickness of any plastic coating or CIPP layer not included in the structural design of the CIPP. The average thickness shall be calculated using all measured values and shall meet or exceed the minimum design thickness. The minimum wall thickness at any point shall not be less than 87.5% of the approved specified thickness.

E. The installed CIPP thickness shall be measured for each liner shipment to the job site. If the CIPP thickness does not meet that specified in the contract and submitted as the approved design by the Contractor, then the liner shall be repaired or removed. The samples shall be made by core drilling 2-inch diameter test plugs at random locations selected by the City. As an alternative the Contractor may use industry proven, nondestructive methods for confirming the thickness of the installed CIPP if it can be shown the calibrated thickness is the same as core test plugs.

3.05 ACCEPTANCE

A. Liner

1. It is the intent of these specifications that the completed liner with all appurtenances shall be essentially equivalent in final quality and appearance to new sewer installation.
2. The finished liner shall be continuous over the entire segment between manholes and homogenous throughout.
3. The finished liner shall be fully rounded and as free as commercially practicable from visible defects, including but not limited to damage, deflection, holes, delamination, ridges, cracks, uncured resin, foreign inclusions or other objectionable defects.
4. Where a defect in the liner requires removal of a section of the liner in the City's opinion, the Contractor shall make all repairs as required by the City and shall install a segmental liner, compatible with the liner, to accomplish a continuous finished liner.
5. The pipe shall be neatly and smoothly cut off at each manhole. The manhole trough shall be raised to the invert of the liner to preclude snagging and shoaling of debris.

B. Defects: Any defect which will or could affect the structural integrity, strength of the lining, flow impairment, or leaks shall be repaired as outlined below or in accordance with the approved repair or replacement procedures as recommended by the CIPP system manufacturer. The repair or replacement of the defects will be at the Contractor’s expense.

1. Leaks
   a. There shall be no visible infiltration through the liner, around the liner at manhole connections, at lined service connections or in lined services. Contractor shall repair any visible leaks and the repair method shall be approved by the City.
2. Wrinkles/Fins
   a. Wrinkles outside the flow line of the pipeline:

(1) Wrinkles/fins in height up to a maximum of 5% of the inside diameter of the host pipe are acceptable

(2) Wrinkles/fins over 5%, particularly those of a longitudinal configuration, may be acceptable and should be evaluated, by the project engineer for acceptance, on a case-by-case basis.

b. Wrinkles in the flow line:

(1) Wrinkles/fins projecting more than 5% into the flow that are generally longitudinal in their orientation may be deemed acceptable by the City on a case-by-case basis by considering any potential operation and maintenance issues that would result from their being left in place.

(2) Wrinkles/fins in the lower third or flow line of the finished CIPP (based upon the depth of flow) that are generally circumferential in their orientation should not exceed 0.5-inches, whichever is smaller. Acceptability of larger wrinkles/fins meeting this characterization shall be, on a case-by-case basis by the City with consideration given to potential operations and maintenance issues that would result from their being left in place.

c. Repair when wrinkles/fins are removed:

(1) Wrinkles should be fully cured, tight and the resin should be homogeneous across the full width of the wrinkle.

(2) In most cases, when wrinkles/fins are removed from the installed CIPP, the resin in the liner pipe is fully cured and homogeneous and no further repair is required. If a repair is required the manufacturer should be contacted for the correct repair procedure.

3. Blisters should be probed and punctured to determine the existence of water behind the blister.

a. No action required unless the pipe is leaking at the blisters.

4. Lifts in Liner

a. Soft lifts should be re-processed by the Contractor to fully cure the CIPP.

b. Hard lift shall be removed and a new short liner as required being equivalent to the original installed CIPP.

5. A bulge in the invert caused by residual debris left in the pipe that impedes the flow characteristics of the pipeline should be cut out.

a. Cut out the section of the bulge and replace with a new short liner equivalent to the original product or as recommended by the manufacturer.

6. Pinholes: the area where the liner has pinholes should be patched with a short-liner repair or the liner removed and replaced as recommended by the manufacturer.

7. Soft spot in liner needs to be reheated and hardened or cut out and replaced or as recommended by the manufacturer.

8. Dry tube or white spots are not acceptable and shall be removed and a patch repair shall be performed or as recommended by the manufacturer.

9. Liner surface peeled off

a. Cut out a representative sample of the CIPP
b. Test physical properties and remaining CIPP thickness to verify that the contract design requirements are met.
c. Replace liner or as recommended by the manufacturer

10. Hole in the liner is not acceptable
    a. Small holes can be repaired with epoxy
    b. Short liner installed over larger holes or as recommended by the manufacturer
11. Cracks in liner are unacceptable and shall be repaired
12. Loose liner seam tape shall be removed to prevent potential hang-up of debris.
13. Annular space between host pipe and liner at manhole
    a. If leaking between the host pipe and the CIPP, inject a hydrophilic type grout to stop the leakage.
    b. If the pipe is located in groundwater, inject a hydrophilic type grout to stop possible future leakage.
    c. If the pipe in not in groundwater, a cementitious grout can be used to fill the space.
14. Liner delamination
    a. Cut out the section of delaminated liner and replace with a new short liner equivalent to the original product or as recommended by the manufacturer.
15. CIPP discoloration
    a. Obtain a sample for testing the CIPP physical properties. Follow manufacturer's recommendations for repair.
    b. Remove and replace the CIPP physical if the physical properties do not meet the contract minimum requirements.
    c. No action required if the tested samples meet the physical properties.
16. Improper repair of CIPP: duct tape is not an acceptable repair for any situation.
17. The CIPP should fit tight inside the host pipe.
    a. If the CIPP does not fit tightly against the original pipe at its termination point(s), the full circumference of the CIPP exiting the existing host pipe should be sealed by filling with a resin mixture compatible with the CIPP.
18. Overcut connection not allowed
    a. Opening cut to match bottom of service pipe to eliminate debris build-up
    b. If an overcut is made, grout the interface between the connection and the mainline
    c. Install a connection hat
    d. Install a short liner, then re-cut the service connection opening
19. Leakage between CIPP and host pipe at service connection
    a. Leakage shall be stopped
    b. Grout the interface between the connection and the mainline
    c. Install a connection hat
20. Connection hat issue
    a. Coating from mainliner not removed before installing the hat
    b. Loose material shall be removed
    c. Remove and replace the connection hat as recommended by the manufacturer
21. Undercut service connection
    a. Finish cut with brush to create a smooth opening

22. Resin slug in service connection
    a. If not blocking the flow from the service connection and slug does not impede more than 20% of the connection opening, no action required
    b. If blocking the flow, remove slug or dig up and replace the connection

C. Service Connections
1. The CIPP lateral lining shall not inhibit the CCTV post video inspection of the mainline or service lateral pipes.
2. Reinstatement of all lateral connections shall be done neatly and smoothly.

3.06 CLEAN-UP AND RESTORATION

A. The Contractor shall not allow the site of the Work to become littered with trash and waste material, but shall maintain the site in a neat and orderly condition throughout the construction period.

B. On or before completion, the Contractor shall clean and remove from the site of the Work all surplus and discarded materials, temporary structures, stumps and portions of trees, and debris of any kind. He shall leave the site of work in a neat and orderly condition, similar or equal to that prior to construction.

C. All private and public property along or adjacent to the Work disturbed by construction operations shall be restored to a condition similar or equal to that existing prior to construction.

D. Before final acceptance by the City , the Contractor shall replace and/or restore any water, sewer, drain, and gas lines and appurtenances; electrical, telephone, telegraph conduits and wires, both underground and aboveground, and appurtenances; traffic signals, fire and police alarm systems and appurtenances; sidewalks, curbs, gutter, drainage ditches and pavements and all other public utility facilities and appurtenances along or adjacent to the Work that may have been disturbed by construction operations.

E. Conditions permitting, property cleanup and restoration shall begin and be prosecuted to completion on a timely basis as set forth herein.

3.07 PROGRESSIVE CIPP INSTALLATION RECORD (SHOT RECORD)

A. The Contractor shall provide a progressive CIPP Installation Record (Shot Record) with monthly application for partial payments. The progressive shot record shall indicate quantities actually installed and deviations to the parameters included in the shot record (i.e. shot number and corresponding manhole to manhole pipe reaches for each scheduled installation, design thickness, actual thickness delivered to the site, pipe diameter, reach length, total length of shot, and number of laterals).

B. Monthly partial payments will not be approved without prior approval of the progressive CIPP Installation record (Shot Record) including verification and acceptance of all quantities by the City.

3.08 WARRANTY INSPECTION

A. The City shall conduct the warranty television inspection within 1-year following completion of the project. If it is found that any of the CIPP has developed abnormalities since the completion of the project, the abnormalities shall be repaired and/or replaced by the Contractor promptly as per these specifications and as recommended by the manufacturer.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02772
CURE-IN-PLACE PIPE FOR LATERAL RENEWAL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Renewal of existing sanitary sewer laterals by installation of a resin impregnated flexible felt tube into the existing lateral line utilizing a vertical inversion standpipe and hydrostatic head, pulled in place, or other approved method and curing by circulating hot water or other approved means to produce a hard, impermeable pipe.

B. Work shall include the installation of cleanouts to access laterals to CCTV specific laterals listed in the Drawings. Contractor shall perform a pre-CCTV inspection of the laterals per Section 02762 , "Televising Sanitary Sewers". City will determine upon review of the CCTV inspection which laterals will be renewed or replaced.

C. Post CCTV inspection after renewal as per Section 02762 "Televising Sanitary Sewers."

1.02 INSTALLER EXPERIENCE AND QUALIFICATIONS

A. These qualifications shall include detailed descriptions of the following:
1. To be acceptable, the contractor must have a minimum of 1,500 lateral liner installations in Florida.
2. To be acceptable, the contractor must have had a minimum of 3- years active experience in the commercial installation of the lateral lining.

1.03 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

A. It shall be the responsibility of the Contractor to schedule and perform his work so as to result in no overflows or spills of sewage or combined sewage from the system. If sewage flows are such that they interfere with the Contractor's ability to perform work, the Contractor shall be responsible for scheduling his work during low flow periods or provide bypass pumping. The Contractor shall provide a bypass pumping plan to the City for approval prior to the start of bypass operations.

B. In the event of overflows caused by the Contractor's work activities, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the spillage, disinfect the area affected by the spill, and notify City in a timely manner.

C. Contractor will indemnify and hold harmless the City for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor. Should fines subsequently be imposed as a result of any overflow for which the Contractor is fully or partially responsible, the Contractor shall

pay all such fines and all of the City's legal, engineering, and administrative costs in defending such fines and claims associated with the overflow.

1.04 SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. Submit the following:

1. The Qualifications of the installer shall be submitted 1- week prior to Pre- Construction conference.
    a. Name: business address and telephone number of the Contractor
    b. Name(s) of all supervisory personnel to be directly involved with this project
    c. The Contractor shall sign and date the information provided and certify that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel will be directly involved with and used on this project. Substitutions of personnel and/or methods will not be allowed without written authorization of the City.
    d. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the City/Professional.
    e. The Contractor shall provide his references of previous project lists going back 3years including his customer's names, owner's contact name, phone number, owner's project number, City's project name and the list must include the number of laterals rehabilitated as well as the number and type of connection seals installed.
2. Certified copies of test reports of factory tests required by the applicable standards and this Section.
3. Manufacturer's installation instructions and procedures
4. Contractor's procedures and materials for service renewal including time and duration of sewer service unavailability
5. The thickness calculations, signed and sealed by a Professional Engineer registered in the State of Florida and certified by the manufacturer as to the compliance of his materials to the values used in the calculations shall be submitted to the City prior to CIPP installation.
6. Sampling procedures and locations for obtaining representative samples of the finished liner.
7. Both a pre-lining and post-lining digital data video shall be submitted for review and approval. The digital data video shall be clearly and properly labeled. A digital data video and suitable log shall be prepared by the Contractor during the Work and provided for review.

C. A final certificate of compliance with this specification shall be provided by the manufacturer for all lining material furnished. Tests for compliance by an independent

laboratory shall be made according to the applicable ASTM specification and the manufacturer's quality control program.

D. Furnish an extended warranty for liner materials from the Contractor and liner manufacturer for a total of one (1) year from date of acceptance.
   1. If, at any time during the warranty period, any leakage, cracking, loss of bond, or other discontinuity is identified, the Contractor shall make repairs acceptable and at no additional cost to the City.

E. As part of the design calculation submittal, the liner manufacturer shall submit a tabulation of time versus temperature. This tabulation shall show the lengths of time that exposed portions of the liner will endure without self-initiated cure or other deterioration beginning. This tabulation shall be at 5 °F increments ranging from 70°F to 100°F. The manufacturer shall also submit his analysis of the progressive effects of such "pre-cure" on the insertion and cured properties of the liner. This information shall be submitted in a timely fashion prior to construction. The minimum liner thickness is for materials with characteristics as shown. Bidders with materials with other characteristics must supply complete information in their bids of the values as listed for ascertaining minimum thickness.

1.05 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products. No products shall be shipped to the job site without the approval of the City.

B. Keep products safe from damage. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

PART 2 - PRODUCTS

2.01 GENERAL

A. The system proposed (materials, methods, workmanship) must be proven through previous successful installations to an extent and nature satisfactory to the City that is consistent with the size of the project being proposed. Since CIPP is intended to have a minimum 50- year design life, only products deemed to have this performance will be accepted.

B. All CIPP lining products shall comply with the latest versions of ASTM D5813 and ASTM F1216 or ASTM F1743, including appendices.

2.02 STRUCTURAL REQUIREMENTS

A. The liner shall be fabricated to a size that when installed will neatly fit the internal circumference of the conduit to be repaired as specified by the City.

B. The minimum required structural CIPP wall thickness shall be based on the physical properties described above and in accordance with the design equations in the appendix of ASTM F 1216, and the following design parameters:

Design Considerations	**Criteria**
Tube Design	ASTM F 1216 Appendix X1
Design Safety Factor	2.0
Retention Factor for Long Term Flexural Modulus to be used in Design	50 %
Ovality	2 %
Groundwater Depth = Pipe Depth (above invert)*	100% depth from pipe to surface
Lining enhancement factor	7 maximum
Soil Modulus	1,000 psi
Soil Density	120 pcf
Live Load	One (1) H20 passing truck
Design Condition	Fully deteriorated

C. Each CIPP shall be designed to withstand internal and/or external loads as dictated by the site and pipe conditions. When not specified by the City in the contract documents, the design thickness of the CIPP shall be arrived at using standard engineering methodology as found in ASTM F1216. In no case shall the finished thickness of the cured liner be less than three millimeters. The long-term modulus shall not exceed 50 percent of the short- term value for the resin system and shall be verifiable through testing. The thickness calculations, signed and sealed by a professional engineer registered in the State of Florida, shall be submitted to the City prior to CIPP installation.

D. When multiple layers are present, the layers of the finished CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or such that the knife blade moves freely between the layers. If separation of the layers occurs during testing of the field samples, new samples will be cut from the work. The composite of the materials will, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing Methods. The CIPP design for the lateral tube shall assume no bonding to the original pipe, in accordance with ASTM F1216. Any reoccurrence may be cause for rejection of the work. The cured liner shall meet TABLE 02772 - 1 Minimum Physical Properties.

TABLE 02772- 1
Minimum Physical Properties

Physical Characteristics	Test Procedure	Minimum Value
Flexural Strength	ASTM D790	4,500-psi
Flexural Modulus	ASTM D790	250,000-psi
Flexural Modulus (50-year)	ASTM D790	125,000-psi

2.03 MATERIALS

A. Approved Products
   1. Products shall be full circumference type as manufactured by:
      a) BLD "Service Connection Seal + Lateral" of BLD Services, LLC or
      b) LMK Pipe Renewal Full Circumference Lateral Liner in accordance with ASTM F2561
      c) No substitutions permitted

B. Lateral Liner Tube
   1. The sewer service lateral liner shall be a single piece liner that lines the lateral and be a contiguous part of the mainline. The tube shall consist of 1 or more layers of a flexible needled felt or an equivalent non-woven or woven material, or a combination of non-woven and woven materials, capable of carrying resin, withstanding installation pressures and curing temperatures. The tube should be compatible with the resin system to be used on this project. The material should be able to stretch to fit irregular pipe sections and negotiate bends. Projected changes in groundwater level, temperature and other loading factors shall cause no significant changes in the service characteristics or service life of the sewer pipe liner. The liner will be continuous in length and the wall thickness shall be uniform. The tube will be capable of conforming to offset joints, bells, and disfigured pipe sections. The mainline liner will be flat with one end overlapping the second end and sized accordingly to create a circular lining equal to the diameter of the mainline pipe. The resin will be polyester or vinyl ester with proper catalysts as designed for the specific application. The cured-in-place pipe shall provide a smooth bore interior. Installation will be accomplished remotely using air or water for inversion and curing. The cured pipe repair system shall be watertight and shall conform to the existing pipe and eliminate any leakage or connection to the outside of the host pipe/service.
   2. The liner shall be polyester fiber felt tubing saturated with an epoxy vinyl ester or polyester resin prior to insertion which when cured, will be chemically resistant to reagents as defined in ASTM F1216, ASTM F1743, and ASTM D543 as applicable.

3. The system proposed (materials, methods, workmanship) must be proven through previous successful installations to an extent and nature satisfactory to the City that is consistent with the size of the project being proposed. Since CIPP is intended to have a minimum 50- year design life, only products deemed to have this performance will be accepted.
4. The lateral liner shall be fabricated under controlled conditions to a size that, when installed, will tightly fit the internal circumference and the length of the original conduit. Allowances should be made for the longitudinal and circumferential stretching that occurs during placement of the tube. Maximum stretching allowances shall be as defined in ASTM F1216 or ASTM F1743. The Contractor shall verify the lengths in the field before cutting the liner to length. The finished pipe liner in place shall be fabricated from materials which when complete are chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and temperatures up to 150ºF.
5. All CIPP lining products shall comply with the latest versions of ASTM D5813 and ASTM F1216 or ASTM F1743, including appendices.
6. The tube shall be uniform in thickness and when subjected to the installation pressures shall meet or exceed the designed wall thickness
7. Any plastic film applied to the tube on what will become the interior wall of the finished CIPP shall be compatible with the resin system used, translucent enough that the resin is clearly visible, and shall be firmly bonded to the felt material.

8. At time of manufacture, each lot of liner shall be inspected and certified to be free of defects. The tube shall be marked for distance at regular intervals along its entire length, not to exceed 5- feet. Such markings shall also include the Manufacturer's name or identifying symbol.
9. Liners may be made of single or multiple layer construction where any layer must not be less than 1.5- mm thick and total minimum thickness is 3.0- mm. A suitable mechanical strengthener membrane or strip may be placed in between layers where required to control longitudinal stretching.

C. Resin Components
1. The resin system shall be a corrosion resistant epoxy vinyl ester or polyester that when properly cured within the tube composite meets the minimum requirements given herein or those that are to be utilized in the design of the CIPP for this project. The catalyst system may be accelerated to promote curing.
2. The resin used shall not contain non-strength enhancing fillers.
3. The Contractor shall submit the resin characteristics, including filler identification, to the City for approval prior to lining activities.

D. Interface Seal
1. The interface seal shall be a polyester impregnated, corrosion resistant fiberglass insert. The seal shall be of 1- piece construction and shall be designed such that when expanded shall tightly fit both T and Y connections at the interface between the

mainline and lateral sewer. The seal shall extend into the mainline a minimum of 4-inches and shall provide a minimum of a 3-inch overlap inside the mainline pipe and be of equal thickness as the lateral liner at the interface.

2. An epoxy sealant rated for piping applications shall be applied to the seal to ensure that any gap between the interface of the mainline pipe and the CIPP lateral lining is air and watertight.

PART 3 - EXECUTION

3.01 DETERMINATION OF LATERALS TO BE LINED OR REPLACED

A. Install cleanouts to access laterals for CCTV inspection for the specific laterals listed in the Drawings.

B. Contractor shall perform a pre-CCTV inspection of the laterals per Section 02762 , "Televising Sanitary Sewers". City will determine upon review of the CCTV inspection the quantity of laterals which will be renewed.

C. After completing the video inspection, the Contractor shall provide the CCTV videos to the City for review and to determine which laterals requires renewal or replacement.

3.02 GENERAL

A. The Contractor shall carry out his operations in strict accordance with all OSHA, State, local, and manufacturer's safety requirements. Particular attention is drawn to those safety requirements involving entering confined spaces. Curing with pressurized steam creates additional safety concerns with regard to high temperatures, quick burn times, potential blow offs, etc. Contractors shall take additional precautions to insure the safety of everyone nearby curing mechanisms.

B. It is the intent of this specification to provide for the renewal of sewer service laterals by the installation of a resin-impregnated flexible tube and a mainline/lateral connection seal. The tube is either inverted or pulled into the original service lateral through a newly installed cleanout and then expanded to fit tightly against the lateral by the use of water or air pressure. The resin system shall then be cured by elevating the temperature of the fluid (water/air) used for the inflation to a sufficient enough level for the initiators in the resin to effect a reaction. The finished pipe shall be such that when the thermosetting resin cures, the total wall thickness shall be a homogeneous and monolithic felt and resin composite matrix that will be chemically resistant to withstand internal exposure to domestic sewage.

C. The system shall be provided with a seal at the mainline/lateral interface. The finished seal shall be such that when the thermosetting resin cures, the seal bonds

to the lateral liner forming an airtight and watertight interface and will provide chemical resistance to domestic sewage.

D. The Contractor shall deliver the liner to the site and provide all equipment required to insert the liner into the host pipe and cure it in place. The Contractor shall designate a location where the tube will be vacuum impregnated prior to installation. The Contractor shall notify the City at least 72-hours prior to wet out to allow the City to observe the materials and wet out procedure. All procedures to prepare the liner for installation will be in strict accordance with the manufacturer's recommendations. Any material not properly prepared shall be rejected and replaced with acceptable materials at the Contractor's expense.

E. The liner shall be impregnated with resin and stored according with manufacturer recommendations.

3.03 PREPARATION

A. The Contractor shall notify all residents affected by this construction at least 24-hours prior to any service disruption affecting their service connection. The mainline sewer shall be kept in operation during the lateral lining operations. Customers shall be notified by the Contractor with door hanger advising the customers of when the Work will begin, expected date of completion, the type of work and contact person for any questions.

B. The Contractor shall install a cleanout at the respective right-of-way line, property line or easement line prior to or immediately after the lining procedure. Cleanouts shall be installed per the City's requirements as shown on the drawings and specified herein.

C. The Contractor shall perform cleaning of the lateral and affected areas of the existing sewer line in accordance with the liner manufacturer's recommendations, videotaping, and inspection prior to installation of the CIPP lateral. The Contractor, when required, shall remove all internal debris out of the pipeline that will interfere with the installation of the CIPP. The Contractor shall provide an appropriate dumpsite for all debris removed during the cleaning operations. Precautions shall be taken by the Contractor to ensure that no damage or flooding of public or private property is caused by the cleaning operation.

D. It shall be the responsibility of the Contractor to notify the City of line obstructions, offset joints, or collapsed pipe that will prevent the insertion of the tube or significantly reduce the capacity of the lateral. The City with input from the Contractor shall determine the method of pipe repair required and shall address these concerns on a caseby-case basis.

E. Protruding laterals or services shall be trimmed flush with the inside of the main sewer wall prior to lining. Trimming shall not cause damage to the lateral or service beyond the inside face of the main sewer.

3.04 PRETREATMENT OF REGULATED CHEMICALS TO DISCHARGE INTO SEWER

A. CIPP liner systems using resins containing styrene or other regulated chemicals that will be discharged into the wastewater system shall require a pretreatment plan to remove the regulated chemicals to acceptable levels prior to discharge. The Contractor shall submit the pretreatment plan to the City for approval prior to discharge. The information required shall include:

1. MSDS for all chemicals used in the process and that will be discharged into the wastewater system
2. Representative analytical data that was performed in the past for the proposed process, as collected from the wastewater stream
3. The addresses and mapped locations of the discharge
4. The total duration of discharge request
5. The anticipated discharge temperature. Discharges in excess of 140 °F are not permitted.
6. The Contractor shall submit for approval a summary table of pre-treatment design calculations in Excel containing the following information: a. Dates of discharge of each section
   b. Lining section numbers using the OCUD numbering system
   c. Length and diameter of each section
   d. Volume (in gallons) of inversion water of each section
   e. Volume (in gallons) of cool down water of each section
   f. Total volume (in gallons) of inversion and cooling water of each section
   g. Regulated chemical (in pounds) in discharge volume of each section
   h. Reduction chemical (in pounds) to meet post treatment concentration limit Reaction time period (in hours) to achieve post treatment concentration limit j. Cool down time period (in hours)

   i. Regulated chemical post treatment concentration limit (in PPM)

7. The Contractor shall provide pre-treatment and post-treatment sampling and laboratory analysis of the process wastewater and submit the results to the City for verification.

3.05 BYPASS PUMPING

A. When the flow demand on the lateral dictates that bypass pumping is required, the Contractor shall furnish all necessary pumping equipment, conduit, etc. to adequately and safely divert sewage flow around the Work in a manner approved by the City and as set forth in Section 01516 "Collection System Bypass." No flow shall be discharged on the surface, into storm sewers, in ditches, or in waterways.

B. During a bypass operation, the pump shall be manned continuously: The Contractor shall maintain the pump and bypass equipment, and shall be responsible for any damages to public or private property due to the malfunction of same.

3.06 CLEANING SEWER LINES

A. Prior to any lining of a pipe so designated, it shall be the responsibility of the Contractor to remove all internal debris and clean the existing sewer line and/or lateral in accordance with Section 02761 "Cleaning Sanitary Sewer Systems." Both mainline and lateral line shall be cleaned.
   1. Preparation of the interior surface shall be accomplished by a thorough high-pressure water-jet cleaning. The pipe shall be left free of all loose sand, rock, or other deleterious materials. Any roots in the pipe shall be either removed or cut off flush with the interior.
   2. If conditions such as broken pipe and major blockages are found that will prevent proper cleaning or where additional damage would result if cleaning is attempted or continued, the Contractor shall notify the City immediately. The City will determine what course of action will be taken to complete the project.
   3. Precautions shall be taken by the Contractor to ensure that no damage or flooding of public or private property is caused by the cleaning operation.
   4. The City shall inspect the prepared pipe for cleanliness and smoothness before the Contractor is authorized to proceed with pipe lining operations.

B. Pipe Preparation: The liner method must be compatible with the existing mainline pipes interior coatings or materials that could cause a separation or a natural joint because of the lack of adhesion.

3.07 PRE AND POST TELEVISION INSPECTION

A. Television survey shall be performed in accordance with Section 02762 "Televising Sanitary Sewer Systems", including Pre-construction and Post-construction Surveys. The Contractor shall provide television equipment capable of properly documenting the conditions as found within the lateral. The camera equipment shall be capable of launching into the full length of each lateral and providing an accurate picture of the lateral to be lined. Lighting for the camera shall illuminate the entire periphery of the lateral.

B. Both a pre-lining and post-lining digital data video shall be submitted to the City for approval. The Contractor shall launch into each lateral connection on both pre and post inspections. The digital data video shall be clearly and properly labeled. A digital data video and a suitable log shall be prepared by the Contractor during the Work and provided to the City.

C. The liner shall be continuous and free of all visual and material defects except those resulting from pre-lined conditions (such conditions shall be brought to the attention of the City prior to lining). There shall be no damage, deflection, holes, delaminating, uncured resin or other visual defects in the liner. The liner surface shall be smooth and free of waviness throughout the pipe. No visible leakage through the liner or at manhole or service lateral connections will be allowed. Any defects located during the inspection shall

be corrected by the Contractor to conform to the requirements of the specifications and to the satisfaction of the City. The Contractor shall not reactivate any section of lined sewer pipe until authorized to do so by the City.

3.08 CIPP LINER INSTALLATION

A. The CIPP shall be installed in accordance with the practices given in ASTM F1216 (for direct inversion installations) or ASTM F1743 (for pulled-in-place installations). The quantity of resin used for the tube's impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances being made for polymerization shrinkage and the loss of any resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used in conjunction with a roller system to achieve a uniform distribution of the resin throughout the tube.

B. The resin-impregnated tube shall be installed into the host pipe by methods approved by the manufacturer and proven through previous successful installations. The insertion method shall not cause abrasion or scuffing of the tube. Hydrostatic or air pressure shall be used to inflate the tube and mold it against the walls of the host pipe. There will be no use of sewage in place of clean water for insertion of the tube, or for the curing of the liner.

C. The tube is to be installed at a rate sufficient to cause controlled installation of the tube into the conduit. The tube shall be installed in such a manner that no damage is done to the tube.

D. Should there be any difference between the referenced requirements, the more stringent shall govern. Prior to construction, the Contractor shall submit to the City such written information which shall include, but not be limited to, storage and handling of lateral liner before installation, preparing liner for installation, installing the liner in the sewer lateral, temperature and pressure requirements for inverting and setting the liner, curing and cool down procedures, end seals and service restore.

E. The Contractor shall have on hand at all times, for use by his personnel and the City, a digital thermometer or other means of accurately and quickly checking the temperature of exposed portions of the liner.

3.09 CURING

A. After inversion is completed the Contractor shall supply suitable heat source and recirculation equipment. The equipment shall be capable of delivering heat throughout the section to uniformly raise the temperature above the temperature required to affect a cure of the resin. This temperature shall be determined by the resin/catalyst system employed.

B. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat supply. Thermocouples shall be placed between the tube and the host pipe to determine the liner temperature during cure. The water or air temperature in the pipe during the cure period shall be as recommended by the resin manufacturer.

C. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the installation process, during which time the recirculation and cycling of the heat exchanger to maintain the temperature continues. The heat source shall be shut down during the post cure.

D. Temperatures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the manufacturer's recommended temperature levels. Copies of these records shall be given to the City at the completion of each installation.

3.10 COOL DOWN

A. Cool down may be accomplished by the introduction of cool water or air into the installation standpipe to replace the initial heating agent. The Contractor shall cool the hardened pipe to a temperature below 100°F before relieving the pressure in the pressure apparatus. A minimum period of post cure shall be maintained under a static head to provide a minimum hoop tension on the tube felt. Care shall be taken in the release of the static head so that a vacuum will not be developed.

3.11 INTERFACE SEAL INSTALLATION

A. The interface seal between the mainline and the lateral shall be installed by remote device from inside of the sewer main. The seal shall be properly expanded with air pressure to tightly fit the lateral interface.

B. Seal installation shall be installed in strict accordance with the manufacturer's written specifications, recommendations and these specifications.

C. The finished seal shall be continuous over the entire interface and be as free as commercially practical from visual defects such as foreign inclusions, dry spots and pinholes. The seal shall be homogeneous, impervious, and free of any leakage from the surrounding ground to the inside of the lined pipe. The interface seal shall not inhibit the post video televising of the mainline or the service lateral pipes.

D. During the warranty period, any defects which will affect the integrity or strength of the seal, collect solids, or reduce hydraulic flow capabilities of the product shall be repaired at

the Contractor's expense in a manner mutually agreed upon by the City and the Contractor.

3.12 CLEANUP

A. After the installation work has been completed and all testing acceptable, the Contractor shall cleanup the entire project area. The Contractor shall dispose of all excess material and debris not incorporated into the permanent installation. The work area shall be left in a condition equal to or better than prior condition.

3.13 WARRANTY

A. The City shall conduct the warranty television inspection within 1- year after the date of acceptance. Any defective sections of liner located during the inspection shall be promptly repaired or replaced by the Contractor as directed by the City. In the event that a lateral liner or interface seal is found to be leaking during the inspection, the Contractor shall be required to promptly replace it with a new section of pipe or liner or, if approved by the City, to eliminate the leak(s) by other means of repair.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02773

SERVICE LATERAL CLEAN-OUTS FOR TELEVISING ACCESS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Contractor shall install service lateral cleanouts on gravity mains, not being replaced, to perform the CCTV inspection of the service laterals. All costs of material, equipment, labor and other costs due to the unspecified field conditions shall be borne by the Contractor.

B. Record Information: The Contractor shall submit to the City the locations and elevations of the clean-out tops.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix B "List of Approved Products" appended to these technical specifications.

2.02 MATERIALS

A. Polyvinyl Chloride Pipe and Fittings: Polyvinyl Chloride (PVC) Pipe shall meet the requirements of Section 15064 "Polyvinyl Chloride Pipe and Fittings."

B. Concrete and Reinforcing Steel: Concrete and reinforcing steel shall conform to the requirements of Division 3 - Concrete. Concrete classes for the various purposes shall be as follows:
   1. Manhole bottoms, Class A
   2. Precast manholes, Class A (4,000-psi)
   3. Pipe and riser encasement, Class C
   4. Protective slabs, Class C

C. Cement Mortar: Cement mortar for manhole construction shall comply with ASTM Designation C 270, Type M, except that the cement shall be Portland Type II only. No mortars that have stood for more than 1-hour shall be used.

PART 3 - EXECUTION

3.01 PREPARATION

A. The interior of all pipe shall be thoroughly cleaned of all foreign material before being installed and shall be kept clean.

3.02 INSTALLATION

A. Sewer Pipe
   1. PVC Pipe
      a. Handling PVC pipe: The handling of PVC pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of pipe with deep cuts and gouges shall be removed and discarded at no expense to the City.
   2. Building Laterals/Service Connections
      a. Service lateral connections shall be constructed in accordance with the details as indicated on the Drawings.
      b. All connections and changes of direction shall be made using standard fittings designed for that purpose.
      c. Locator balls shall be placed under all sanitary sewer service cleanouts.
      d. On curbed streets, the exact location for each service connection shall be marked by etching or cutting an "S" in the concrete curb. Where no curb exists or is planned, locations shall be marked by a method approved by the City.

3.03 FIELD QUALITY CONTROL

A. Workmanship: Clean-outs shall be built watertight.

B. Closed Circuit Television Inspection
   1. Internal gravity sewer video inspection shall be performed by the Contractor to check for alignment and deflection. The television inspection shall also be used to check for cracked, broken, or otherwise defective pipe and overall pipe integrity.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 02774

WASTEWATER GRAVITY COLLECTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Construction of sanitary sewers, sewer connections and appurtenances as shown on the Drawings or specified herein.

1.02 QUALITY ASSURANCE

A. Storage: PVC pipe shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the PVC pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes. Where necessary, due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

B. Tests: Certified records of tests made by the manufacturer or by a reliable commercial laboratory shall be submitted with each shipment of pipe. All pipe shall be inspected upon delivery and that which does not conform to the requirements of these specifications shall be rejected and must be immediately removed by the Contractor. The Contractor shall furnish and provide samples of pipe for the performance of such additional tests as the City may deem necessary.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
   1. Precast manholes
   2. Manhole frames, covers, and other castings
   3. Manufacturer's certified test report on castings
   4. Certification of admix installation from pre-caster
   5. Certified test records for polyvinyl chloride pipe
   6. Mill Test Certificates on ductile iron pipe
   7. Manhole pipe connections
   8. Coal tar epoxy
   9. Special interior linings

B. Record Information: The Contractor shall submit to the City the elevations of the center of the manhole covers and inverts of all pipes in the manholes.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix B "List of Approved Products" appended to these technical specifications.

2.02 MATERIALS

A. Ductile Iron Pipe and Fittings: Ductile iron pipe shall meet the requirements of Section 15062 "Ductile Iron Pipe and Fittings."

B. Polyvinyl Chloride Pipe and Fittings: Polyvinyl Chloride (PVC) Pipe shall meet the requirements of Section 15064 "Polyvinyl Chloride Pipe and Fittings."

C. Precast Concrete Manholes
   1. Precast manholes shall conform to the requirements of ASTM Designation C 478.
      a. The minimum shell thickness shall be 5-inches.
      b. Lifting holes through the structures are not permitted.
      c. The design of the structure shall include a precast base of not less than 8-inches in thickness poured monolithically with the bottom section of the manhole walls.
      d. Where drop structures are required, the design of the structure shall include a precast base, for the drop structure, of not less than 8-inches in thickness poured monolithically with the bottom section of the manhole walls.
      e. New manholes shall contain a crystalline waterproofing concrete admix. Crystalline waterproofing concrete admix shall be added to the concrete during the batching operation. Admix concentration shall be added based upon manufacturer design percent concentration of admixture to the required weight of cement. The amount of cement shall remain the same and not be reduced. A colorant shall be added to verify the admix was added to the concrete for all precast manholes. Colorant shall be added and provided at the admix manufacturing facility, not at the concrete batch plant. Contractor shall provide certification from the pre-caster that the admix was installed in accordance with the manufacturers recommendations.
   2. Top sections shall be eccentric, except that concrete top slab shall be used where shallow cover requires a top section less than 3-feet deep.
   3. New manholes shall be lined with Interior Linings where shown on the Drawings.

D. Concrete and Reinforcing Steel: Concrete and reinforcing steel shall conform to the requirements of Division 3 - Concrete. Concrete classes for the various purposes shall be as follows:
   1. Manhole bottoms, Class A
   2. Precast manholes, Class A (4,000-psi)
   3. Pipe and riser encasement, Class C
   4. Protective slabs, Class C

E. Castings: Gray iron castings for manhole frames, covers, adjustment rings, and other items shall conform to the ASTM Designation A 48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions which would impair their strength, or otherwise make them unfit for the service intended. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated on the Drawings. The words SANITARY SEWER shall be cast in all manhole covers as shown on the Drawings. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings unless otherwise specified.

F. Brick: Brick for manhole construction shall be dense, hard burned, shale, or clay brick conforming to ASTM Designation C 32, Grade MM or C 62, Grade MW, except that brick absorption shall be between 5 and 25-grams of water absorbed in 1-minute by dried brick, set flat face down, in 1/8-inch of water.

G. Cement Mortar: Cement mortar for manhole construction shall comply with ASTM Designation C 270, Type M, except that the cement shall be Portland Type II only. No mortars that have stood for more than 1-hour shall be used.

H. Pipe Adapter: Connection of PVC gravity sewer lines to precast manholes and wetwells shall be made by using a flexible boot type manhole coupling adapter.

I. Interior Linings (existing structures): Interior surfaces of existing manholes and wetwells shall be coated or lined to resist corrosion where shown on the Drawings. Coatings and linings shall meet the requirements of Section 09901 Coatings and Linings.

J. Interior Linings (proposed structures): Interior surfaces of new wetwells shall be lined. Interior surfaces of new manholes shall be lined where shown on the Drawings. Coatings and linings shall meet the requirements of Section 09901 Coatings and Linings.

K. Joint Sealer: Joint sealer material for precast manhole structures shall be pre-formed flexible plastic conforming to Federal Specification SS-S-00210 (GSA-FSS). Seal all exterior joints with Portland Type II cement after setting of joint sealer and placement of manhole section to form a watertight joint.

L. Non-Shrink Mortar: Non-shrink mortar shall be used for filling annular spaces and holes in precast manholes and wetwells.

M. Manhole Encapsulation: Manhole cones, riser rings, iron frame, cover, and all joints shall be encapsulated with a heat shrink-wrap with a minimum thickness of 98-mils (2.5-mm).
   1. Wrap shall have a cross-linked polyolefin backing coated with a protective heat activated adhesive. The wrap shall effectively bond to the substrate via primer provided by the manufacturer. The wrap shall be applied with a high intensity propane torch.
   2. Heat shrink-wrap for all barrel section joints of manholes shall be a minimum 9-inch width. Corbel section, riser rings, and ring and cover shall have a minimum 12-inch width wrap.
   3. Adhesive tap materials shall not be allowed.

PART 3 - EXECUTION

3.01 PREPARATION

A. Upon satisfactory excavation of the pipe trench, as specified in Section 02220 "Excavating, Backfilling and Compacting" a continuous trough for the pipe barrel and recesses for the pipe bells shall be excavated by hand digging so that, when the pipe is laid in the trench, true to line and grade, the pipe barrel will receive continuous uniform support and the bell will receive no pressure from the trench bottom.

B. The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered in the trench and shall be kept clean during laying operations by means of plugs or other approved methods.

3.02 INSTALLATION

A. Sewer Pipe
   1. General
      a. Laying of pipe shall proceed upgrade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleaned of all dirt, stones, and other foreign material. The spigot ends of the pipe and/or pipe gaskets shall be lubricated lightly with a lubricant as specified by the pipe manufacturer and approved by the City. Sufficient pressure shall be applied to the pipe so as to properly seat the socket into the bell of the pipe. Any damage to the pipe due to over-exertion shall be replaced at the Contractor's expense. All pipe shall be laid straight, true to the lines and grades shown on the Drawings.
      b. Variance from established line and grade, at any point along the length of the pipe, shall not be greater than 1/32-inch per inch of pipe diameter and not to exceed 1/2-inch, provided that any such variation does not result in a level or reverse sloping invert.
      c. Any pipe, which is disturbed or found to be defective after installation, shall be taken up and relayed or replaced at the Contractor's expense.
      d. Approved utility crossing signs shall be placed on the pipe alignment at each side of any waterway crossing.
   2. PVC Pipe
      a. Handling PVC pipe: The handling of PVC pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of pipe with deep cuts and gouges shall be removed and discarded at no expense to the City.
      b. Lowering pipe into trench: Care shall be exercised when lowering pipe into the trench to prevent damage to or twisting of the pipe.
   3. Building Laterals/Service Connections
      a. Service connections shall be constructed in accordance with the details as indicated on the Drawings.
      b. Sewer lateral pipe shall be extended to the right-of-way and plugged at the right-of-way line to avoid leakage (unless otherwise indicated on the Drawings). All connections and changes of direction shall be made using standard fittings designed for that purpose.
      c. Locator balls shall be placed under all sanitary sewer service cleanouts.

d. On curbed streets, the exact location for each service connection shall be marked by etching or cutting an "S" in the concrete curb. Where no curb exists or is planned, locations shall be marked by a method approved by the City.

4. PVC C-900 DR 14 Pipe Section: PVC C-900 DR 14 pipe shall be substituted for the specified PVC pipe where:
   a. The sewer or service pipe is to be constructed with less than 30-inches of cover between the top of the pipe and the final top of pavement or ground line.
   b. The PVC sewer main crosses over a water main, or is at a depth which results in less than 18-inches clear distance between pipes when crossing under a water main. The DR 14 pipe shall extend a minimum of 10-feet on each side of the point of crossing.
   c. The lateral separation of the sewer pipe and potable water piping is less than 10-feet.

B. Manholes:
1. Manhole excavation and bedding at manhole junctions shall be performed in accordance with the provisions of Section 02220 "Excavating, Backfilling and Compacting" of these specifications.
2. The invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section using 2,500-psi concrete. Steep slopes outside the invert channels shall be avoided. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer or entering branch shall be a smooth curve with radius as long as practicable. Invert channels shall also be formed for pipe stubouts.
3. The first pipe joint outside the manhole shall be located a minimum distance of 24-inches from the outside surface of the manhole.
4. Precast manhole tops shall terminate at such elevations to permit laying brick courses under the manhole frame to make allowance for future street grade adjustments.
5. Frames and covers shall be set accurately to conform to the finished grade.
6. Outside drop connections shall be made in accordance with the details shown on the Drawings.
7. Drop connection base slab extensions on precast manholes shall be manufactured monolithically with the manhole elements at the casting yard. The manufacturer shall submit for approval the method of drop manhole construction.
8. Where additional pipe connections or modifications of existing factory made openings are required on new or existing precast concrete manholes or wetwells, all cutting relative thereto shall be performed only by a power driven abrasive wheel or saw. It is specifically noted that such connections to existing manholes or wetwells shall be installed in accordance with the details for new units shown on the Drawings, and shall be caulked watertight with non-shrink grout.
9. Connection of the pipe entering the manhole shall be made by using a flexible boot type manhole coupling adapter. At the entry into the manhole, no part of the horizontal pipe shall rest against the concrete.
10. Manholes shall be completed as the work progresses so that testing may be conducted as prescribed in paragraph 3.03 Field Quality Control.

C. Concrete encasement: Class C concrete encasement shall be constructed in accordance with details shown on the Drawings.

1. The City may order the line encased when:
   a. The sewer main crosses over a water main, or is at a depth which results in less than 18-inches clear distance between pipes when crossing under a water main. Encasement shall extend a minimum of 10-feet on each side of the point of crossing. In lieu of encasement, the sewer line may be constructed of PVC DR 14 pipe and shall be laid such that both joints will be a distance of 10-feet from the crossing.
   b. The maximum width for trench excavations is exceeded. The Contractor shall construct concrete encasement around the pipe for the length of the excessive excavation. No payment will be made for the concrete encasement required due to excessive trench widths.
2. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

D. Concrete protective slabs: Concrete protective slabs as shown on the Drawings shall be constructed over gravity sewers that have less than 3-feet of cover from finished grade.

E. Connections to existing structures: Proposed sewer lines shall be connected to the existing manholes by core drilling the proper size opening and installing a flexible boot type manhole adapter as specified in paragraph 2.01.H of this Section.

F. Invert channels (benching) shall be provided for all new manholes and existing manholes which are connected into. No brick shall be allowed in construction of the manhole invert. Inverts shall be poured using 2,500-psi concrete.

3.03 FIELD QUALITY CONTROL

A. Workmanship: Sewers and appurtenances shall be built watertight. The sewage must be pumped for disposal and special care and attention must be paid to securing watertight construction. Upon completion, the sewers, or sections thereof, will be tested and gauged and if leakage is above the allowable limits specified, the sewer will be rejected.

B. Inspection: On completion of each block or section of sewer, or such other times as the City may direct, the block or section of sewer shall be cleaned, tested, and inspected.
   1. Each section of the sewer shall show, on examination from either end, a full circle of light between manholes.
   2. Each manhole or other appurtenance to the system shall be of the specified size and form, be watertight (no leakage allowed by visual inspection), and be constructed with the top set permanently to specified position and grade. All repairs shown necessary by the inspection shall be made; broken or cracked pipe replaced; all deposits removed and the sewer left true to line and grade, entirely clean and ready for use.
   3. No pipe shall exceed a deflection of 5%. After the final backfill has been in place at least 30-days, the Contractor shall perform deflection testing using a rigid ball or mandrel with a diameter of not less than 95% of the base inside diameter or average inside diameter of the pipe, depending which is specified in the ASTM standard to which the pipe is manufactured. If the mandrel does not pass the completed section of sewer, the entire section of sewer will be rejected.

C. Closed Circuit Television Inspection:
   1. Internal gravity sewer video inspection shall be performed by the Contractor to check for alignment and deflection. The television inspection shall also be used to check for cracked, broken, or otherwise defective pipe and overall pipe integrity.
   2. The video internal inspection will be performed in 2 stages. The first inspection shall be within 30-days after the installation of the gravity sewer pipe provided the road base is in place and the manhole rings and covers are to grade. The second inspection of the gravity sewer pipe shall be before the end of the 1-year warranty period.
   3. If the first or second video inspection reveals cracked, broken, or defective pipe, or pipe misalignment resulting in vertical sags in excess of 1-1/2-inch or a ring defection in excess of 5%, the Contractor shall be required to repair or replace the pipeline. Successful passage of both the low-pressure air exfiltration test and video inspection is required before acceptance by the City.
   4. Prior to repair or replacement of failed sewer pipe, the method of repair or replacement shall be submitted to the City for approval. Pressure grouting of pipe or manholes shall not be considered as an acceptable method of repair.

D. Low Pressure Air Exfiltration Testing:
   1. The Contractor shall provide all labor, equipment, and materials and shall conduct all testing required under the direction of the City
   2. Low pressure air testing shall conform to the requirements of UNI-B6-79 "Recommend Practice for Low-Pressure Air Testing of Installed Sewer Pipe", as published by UNI-Bell Plastic Pipe Association.
   3. During sewer Construction, all service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged so as not to allow for air loss that could cause an erroneous air test result. Where necessary, the Contractor shall restrain caps, plugs, or short pipe lengths such that blowouts are prevented.
   4. Each test section shall not exceed 400-feet in length and shall be tested between adjacent manholes.
   5. Before testing, Contractor shall install monitoring wells at each manhole to determine groundwater level and adjust test pressure accordingly. In no case shall the test pressure exceed 9.0-psig. All pressurizing equipment shall include a regulator or relief valve set no higher than 9.0-psig to avoid over-pressurizing.
   6. Low-pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0-psig greater than the average backpressure of any groundwater above the invert of the pipe, but not greater than 9.0-psig.
   7. When temperatures have been equalized and pressure stabilized at 4.0-psig greater than the average groundwater backpressure, the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5-psig greater than the average groundwater backpressure. At a reading of 3.5-psig greater than the average groundwater backpressure, timing shall commence with a stopwatch or other timing device that is at least 99.8% accurate.
   8. If the time shown in the table, for the designated pipe size and length, elapses before the air pressure drops 1-psig; the section under-going test shall have passed. The test may be discontinued once the prescribed time has elapsed.

9. If the pressure drops 1-psig before the appropriate time shown in the table has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.
10. Should the section fail to meet test requirements, the Contractor shall determine the source or sources of leakage, and make all necessary repairs and shall repeat the test until the test section is within established limits. All corrective work shall be at the Contractor's expense.

E. Correction of Non-Conforming work:
1. All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the City. Non-conforming work shall be defined as failure to adhere to any specified or implied directive of these technical special provisions and/or the Drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the Drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, water standing in any pipe segment or structure, visible or detectable leakage, and failure to pass any specified test or inspection.

Table 02774-1
Test Time Table

TEST TIME:
For sewer diameter between 8 inches and 36 inches inclusive, the pipe shall be tested between adjacent manholes. The test time for the air pressure to drop the specified one pound shall be as listed below:

SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP

1 Pipe Dia. (in.)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Feet							
				100	150	200	250	300	350	400	450
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.148 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:26	71:13	89:02	106:50	124:38	142:26	160:15
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

END OF SECTION

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SECTION 02775
WASTEWATER MANHOLE REHABILITATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Sanitary sewer manhole rehabilitation including:
   1. Rehabilitation and leak proofing of manholes by lining with Sewper® calcium aluminate spray applied, or equal as determined by City.
   2. The inspection and testing of the various types of work to insure compliance.

1.02 REFERENCES

A. Codes, Specifications, and Standards (Not Used)

B. Testing and Materials Standards
   1. American Society of Testing and Materials (ASTM)

C. Related Sections
   1. Section 01516 "Collection System Bypass"
   2. Section 02774 "Wastewater Gravity Collection Systems"
   3. Section 09901 “Coatings and Linings”

1.03 DEFINITIONS (NOT USED)

1.04 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

A. It shall be the responsibility of the Contractor to schedule and perform his work so as to result in no overflows or spills of sewage from the system. If sewage flows are such that they interfere with the Contractor’s ability to perform work, the Contractor shall be responsible for scheduling his work during low flow periods or provide bypass pumping. Bypass pumping shall be provided only with the specific written approval of the City.

B. In the event of overflows caused by the Contractor’s work activities, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the spillage, disinfect the area affected by the spill, and notify City in a timely manner.

C. Contractor will indemnify and hold harmless the City for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor. Should fines subsequently be imposed as a result of any overflow for which the Contractor is fully or partially responsible, the Contractor shall pay all such fines and all of the City's legal, engineering, and administrative costs in defending such fines and claims associated with the overflow.

1.05 SHOP DRAWINGS AND SUBMITTALS

A. Shop Drawings shall be submitted to the City for review and acceptance prior to starting construction in accordance with the General Conditions and 01300 "Submittals" for the following:
   1. Manhole Liner

B. Submittals shall be submitted to the City for review and acceptance at least 14-days prior to starting manhole rehabilitation in accordance with the General Conditions and Division 1 for the following:
   1. Manufacturers' Certificate of Compliance certifying compliance with the applicable Specifications and Standards. The certifications shall list all materials furnished under this Section.
   2. Certified copies of factory tests required by the applicable Standards, the Manufacturer, and this Section.
   3. Manufacturer's handling, storage, and installation instructions and procedures.
   4. Recommended lining thickness design to withstand groundwater pressure as specified in Part 3 of this Section.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials
   1. All materials furnished for this work shall be in accordance with the "List of Materials and Approved Manufacturers" as appended to these Specifications.
   2. The materials used shall be designed, manufactured, and intended for sewer manhole rehabilitation and the specific application in which they are used. The materials shall have a proven history of performance in sewer manhole rehabilitation. The materials shall be delivered to the job site in original unopened packages clearly labeled with the manufacturer's identification and printed instructions. All materials shall be stored and handled in accordance with recommendations of the manufacturer. All materials shall be mixed and applied in accordance with the manufacturer's written instructions.
   3. The Contractor shall warrant and hold harmless the City against all claims for patent infringement and any loss thereof.
   4. Handle and store all materials and dispose of all wastes in accordance with applicable regulations.

5. Each lining system shall be designed for application over wet surfaces (but not active running water) without degradation of the final product and/or the bond between the product and the manhole surfaces.

B. The following shall be used for stopping active leaks in concrete and masonry manholes:
   1. A premixed fast-setting, volume-stable waterproof cement plug consisting of hydraulic cement, graded silica aggregates, special plasticizing, and accelerating agents. It shall not contain chlorides, gypsum's, plasters, iron particles, aluminum powder, or gas-forming agents, or promote the corrosion of steel it may come in contact with. Set time shall be approximately 1-minute. Ten (10) minute compressive strength shall be approximately 500-psi.
   2. A siliconate-based liquid accelerator field mixed with neat Portland cement. The set time shall be approximately 1-minute.
   3. The elastomeric polyurethane resin-soaked method, using dry twisted jute oakum, or resin-rod with polyurethane resin (water activated).

C. Manhole lining:
   1. The material applied to the surface of the manhole shall be a cementitious blend of calcium aluminate cement and manufactured calcium aluminate aggregates for constructing a liner that is impervious to the flow of water, is resistant to sulfide attack, and restores structural integrity to existing manhole walls.
   2. A monolithic liner shall be formed which covers all interior manhole surfaces and shall have the following minimum requirements at 28-days:

Compressive Strength (ASTM C-579B)	3,000-psi
Tensile Strength (ASTM C-496)	300-psi
Flexural Strength (ASTM C-293) (Modified)	600-psi
Shrinkage (ASTM C-596)	0% at 90% R.H.
Bond (ASTM C-321)	130-psi
Density, when applied	105± pcf

D. Spray applied epoxy resin system manhole lining.
   1. The material sprayed onto the surface of the manhole shall be an epoxy resin system formulated for application within a sanitary sewer environment. The resin will exhibit suitable corrosion resistance and enhance the structural integrity of the existing manhole.

E. Multi-component stress skin panel liner system.
   1. The material applied onto the surface of the manhole shall be a multi-component stress skin panel liner system designed to withstand the effects of hydrogen sulfide without any deterioration to the liner. The liner shall be a solvent free, two-component polymeric, moisture/chemical barrier specifically developed for the wastewater environment.
   2. The cured epoxy resin system shall conform to the following minimum Structural Standards:

Table 02775-1
Minimum Structural Standards

Cured Product	Test Method	Results
Tensile Stress	ASTM D-638	7,000-psi
Flexural Stress	ASTM D-790	13,000-psi
Flexural Modulus	ASTM D-790	500,000-psi
Compressive Strength	ASTM D-695	13,000-psi

PART 3 - EXECUTION

3.01 REHABILITATION OF MANHOLE STRUCTURE

A. General Procedures
   1. Safety: The Contractor shall perform all work in strict accordance with all applicable OSHA, state, local, and manufacturer's safety standards. Each method of manhole rehabilitation in this Section requires some degree of manhole entry by workers. Particular attention is drawn to those safety requirements regarding confined space entry and respiratory protection from airborne particulate materials during cleaning, product mixing, and application.
   2. Cleaning: All concrete and masonry surfaces to be rehabilitated shall be clean. All grease, oil, laitance, coatings, loose bricks, mortar, unsound brick or concrete, and other foreign materials shall be completely removed. Water blasting utilizing a 210°F steam unit and proper nozzles shall be the primary method of cleaning; however, other methods such as wet or dry sandblasting, acid wash, concrete cleaners, degreasers, or mechanical means may be required to properly clean the surface. All surfaces on which these methods are used shall be thoroughly rinsed, scrubbed, and neutralized to remove cleaning agents and their reactant products. Debris resulting from cleaning shall be removed from the manhole and not discharged downstream.
   3. Stopping Infiltration: After surface preparation and prior to the application of mortars and coatings, infiltration shall be stopped either by plugging with a waterstop compound or chemical grout sealing.
   4. Patching: All large holes or voids around joints, or pipes and all spalled areas and all holes caused by missing or cracked brick shall be patched. All missing mortar shall be repointed using a non-shrink patching mortar. All cracked or disintegrated material shall be removed from the area to be patched or repointed, exposing a sound sub base. All cracks not subject to movement and greater than 1/16-inch in width shall be routed out to a minimum width and depth of 1/2-inch and patched with non-shrink patching mortar.

5. Flow Control: The Contractor shall be responsible for plugging or diverting the flow of sewage as needed for repair and lining of manhole inverts and benches.
6. Remove all loose grout and rubble from existing channel. Rebuild channel if required by reshaping and repairing slope of shelves or benches. Work shall include aligning inflow and outflow ports in such a manner as to prevent the deposition of solids at the transition point. All inverts shall follow the grades of the pipe entering the manhole. Changes in direction of the sewer and entering branch or branches shall have a true curve with the largest possible radius and shall be shaped to allow easy entrance of maintenance equipment including buckets or T.V. camera.
7. Each lining system shall be installed in accordance with the manufacturer's recommendation to withstand groundwater pressures. For manholes greater than 12-feet in depth, the lining shall withstand the pressures associated with a groundwater depth equal to the manhole depth. Linings for all other manholes shall withstand the pressures associated with groundwater depth of 12-feet. Measure groundwater depth from manhole bench to top of ground surface.
8. Application of products shall be by factory certified applicators.

3.02 SPRAY APPLIED LIGHT-WEIGHT STRUCTURAL REINFORCED CEMENT

A. The surface prior to spraying shall be damp without noticeable free water droplets or running water. Materials shall be spray-applied to a minimum uniform thickness to insure that all cracks, crevices, and voids are filled and a somewhat smooth surface remains after light troweling. The light troweling is performed to compact the material into voids and to set the bond.

B. The first application shall have begun to take an initial set (disappearance of surface sheen, which could be 15-minutes to 1-hour depending upon ambient conditions) before the second application to assure a minimum total finished thickness of 1/2-inch. The final finished thickness may need to be greater than 1/2-inch as recommended by the manufacturer to withstand groundwater pressures. A depth gauge shall be used during application, at various locations, to verify the required thickness. The surface then shall be trowelled to smooth finish with care taken not to over trowel so as to bring additional water to the surface and weaken it. Manufacturer's recommendations shall be followed whenever more than 24-hours have elapsed between applications.

C. The bench covers used to catch debris shall be removed and the bench and invert sprayed such that a gradual slope is produced from the walls to the invert with the thickness at the edge of the invert being no less than 1/2-inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.

D. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24-hours after application. If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F, using ice if necessary.

E. The final application shall have a minimum of 4-hours cure time before being subjected to active flow.

3.03 CENTRIFUGALLY CAST STRUCTURAL REINFORCED CEMENT

A. Application procedures shall conform to the recommendations of the manufacturer.

B. The rotating casting applicator shall be positioned to evenly apply the material and be withdrawn at a rate to assure a final minimum thickness of 1-inch. The final finished thickness may need to be greater than 1-inch as recommended by the manufacturer to withstand groundwater pressures. A depth gauge shall be used during application, at various locations to verify the required thickness.

C. The bench covers used to catch debris shall be removed and the bench and invert sprayed or hand applied so that a gradual slope is produced from the walls to the invert with the thickness at the edge of the invert being no less than 1/2-inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.

D. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24-hours after application. If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F.

E. The final application shall have a minimum of 1-hour cure time as recommended by the manufacturer before being subjected to active flow.

3.04 SPRAYED APPLIED EPOXY RESIN SYSTEM

A. Application procedures shall conform to the recommendations of the manufacturer.

B. The epoxy resin shall be sprayed onto the surfaces of the manhole walls, benches, and inverts to produce a smooth coating and yield the required structural integrity and corrosion resistance. A depth gauge shall be used during application at various locations to verify the required thickness.

C. The epoxy resin shall be applied to a minimum thickness of 0.125-inches (125-mils) at the top of the manhole and gradually thickened in accordance with manufacturer's recommendations to withstand groundwater pressures. The application shall have a minimum cure time as recommended by the manufacturer before being subjected to active flow.

D. The sloped surface of the manhole bench shall be made non-skid by broadcasting aluminum oxide or sand into the surface prior to gelatin/set.

3.05 MULTI-COMPONENT LINER SYSTEM

A. Application procedures shall conform to the recommendations of the manufacturer.

B. The liner system shall be sprayed onto the surfaces of the manhole walls, benches, and inverts to produce a smooth surface. The spray equipment shall be specifically designed to accurately ratio and apply the liner system.

C. Final installation shall be a minimum of 500-mils.

D. The application shall have a minimum cure time as recommended by the manufacturer before being subjected to active flow.

3.06 SANITARY SEWER LATERAL CONNECTIONS TO MANHOLES

A. Sanitary sewer lateral connections to rehabilitated manholes shall be reinstated to provide a seamless, leak free, and unobstructed flow connection between the new manhole lining or coating system and the lateral connection per 3.01A.

B. Sanitary sewer laterals requiring rehabilitation shall be renewed per Section 02772 "Cured-In-Place Pipe (CIPP) For Lateral Renewal."

3.07 MANHOLE REHABILITATION ACCEPTANCE

A. Test all rehabilitated manholes using the vacuum test method as per ASTM C 1244 "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test", following the manufacturer's recommendations for proper and safe procedures. Vacuum testing of manholes and structures shall be performed after curing of linings. Any visible leakage in the manhole or structure before, during, or after the test shall be repaired regardless of the test results.

B. All pipes for vacuum testing entering the manhole shall be installed at the top access point of the manhole. A vacuum of 10-inches of mercury (5.0-psi) shall be drawn on the manhole, and the time shall be measured for the vacuum to drop to 9-inches of mercury (4.5-psi). Manholes will be considered to have failed the air test if the time to drop 1-inch of mercury is less than what is shown in the following table:

Table 02775-2
Vacuum Test Timetable

Vacuum Test Timetable Manhole Diameter – Inches				
Depth – feet	48-inches	60-inches	72-inches	96-inches
4	30 sec.	30 sec.	30 sec.	30 sec.
8	30 sec.	30 sec.	32 sec.	38 sec.
12	30 sec.	39 sec.	48 sec.	57 sec.
16	40 sec.	52 sec.	64 sec.	76 sec.
20	50 sec.	65 sec.	80 sec.	95 sec.
24	60 sec.	78 sec.	96 sec.	114 sec.
+ Each 2'	+5 sec.	+6.5 sec.	+8.0 sec.	+9.5 sec.

C. Manhole depths shall be rounded to the nearest foot. Intermediate values shall be interpolated. For depths above 24-feet, add the values listed in the last line of the table for each 2-feet of additional depth.

D. If the manhole or structure fails the vacuum test, the Contractor shall perform additional repairs and repeat the test procedures until satisfactory results are obtained.

E. After the manhole rehabilitation work has been completed, the manhole shall be inspected by the Contractor in the presence of the City and the work shall be accepted if found satisfactory to the City. No evidence of visible leaks shall be allowed. Non-uniformity, sagging, lamination, holidays or other defects will be cause for rejection of the coating. All surfaces shall be tested for the presence of holidays and pinholes via spark testing at 100-volts per millimeter. The Contractor shall provide the testing equipment and perform the testing in the presence of the City. Any holidays or pinholes found during the testing shall be repaired and the surface re-tested until the surfaces are completely free of holidays and pinholes.

3.08 CLEANUP

A. After the installation work has been completed and the testing is acceptable, the Contractor shall clean up the entire project area. The Contractor shall dispose of all excess material and debris. The work area shall be left in a condition equal to or better than the prior condition.

3.09 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of 1-year from the date of acceptance.

B. If at anytime during the warranty period any leakage, cracking, loss of bond, or other discontinuity is identified, the Contractor shall remove and replace the manhole liner with new material at no cost to the City. No field repair shall be approved.

C. Furnish an extended warranty for manhole rehabilitation materials from the Contractor and liner manufacturer for a total of 5-years from date of final completion.

END OF SECTION

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SECTION 02784
CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section specifies aluminum coated steel chain link fence, nominally 6-feet high, complete with gates to be constructed around the area indicated on the Drawings.

1.02 QUALITY ASSURANCE

A. Chain link fences and gates shall be constructed in accordance with specified standards, as well as all pertinent codes and regulations. Where provisions of pertinent codes conflict with the specifications, the more stringent provisions shall govern.

B. Chain link fences and gates shall be manufactured by established, reputable manufacturers that have been engaged in the manufacture of chain link fencing for at least 10-years.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

B. The Contractor shall submit layout drawings of all fence and gate installations along with details and manufacturer's literature of all fence and gate materials in the Project.

C. The Contractor shall submit all motor data, connection diagrams, wiring diagrams, and O&M instructions for all gate operators in the Project.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 MATERIALS

A. Fabric: The fabric shall be aluminum coated steel chain link, 72-inches high, No. 9-gauge wire woven in a 2-inch mesh. The fabric shall conform to the requirements of ASTM Designation A491. The aluminum coating shall be a minimum of 0.40-ounces per square foot of wire surface for No. 9-gauge fabric. The fabric shall have a minimum tensile strength of 75,000-psi. The weight of the coating shall be determined by the strip test as defined in ASTM Designation A428. The fabric shall be coated with an ultra violet stable black PVC coating which meets ASTM standards F688 Class I.

B. Post and Other Appurtenances: All posts and other appurtenances used in the construction of this fence shall be hot dipped galvanized with a minimum of 1.8-ounces per square foot of surface. Pipe sections shall conform to the requirements of ASTM Designation A120. All posts, rails, and fittings shall be coated with an ultra violet stable black PVC coating which meets ASTM standards F688 Class I.

C. Sizes of Posts, Gate Frames, and Rails:

COMPONENT	DIMENSIONS	
	Nominal Diameter	NPS Pipe Schedule
1. End, corner & pull posts	3-inch	40
2. Gateposts (one leaf width 8-feet or less)	3-inch	40
3. Intermediate posts	2-3/8-inch	40
4. Gate Frames	1-5/8-inch	40
5. Braces	1-5/8-inch	40
6. Top Rails	1-5/8-inch	20

D. Gates
1. Swing Gates: Gates shall be complete with latches, stops, keepers, and hinges. Gate frames shall be constructed of round tubular members continuously welded at all corners or assembled with fittings. Welds shall be painted with aluminum or zinc based paint prior to application of PVC coating. Gate filler shall be of the same fabric as specified for the fence and shall be attached securely to the gate frame with No. 9 tie wires at intervals not exceeding 12-inches. Hinges shall be of adequate strength for the gate and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be easily operable by one person. Latches, stops, and keepers for all gates, along with 1-inch stainless steel chain and padlock, shall be provided.
2. Sliding Gates: Sliding gates shall be complete with latches, stops, keepers, rollers, and roller tracks. Gate shall ride on a double wheel carrier. Gateposts shall be 3-inch Sch. 40 and frame shall be 1-5/8-inch Sch. 40. Slide pipe tracks shall be 1-5/8-inch Sch. 40. Safety post (outside of gatepost) shall be 3-inch Sch. 40. Fabric shall match fence.

3. Gate padlocks shall be the City standard, case brass, shackle-case hardened steel, 1-inch links with 12-inch chain, 606 finish and keyed alike when more than one.

E. Top Rail: The top rail shall be provided with couplings approximately every 20-feet. Couplings are to be the outside sleeve type, at least 6-inches long.

F. Concrete: Concrete shall have a minimum compressive strength of 2,500-psi at 28-days.

G. Hardware: Miscellaneous hardware shall be of steel, malleable iron or ductile iron of standard design and conform to the requirements of the Chain Link Fence Manufacturer's Institute. All parts shall be galvanized except ties and clips may be aluminum.

H. Power Gate Operators: The operators for sliding gates shall be Robot Industries, Inc. Model LSG-100, Venco Model SJH, or acceptable equal units designed for use on cantilever sliding gates. Operator motors shall be 1 horsepower and shall be wound for 208 volt, 3 phase, and 60 Hz power supply. Units shall provide gate speed of not less than 75-feet per minute. Units shall be arranged for ground level mounting on 6-inch concrete pads. A quick disconnect for manual operation with a padlock control shall be provided. The cover for the operator shall be of galvanized steel, and the units shall be provided with electric overload protection.

PART 3 - EXECUTION

3.01 ARRANGEMENT

A. Posts: Posts shall be uniformly spaced, not to exceed 10-feet on centers. Intermediate posts shall have waterproof tops, which have integrally cast openings through which the top rails shall pass. Terminal posts shall consist of end, corner, and pull posts.

B. Braces: Braces shall be provided at each gate, corner, pull, and end post.

C. Top Rails: The top rails shall pass through the line post tops and form a continuous brace from end to end of each stretch of fence. The top rail shall be securely fastened to the terminal posts by heavy pressed steel brace bands and malleable end connections.

D. Bottom Tension Wire: The bottom tension wire shall be No. 7-gauge aluminum coated spring coil or crimped wire. Minimum weight of aluminum coating shall be 0.40-ounces per square foot of wire surface. The tension wire shall be stretched taut between terminal posts and securely fastened to each intermediate post 2-inches above the finish grade line. Tension wire shall be attached to the fence fabric with aluminum hog rings every 24-inches.

E. Stretcher Bars: Stretcher bars shall be no less than 3/16-inch by 3/4-inch in cross section and shall have minimum length 2-inches longer than the fabric height. Stretcher bars shall be used for attaching the fabric to all terminal posts by threading through the fabric and being attached to the posts with No. 9-gauge tension bands, or other positive mechanical means, spaced at 24-inch centers. One (1) stretcher bar shall be provided for each gate and end post and 2 for each corner and pull post.

F. Ties and Clips: Fabric shall be fastened to all intermediate posts with 9-gauge tie wires, spacing not to exceed 12-inches apart. Fabric shall be tied to top rail with 9-gauge tie wires, spacing not to exceed 24-inches on centers.

3.02 INSTALLATION

A. Post Setting: Line and terminal posts shall be set in holes 12-inches in diameter, 42-inches deep with 36-inch post embedment. After the post has been set and plumbed, the hole shall be filled with concrete. The exposed surface of the concrete shall be crowned to shed water.

B. Terminal and Gateposts: Terminal and gateposts shall be set as specified above and shall be braced to the nearest post with a galvanized horizontal brace used as a compression member and a galvanized 3/8-inch steel truss rod and turnbuckle used as a tension member.

C. Fabric: Fabric shall not be stretched until concrete footings have cured a minimum of 3-days. Chain link fabric shall be placed on the side designated by the City and shall be stretched taut approximately 2-inches above finish grade and securely fastened to all posts. Rolls of wire fabric shall be joined by weaving a single strand into the ends of the rolls to form a continuous mesh.

END OF SECTION

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SECTION 02931 –

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction. Contractor shall engage and pay a Certified Arborist who will be responsible for supervising implementation of tree, shrub and plant protection throughout construction.

1.02 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches above the ground for trees up to, and including, 4-inch size; and 12 inches above the ground for trees larger than 4- inch size.

B. DBH (Diameter at Breast Height): The diameter at breast height of a tree's trunk measured at a height four and one-half (4 ½) feet above grade. In the case of multiple trunk trees, the DBH shall mean the sum of each trunk's diameter measured at a height of four and one-half (4 ½) feet above grade.

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated on the Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.03 SUBMITTALS

A. Certified Arborist: Submit evidence contract with acceptable Certified Arborist prior to commencing site mobilization activities.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

B. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction prior to the work.

1. Species and size of tree.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.

Description of maintenance following pruning.

C. Qualification Data: For qualified arborist and tree service firm.

D. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

F. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.5 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by International Society of Arboriculture (ISA) or registered by the American Society of Consulting Arborists. In addition, Certified Arborist shall have experience in tree risk assessments, preferably TRAQ Qualified

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

1.6 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: 80 percent sand and 20 percent muck thoroughly mixed with a commercial shredder/blender or equivalent. Material shall be proportioned by volume rather than weight and site mixing is not allowed. Mixture shall be free from rocks greater that ½" in size, limbs, roots, and other deleterious matter. The Landscape Architect reserves the right to reject topsoil, at any time, used during the execution of the work not meeting specifications.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded Melaleuca, Grade A.
2. Color: Natural.

C. Protection-Zone Fencing: Fencing fixed in position as indicated on the Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated with flagging tape.

B. Protect tree root systems from damage caused by runoff or spillage of chemically injurious materials while mixing, placing, or storing construction materials. Protect root

systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Above-ground surface runoff shall not be directed into the tree canopy area from adjacent areas. Ensure that sidewalks or other construction do not trap water near the tree.

D. Protect existing plant materials from unnecessary cutting, breaking and skinning of roots and branches, skinning and bruising of bark.

E. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.

1. Apply 3-inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

3.2 TREE- AND PLANT-PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin.

B. Maintain protection zones free of weeds and trash.

C. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by City.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.3 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to specifications.

B. Trenching near Trees: Where trenching for utilities is required within drip lines, tunnel under and around roots of 2-1/2 inches diameter or larger by hand digging. Do not cut main lateral roots that are two inches or larger. Cut smaller roots that are smaller than two inches that interfere with installation of new Work. Use sharp, approved pruning tools.

C. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.

D. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning. . Treat and cover cut ends as directed by Certified Arborist.

E. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover, pack with wet peat moss or four layers of wet untreated burlap and temporarily support and protect roots from damage until permanently relocated and covered with backfill. Irrigate to eliminate voids and air pockets.

3.4 ROOT PRUNING

A. Certified Arborist shall direct tree root pruning and relocation work that are affected by temporary and permanent construction. Procedure for each tree may vary and shall be subject to approval by Certified Arborist and prior to commencing Work.

B. Prune as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, mutilate, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Do not paint cut root ends.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible in accordance with specifications.

C. Root Pruning at Edge of Protection Zone: Prune 6 inches outside of the protection zone, by cleanly cutting all roots to the depth of the required excavation.

D. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.5 PRUNING

A. Certified Arborist shall direct removal of branches from trees and large shrubs and correctional pruning and cabling that are affected by temporary and permanent construction. Procedure for each tree may vary and shall be subject to approval by

Certified Arborist and prior to commencing Work.

B. Prune branches as follows:

1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
2. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
3. Tree limbs shall be trimmed or removed only under direction of skilled and experienced supervisor, according to directions of Arborist.

C. Chip removed branches and dispose of off-site.

3.6 REGRADING

A. Grade changes shall be limited to six inches of cut or fill from original grade and shall be accomplished by hand.

B. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

D. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

E. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.7 REPAIR AND REMOVAL OF TREES

A. Repair and Removal of Trees: Certified Arborist will determine whether trees shall be restored or removed. Treat and restore trees damaged by construction operations in a manner acceptable to City and owner of the tree, shrub, landscaping and other vegetation. Perform restoration and pruning promptly after damage occurs to prevent progressive deterioration of damaged trees. If trees cannot be restored, Replace trees and plants which are damaged or destroyed due to work operations at no cost to the City.

1. Remove dead and damaged trees that are determined by Certified Arborist to be incapable of restoration to normal growth pattern.

2. Contractor shall be liable for all damage and necessary restoration actions to existing trees, including trunk, branches, or roots. Restoration shall be performed under direction of Certified Arborist.

3.8 REPAIR AND REPLACEMENT OF SHRUBS AND GROUND COVER

A. Repairs and Replacements of Shrubs and Ground Cover: Repair shrubs and other vegetation damaged by construction operation in manner acceptable to the City.

1. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged plant. Remove and replace all dead and damaged plants up to six inch diameter which are determined by the Certified Arborist as being incapable of restoration to normal growth pattern.

2. Provide new shrubs of same size and species as those replaced or as acceptable to the City.

3.9 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and properly dispose of them off Owner's property.

END OF SECTION

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SECTION 09900

PAINTING

1. GENERAL

1.1 Description

A. This specification defines the methods of surface preparation, coating systems, and methods of application for painting of surfaces as outlined herein.

B. The Contractor shall furnish all supervision, materials, labor, tools, equipment, scaffolding or other structures, incidentals required for transportation, unloading, storage and application of paint and protective coating systems and associated products for the surfaces listed herein and not otherwise excluded. All surfaces described shall be included within the scope of this Section. Surface preparation, priming, and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of the work.

C. "**Paint**", as used herein, means all coating systems, materials, including primers, emulsions, enamels, epoxies, sealers and fillers, and other applied materials whether used as a prime, intermediate, or finish coats.

D. The Work includes painting and finishing of interior and exterior exposed items and surfaces such as structural steel, miscellaneous metals, ceilings, walls, floors, doors, frames, transoms, fans, construction signs, guardrails, posts, pipes, fittings, valves, tanks, equipment, and all other work obviously required to be painted unless otherwise specified herein or on the Contract Drawings. The omission of minor items in the schedule of work shall not relieve the Contractor of his obligation to include such items where they come within the general intent of the specifications as stated herein. The following major items of the Project shall be coated:

1. Interior and exterior of cast-in-place concrete, concrete block walls, ceilings, stucco walls and exterior concrete block walls.
2. Interior of concrete water retaining structures.
3. Exterior and interior of buried concrete surfaces (cast-in-place, precast or block).
4. Exposed ferrous surfaces of any components of equipment, pumps, motors, tanks and ferrous or galvanized metal fittings and accessories (except stainless steel).
5. Submerged surfaces, surfaces exposed to liquids, and surfaces in vaults of any ferrous metal and aluminum components of equipment, piping, fittings and valves (except stainless steel).

6. Exposed surfaces of PVC components of piping, fittings, valves, electrical conduit, and equipment.

7. Exposed exterior surfaces of all metallic piping, fittings and valves located on the interior and exterior of buildings and structures. This shall include new piping, fittings and valves for the Project.

8. Embedded aluminum or aluminum in contact with dissimilar metals or in contact with corrosive atmospheres.

E. The following items will not be painted unless otherwise noted:

1. Any code-requiring labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

2. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise indicated.

3. Stainless steel angles, tube, pipe, etc.

4. Aluminum or fiberglass handrails, walkways, kickplates/toeboards, windows, louvers, grating, checker plate, hatches, and stairways unless otherwise indicated.

5. Products with polished chrome, aluminum, nickel, or stainless steel finish.

6. Stainless steel, brass, bronze, chromium plate, anodized aluminum, and aluminum other than exposed utility tubing.

7. Flexible couplings, lubricated bearing surfaces, insulation, and plastic pipe or duct interiors.

8. Plastic switch plates and receptacle plates.

9. Signs, nameplates, code-required labels, equipment identification, performance rating, name or nomenclature plates.

10. Finish hardware.

11. Packing glands and other adjustable parts, unless otherwise indicated.

12. “Pre-finished” items including architectural woodwork and casework, toilet enclosures, metal lockers, elevator equipment, light fixtures, and distribution cabinets.

13. Portions of metal, other than aluminum, embedded in concrete. This does not apply

to the back face of items mounted to concrete or masonry surfaces which shall be painted before erection. Aluminum to be embedded in, or in contact with, concrete shall be coated to prevent electrolysis.

14. Sprinkler heads.

F. All work shall be done in strict accordance with this specification, the Contract Drawings, painting package and the manufacturer's printed instructions.

1.2 Definitions

A. **Field Painting** is the painting of new or rebuilt items at the Project Site.

B. **Shop Painting** is the painting of new or rebuilt items in the shop prior to delivery to the Project Site.

C. **Dry Film Thickness (DFT)** is the thickness of a coat of paint in fully cured state measured in mils ($^{1}/_{1000}$ inch).

D. Definitions of additional painting terms as defined in ASTM D-16, unless otherwise specified.

E. The abbreviations and definitions listed below, when used in this specification, shall have the following meanings:

1.	SSPC:	Steel Structures Painting Council
2.	Exterior:	Outside, exposed to weather
3.	Interior Dry:	Inside, not subject to immersion service
4.	Interior Wet:	Inside, subject to immersion service
5.	ASTM:	American Society of Testing Materials
6.	NACE:	National Association of Corrosion Engineers
7.	NFPA:	National Fire Protection Association
8.	OSHA:	Occupational Safety and Health Administration
9.	NSF:	National Science Foundation
10.	AWWA:	American Water Works Association

1.3 Quality Assurance

A. **Provide the best quality grade of the various types of coatings** as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.

B. The Contractor shall be responsible for a satisfactory paint application which will adhere without peeling, flaking, delamination, blistering or discoloration. Before application of any painting materials, the Contractor shall submit a Project specific Letter of Certification from the manufacturer of the materials to be used. The letter shall state that the manufacturer recommends the materials selected for the application proposed.

C. Painting shall be accomplished by experienced painters specializing in industrial painting familiar with all aspects of surface preparations and applications required for this Project. Work shall be done in a safe and workmanlike manner. Prior to application of coating materials, the approved paint manufacturer shall submit shall submit a Project specific letter certifying that the Contractor or his painting subcontractor are qualified to apply their respective products.

D. Provide undercoat paint produced by the same manufacturer as the finish coats. **Undercoat and finish coat paints shall be compatible**. **Use only thinners approved by the paint manufacturer, and use only within recommended limits**.

E. Reference Standards

1. All work shall conform to applicable provisions of the following standards, except as modified herein:

a. American National Standards Institute (ANSI)

ANSI Standard	Standard Title
ANSI/EIA RS-359-1969	Colors for Identification and Coding (ANSI C83.1)
ANSI Z53.1-1979	Safety Color Code and Marking Physical Hazards
ANSI A13.1-1975	Scheme for the Identification of Piping Systems

b. American Society for Testing and Materials (ASTM)

ASTM Standard	Standard Title
ASTM D 2200-67(1980)	Pictorial Surface Preparation Standards for Painting Steel Structures
ASTM D 3276-80	Recommended Guide for Paint Inspectors

c. National Association of Corrosion Engineers (NACE)

d. Occupational Safety and Health Administration (OSHA)

e. National Science Foundation (NSF)

f. National Fire Protection Association (NFPA)

g. American Water Works Association (AWWA)

F. Acceptable Manufacturers

1. It is the intent of this specification section that the Contractor **use one paint manufacturer throughout**, unless otherwise approved by the Engineer. Products shall be manufactured by one of the following:

a. Tnemec Company, Inc.

b. Carboline Company

c. Induron Coatings, Inc.

d. Devoe, Inc.

e. Xypex

f. Or approved equal.

2. No request for substitution will be considered that decreases the dry film thickness (DFT) and/or number of coats to be applied, or that offers a change from the generic type of coating specified.

1.4 Submittals

A. Materials and Shop Drawings

1. Submit to the Engineer as provided in the General Conditions, Supplementary Conditions and Section 01300, "Submittals", shop drawings, manufacturer's specifications and data on the proposed paint systems, including, but not limited to, the following:

a. Percent solids by volume.

b. Minimum and maximum recommended dry-film thickness (DFT) per coat for prime, intermediate and finish coats for each application.

c. Recommended and detailed surface preparation procedures and techniques.

d. A certificate identifying the type and gradation of abrasives used for surface preparation.

e. Recommended thinners for each of the proposed painting/coating systems.

f. A statement verifying that the specified prime coat is recommended by the manufacturer for use with the specified intermediate and finish coats.

g. Application procedures and instructions including recommended equipment and temperature limitations.

h. Curing requirements and instructions.

i. Material Safety Data Sheets (MSDS) for each painting/coating material.

j. A certificate identifying the type and gradation of abrasives used for surface preparation.

B. Color Samples

1. The manufacturer's standard color charts for color selection by the Owner.

1.5 Product Delivery, Handling and Storage

A. Deliver all materials to the job site in "new", "original", "unopened packages and containers bearing the manufacturers' name, trade name and label analysis, in accordance with Section 01600, "Materials and Equipment".

B. Containers shall be clearly marked to indicate any hazards connected with the use of the paint and steps which should be taken to prevent injury to those handling the product.

C. All containers shall be handled and stored in such a manner as to prevent damage or loss of labels or containers. All containers shall be handled and stored in a steel cabinet raised four (4) inches above the floor to prevent damage from spillage or loss of labels on containers.

D. The Owner shall designate areas for storage and mixing of all painting materials. Store only acceptable product materials on the Project site. Restrict storage to paint materials and related equipment.

E. All painting materials shall be stored in a clean, dry, well-ventilated place, protected from sparks, flame, direct rays of the sun or from excessive heat. Paint susceptible to damage from low temperatures shall be kept in a heated storage space when necessary. The Contractor shall be solely responsible for the protection of the materials stored by himself at the job site. Empty coating cans shall be required to be neatly stacked in an areas designated by the owner and removed from the job site on a schedule determined by the owner.

F. Storage of paint materials and related equipment shall comply with the requirements or pertinent codes and fire regulations. The Contractor shall take all safety precautions in

accordance with Section 7 of AWWA D102, NFPA Bulleting No. 101 and all federal, state and local regulations. In addition, all safety precautions noted on the manufacturer's Material Safety Data Sheets (MSDS) and other literature shall be strictly followed. Proper containers outside of buildings shall be provided by the Contractor and used for painting wastes. No plumbing fixtures shall be used for this purpose.

G. Used rags shall be removed from the buildings every night and every precaution taken against "spontaneous combustion".

1.6 Job Conditions

A. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50°F by the paint and 90°F unless otherwise permitted manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45°F and 95°F unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and maintained within the temperature and humidity limits specified by the paint manufacturer during application and drying periods.

1.7 Warranty and Guarantees

A. All paint and coatings work performed under these specifications shall be in compliance with the project requirements.

1.8 Identification Systems

A. Paint piping and equipment for identification purposes in accordance with Section 09905, "Piping, Valve and Equipment Identification System".

2. PRODUCTS

2.1 Materials

A. All paint shall be manufactured by one of the suppliers listed in 1.4(G), herein, and shall be their highest grade and quality of paint.

B. The following coating systems list a product by name to establish a standard of quality; other products of the same generic types may be submitted to the Engineer for approval as described in 1.6, herein. When other than the specified coating system is proposed, the Contractor shall submit a list, in an electronic format giving the proposed coatings, brand, trade name, generic type and catalog number of the proposed system for the Engineer's review and approval, prior to the application of the painting/coating system.

C. Paint used in successive field coats shall be produced by the same manufacturer. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint. Shop paint shall be of the same type and manufacture as used for field painting by the Contractor.

D. Emulsion and alkyd paints shall contain a "mildewcide" and both the paint and "mildewcide" shall conform to OSHA and Federal requirements, including Federal Specification TT-P-19.

E. **No paint containing lead or chromate shall be allowed on the Project**. Oil shall be pure boiled linseed oil.

F. Rags shall be clean painter's rags, completely sterilized.

G. All cleaners, thinners, driers and other additives and surface pretreatment materials shall only be those approved for use by the manufacturer of the coatings.

H. Do not dilute paints except as recommended by the paint manufacturer.

I. All recommendations of the paint manufacturer in regard to the health and safety of the workmen shall be followed.

J. All coatings to be shop applied must meet the requirements for volatile organic compounds (VOC) of not more than 3.5 pounds per gallon after thinning.

2.2 Coating Schedule

A. The following coating systems table lists the general features of the standard coating systems, by service and generic type, and is provided as a general guideline for this project:

System No.	Generic Type	Surface Material	Finish	Typical Function
1	Epoxy / Polyurethane	Ferrous Metal, Non-galvanized	Gloss	Exterior Metals not subject to immersion or frequent splashing
7	Epoxy	Ferrous Metal, Non-galvanized	Semi-gloss	Metals subject to immersion or frequent splashing
8	Epoxy	Ferrous Metal, Galvanized	Semi-gloss	Metals subject to immersion or frequent splashing
11	Acrylic	Concrete	Low sheen	Precast concrete ceilings, beams and columns
15	Elastomeric	Masonry	Low sheen	Exterior masonry
16	Acrylic	Masonry	Low sheen	Interior masonry
18	Acrylic	Plaster, Stucco	Low sheen	Exterior plaster, stucco
25	Coal Tar Epoxy	Ferrous Metal	Semi-gloss	Metals submerged in non-potable water
26	Coal Tar Epoxy	Concrete	Semi-gloss	Submerged concrete in non- potable water or below grade
29	Sealer, Hardener	Concrete	Semi-gloss	Concrete Floors

2.3 Coating Systems

A. System No. 1

1. System No. 1 shall be used for exterior non-galvanized ferrous metals that are not subject to immersion or frequent splashing of water, reclaimed water or wastewater, including but not limited to the following:

   a. Exposed exterior piping, valves and fittings.

   b. Clarifier and sludge thickener bridge, top side and railings.

2. Surface Preparation: SP-6

3. Shop Primer

   a. One (1) coat of one of the following:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series I Omnithane	1	3

4. Field Touch-Up: Same material as Shop Primer.

5. Intermediate Coat

   a. Provide intermediate coats of one of the following:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	N 69	1	3.5

6. Finish Coat

   a. One (1) full coat of High Gloss aliphatic polyurethane:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	1074	1	3

B. System No. 7

1. System No. 7 shall be used for non-galvanized, ferrous metals subject to immersion or frequent splashing, including but not limited to, the following:

   a. Submerged piping and piping subject to splashing

   b. Submersible pumps

   c. Mixers

   d. Clarifiers, grit collectors, and sludge thickeners

      1) Interior mechanisms

      2) Steel weirs, troughs, supports

      3) Bridge underside

   e. Submerged miscellaneous metal, equipment, etc. without a factory-applied final finish.

2. Surface Preparation: SP 10

3. Shop Primer

   a. One (1) coat of one of the following:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series I Omnithane	1	2.5 - 3.5

4. Field Touch-Up

   a. The "field touch-up" coating shall be the same material as the shop primer.

5. Finish Coat

   a. Two (2) coats of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series 446 Permashield MCU	2	5.0 - 7.0

C. System No. 8

1. System No. 8 shall be used for galvanized, ferrous metals subject to immersion or frequent splashing, including but not limited to, the following:

   a. Submerged galvanized piping and piping subject to splashing.

   b. Submerged galvanized conduit, miscellaneous metal, equipment, etc. without a factory-applied final finish.

2. Surface Preparation: SP M1 and SP 7

3. Field Clean-Up: Remove all grease, oil and contaminants with rags soaked in Toluol or Xylol in accordance with SSPC – SP1.

4. Primer

   a. One (1) coat of one of the following:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series N69	1	2.5 - 3.5

5. Finish Coat

   a. Two (2) coats of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series N69 Epoxoline	2	2.5 - 3.5

D. System No. 11

1. System No. 11 shall be used for interior concrete requiring a matte finish, including but not limited to the following:

   a. Precast concrete ceilings, beams and columns.

2. Surface Preparation: SP C2

3. Filler

   a. The need for a filler may be deleted if concrete surface has been "rubbed" finish.

   b. There is no need for filler for concrete that is to be "submerged.

   c. Filler shall be applied until the surface is "pin-hole" free using the product of one of the manufacturers below (or approved equal), except as indicated above:

Manufacturer	Coating	Coating Application (ft2 / gallon)
Tnemec	215 Surfacing Epoxy	As needed

   d. Remove excess filler from the concrete surface.

4. Finish Coat

   a. Two (2) coats of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series 6 Tneme-Cryl	2	2.5

E. System No. 15

1. System No. 15 shall be used for exterior masonry requiring a matte finish.

2. Surface Preparation: SP C2

3. Filler

   a. Filler shall be applied until the surface is "pin-hole" free using the product of one of the manufacturers below (or approved equal), except as indicated above:

Manufacturer	Coating	Coating Application (ft2 / gallon)
Tnemec	Series 1254	130

   b. Remove excess filler from the concrete surface.

4. Finish Coat

   a. Two (2) coats of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series 6 Tneme-Cryl	2	2.5

F. System No. 16

1. System No. 16 shall be used for interior masonry requiring a matte finish.

2. Surface Preparation: SP C2

3. Filler

   a. Filler shall be applied until the surface is "pin-hole" free using the product of one of the manufacturers below (or approved equal), except as indicated above:

Manufacturer	Coating	Coating Application (ft2 / gallon)
Tnemec	Series 54 Modified Epoxy Masonry Filler	80

   b. Remove excess filler from the concrete surface.

4. Finish Coat

   a. Two (2) coats of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series 6 Tneme-Cryl	2	2.5

G. System No. 18

1. System No. 18 shall be used for the following exterior surfaces:

   a. Concrete columns and beams.

   b. Plaster and stucco.

2. Surface Preparation: SP P2

3. Primer

   a. Filler shall be applied until the surface is "pin-hole" free using the product of one of the manufacturers below (or approved equal), except as indicated above:

Manufacturer	Coating	Coating Application (ft2 / gallon)
Tnemec	Series 218	As needed

b. Remove excess filler from the concrete surface.

4. Finish Coat

a. Two (2) coats of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series 6 Tneme-Cryl	2	2.5

H. System No. 25

1. System No. 25 shall be used for metal surfaces, including but not limited to the following:

a. Submerged piping

2. Surface Preparation: SP 10

3. Shop Primer

a. One (1) coat of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Series 1	1	2.5 - 3.5

4. Field Touch-Up

   a. The "field touch-up" coating to be applied, as required, shall be from one of the following manufacturers, or approved equal:

Manufacturer	Coating
Tnemec	Series I

5. Finish Coat

   a. Two (2) coats of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	446 Permashield MCU **	2	6.0 - 8.0

* Apply the second coat within 90 hours of the first coat.
** Apply the second coat within 7 days of the first coat.

I. System No. 26

1. System No. 26 shall be used for concrete surfaces, including but not limited to the following:

   a. Submerged concrete (**treatment trains, clarifiers**, etc.).

   b. All precast structures or cast-in-place concrete below grade (interior and exterior).

2. Surface Preparation: SSPC – SP 13 – Abrasive blast to provide an anchor profile equal to ICRI CSP 5 or greater.

3. Finish Coat

a. Two (2) coats of one of the following, or approved equal:

Manufacturer	Coating	No. of Coats	DFT per Coat (mils)
Tnemec	Tnemec 46-413 Tnemec-Tar *	2	9

* Apply the second coat within 90 hours of the first coat.
* Apply the second coat within 24 hours of the first coat.
*** Apply the second coat within 7 days of the first coat.

J. System No. 29

1. System No. 29 shall be used for all non-painted, exposed concrete flooring surfaces.

2. Surface Preparation: SP C1

3. System 29 shall consist of the application of three (3) coats of one of the following:

   a. Tnemec Series 629 CT Densifyer

   b. Sonneborn "Kure-N-Seal"

   c. Euclid Chemical Company "Surfhard"

   d. Lambert Corporation "Solidus"

   e. Approved Equal.

2.4 Extra Paint

A. Furnish two (2) unopened gallon cans of each type and each color of paint used, properly marked for future use by the Owner.

3. EXECUTION

3.1 General

A. Inspection of Surfaces

1. Before application of the prime coat and each succeeding coat, **inspect all surfaces**, adjoining work and conditions under which coating systems are to be applied and report to the EOR, any existing unsatisfactory conditions.

2. **Any defects or deficiencies shall be corrected by the Contractor before application of any subsequent coating**. Commencement of surface preparation and painting shall constitute the acceptance of existing conditions and any defects appearing in the painting work thereafter shall be by the Contractor.

3. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by the Owners Representative, and where, in his opinion, surfaces are damaged or contaminated, they shall be cleaned and recoated at the Contractor's expense. Recoating times of the manufacturer's printed instructions shall be adhered to.

4. Coating thickness shall be determined by the use of a properly calibrated inspection gauge for non-ferrous and cementitious surfaces. Coating thickness minimums shall be adhered to. **If a surface fails the DFT test, the entire surface shall be recoated at no additional cost to the Owner.**

B. Equipment

1. Effective oil and water separators shall be used in all compressed air lines serving spray painting and sandblasting operations to remove oil or moisture from the air before it is used. Separators shall be placed as far as practical from the compressor.

2. All equipment for application of the paint and the completion of the work shall be furnished by the Contractor in "first-class condition" and shall comply with recommendations of the paint manufacturer.

3.2 Protection of Surfaces Not Scheduled to be Coated

A. **Protect surrounding areas and surfaces** not scheduled to be coated from damage during surface preparation and application of coatings.

B. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

C. Provide temporary closures as required to prevent circulation of dust from adjacent areas where other work is in progress. Where it is necessary to remove existing protection of work of others, such protection shall be fully replaced.

D. Locate and protect all existing utilities, structures and appurtenances.

3.3 Shop Painting

A. Surface Preparation

1. All ferrous metal to be primed in the shop shall have all rust, dust and scale, as well as all other foreign substances, removed by sandblasting or pickling in accordance with SSPC-SP5 or SP8, respectively. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting. Under no circumstances will cleaned metal be allowed to sit overnight before priming, or pretreatment and priming.

2. All non-ferrous metals shall be solvent cleaned prior to the application of primer.

3. In addition, galvanized surfaces which are to be top coated shall first be degreased then primed.

4. All non-ferrous metal surfaces shall also be scarified prior to top coating.

B. Materials Preparation

1. Mix and prepare painting materials in strict accordance with the manufacturer's recommendations and directions, stirring materials before and during application to maintain a mixture of uniform density, free of film, dirt and other foreign materials.

2. No thinners shall be used except those specifically mentioned and only in such quantity as directed by the manufacturer in his instructions. If thinning is used, sufficient additional coats shall be applied to assure the required dry film thickness is achieved. The manufacturer's recommended thinner or cleanup solvent shall be used for all clean-up.

3. Application by brush, spray, airless spray or roller shall be as recommended by the manufacturer for optimum performance and appearance.

C. Applications

1. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship. Coating systems shall be as specified herein.

2. **Apply paint in accordance with the manufacturer's directions**. Use applicators and techniques best suited for the type of material being applied.

3. All paint and coatings materials shall be stored under cover and at a temperature within 10°F of the anticipated application temperature and **at least 5°F above the dew point**.

4. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color, and appearance.

5. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness.

6. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.

7. The equipment manufacturer or supplier shall provide touch-up paint for items with shop applied finish coats.

8. Where specified in the individual sections, primer coat(s) shall be applied in the shop by the equipment manufacturer. The shop coats shall be as specified and shall be compatible with the field coat or coats.

D. Certification

1. The Contractor shall obtain from the equipment manufacturer or supplier, prior to shipment of equipment, a **written certification that surface preparation, coating brand, material, DFT, and application method complied with this Section**.

3.4 Surface Preparation

A. Prepare all surfaces in accordance with the coating manufacturer's instructions and as specified. Surfaces shall be uniform texture, dry, and free from all dust, rust, scale, splinters, loose particles, disintegrated paint, grit, oil, grease, or deleterious substances that will adversely affect adhesion or appearance of the coating. Rough edges of metal, weld seams and sharp edges from scaffold lugs shall be ground to a curve.

B. Exposed nails and other ferrous metals on surfaces to be coated shall be spot- primed with a metal primer compatible with the finish.

C. Surfaces that have been cleaned, pretreated, and/or otherwise prepared for painting shall be given a coat of the first-coat material as soon as practicable prior to any deterioration of the prepared surface.

D. Hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items and surfaces not to be painted which are in contact with or nearby surfaces to be painted shall be removed, masked, or otherwise protected prior to surface preparation and painting operations.

E. The application of paint shall be held as an acceptance of the surfaces and working conditions and the painter will be held responsible for the results reasonably expected from the materials and processes specified.

F. Program the cleaning and painting so contaminants from the cleaning process will not fall onto wet, newly-painted surfaces.

G. **Do not sandblast or prepare more surface area in one (1) day than can be coated in one (1) day**. Prepare surfaces and apply coatings the same day.

H. Do not sandblast PVC, CPVC or FRP piping or equipment. Do not sandblast epoxy- or enamel-coated pipe that has already been factory coated, except to repair scratched or damaged coatings.

I. **The surface shall be cleaned as specified for the paint system being used**. All cleaning shall be as outlined in the Steel Structures Painting Council's (SSPC) Surface Preparation Specification unless otherwise noted. If surfaces are subject to contamination, other than mill scale or normal atmospheric rusting, the surfaces shall be pressure washed, and acid or caustic pH residues neutralized, in addition to the specified surface preparation.

J. Visual standards, SSPC-VIS-1, "Pictorial Surface Preparation Standards for Painting Steel Surfaces," and the National Association of Corrosion Engineers (NACE), "Blasting Cleaning Visual Standards" TM-01-70 and TM-01-75 shall be considered as standards for proper surface preparation.

K. Oil, grease, soil, dust, etc., deposited on the surface preparation that has been completed shall be removed prior to painting according to SSPC - SP1 Solvent Cleaning.

L. Weld flux, weld spatter and excessive rust scale shall be removed by Power Tool Cleaning as per SSPC - SP 11.

M. All weld seams, sharp protrusions, and edges shall be ground smooth prior to surface preparation or application of any coatings.

N. All areas requiring field welding shall be masked off prior to shop coating, unless waived by the Engineer.

O. All areas which require field touch-up after erection, such as welds, burn backs, and mechanically damaged areas, shall be cleaned by thorough Power Tool as specified in SSPC - SP11.

P. "Touch-up systems will be same as original specification except that approved manufacturer's organic zinc-rich shall be used in lieu of inorganic zinc where this system was originally used. Also, strict adherence to manufacturer's complete touch-up recommendations shall be followed. Any questions relative to compatibility of products shall be brought to the Engineer's attention; otherwise, the Contractor assumes full responsibility.

Q. Wherever the words “solvent cleaning”, “hand tool cleaning”, “wire brushing”, or “blast cleaning” or similar words are used in these specifications or in paint manufacturer’s specifications, they shall be understood to refer to the applicable SSPC (Steel Structures Painting Council, Surface Preparation Specifications, ANSI A159.1) specifications listed above.

R. When specified, the surface shall be pretreated in accordance with the specified treatment prior to application of the prime coat of paint.

S. Ferrous Metal Surfaces

1. Remove any oil or grease from surfaces to be coated with clean rags soaked in a solvent recommended by the coating manufacturer in accordance with SSPC specifications. Any chemical contamination shall be eliminated by means of neutralization or flushing or both prior to additional surface preparation. Clean rags shall be changed each 100 ft^2.

2. For immersion service, all sharp edges and welds shall be ground smooth to a rounder contour, all weld splatter shall be removed, and all pits and dents shall be filled, and all imperfections shall be corrected prior to sandblasting.

3. For non-immersion service, all sharp edges and welds shall be ground, all weld splatter shall be removed, all pits and dents shall be filled, and all imperfections shall be corrected prior to sandblasting.

4. For immersion service, all surfaces to be coated shall be sandblasted to white metal in accordance with Steel Structures Painting Council Specification SSPC - SP10 of the National Association of Corrosion Engineers Specification NACE 2. A white metal blast is defined as removing all rust, scale, paint, etc., to a clean white metal which has a uniform gray-white appearance. No streaks or stains or rust or any other contaminants are allowed. The proper abrasive to obtain the specified surface profile (anchor pattern) designated in the coating manufacturer's most recent printed application instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon as possible after the blasting preparation is finished and always before the surface starts to rust. No sandblasted surface shall stand overnight before coating.

5. For non-immersion service, or wherever specified in the coating manufacturer's most recent printed application instructions for other services, all surfaces to be coated shall be sandblasted to near white metal in accordance with Steel Structures Painting Council Specification SSPC - SP10 or the National Association of Corrosion Engineers Specification NACE 2. A near white metal blast is defined as removing all rust, scale, paint, etc., except for very light shadows, very slight streaks or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coatings that may remain. The proper abrasive to obtain the

specified surface profile (anchor pattern) designated in the coating manufacturer's most recent printed Application Instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon as possible after the blasting preparation is finished and always before the surface starts to rust. No sandblasted surface shall stand overnight before coating. (This is 95 percent of any given surface area blasted to white metal).

6. For non-immersion service surfaces to be coated shall be sandblasted where specified to a commercial sandblast in accordance with Steel Structures Painting Council Specification SSPC - SP 6 or National Association of Corrosion Engineers Specification NACE 3. A commercial sandblast is defined as removing all rust, scale, paint, etc., except for slight shadows, streaks or discolorations caused by rust stain, mill scale oxides or slight, tight residues of paint or coating that may remain, if the surface is pitted, slight residues or paint or rust, may be found in the bottom of pits. The proper abrasive to obtain the specified surface profile (anchor pattern) designated in the coating manufacturer's most recent printed Application Instructions shall be used. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon as possible after the blasting preparation is finished and always before the surface starts to rust. no sandblasted surface shall stand overnight before coating (this is b of any given surface area blasted to white metal).

7. Ferrous metal surfaces previously exposed to sulfides shall be sandblasted, flame cleaned, and sandblasted again in accordance with the recommended surface preparation for the particular service in question.

8. Where blast cleaning is done in the field, only "virgin" sand, grit, or abrasive will be used.

9. Inaccessible areas, such as behind tank rafters or skip-welded lap joints, or in between back-to-back angle iron bracing, shall be coated before assembly to prevent corrosive action from taking place in these inaccessible areas. All surface voids shall be sealed-welded and back-to-back bracing and tank rafters either coated before assembly or eliminated from the design and construction. Sharp corners and edges shall be ground to a smooth contour and welds prepared as described above.

T. Concrete Surfaces

1. All efflorescence, laitance, chalk, dust, dirt, oils, grease, concrete curing agents, form release agents, sealers, old coatings and other chemical contaminants shall be removed either by steam cleaning with detergent, by scrubbing with a hot trisodium phosphate solution consisting of two (2) pounds of trisodium phosphate to each gallon of hot water (160°F), or by high pressure water blasting (3,000 psi or higher). Multiple cleaning operations may be required to remove all

contaminants. Repeat the cleaning operation until the contamination is removed and flush the area with clean water to remove residual cleaning solution. Allow to dry thoroughly before coating.

2. **All concrete surfaces to be coated shall be clean and dry**. "Dry" is defined for new concrete as free of moisture and fully cured which is a minimum of 30 days at 75°F and fifty percent (50%) Relative Humidity or some equivalent cure time at other conditions (7 days minimum for stucco). The moisture content of the concrete shall be determined by using both of the following methods.

    a. The presence of moisture shall be checked by taping a one-foot square piece of 20 mil thick minimum plastic film on the surface. Pieces of test plastic film should be placed at various locations that are likely to be slow drying out, such as below grade, low spots in floors, inside corners and lower wall areas. The plastic film should be carefully sealed with tape to prevent the escape of any moisture or vapor that would be trapped behind the film. The film should be left in place over night or longer to allow sufficient time for moisture migration. After a minimum of sixteen (16) hours, remove and examine the backside for moisture condensation and inspect the concrete surface for darkened areas. The source of the moisture, if present, shall be located, and the cause corrected prior to coating.

    b. The presence of moisture shall also be determined with a moisture detection device such as a Delmhorst Model DLM2E, or equal. Moisture determined by this method shall be less than fourteen (14) percent moisture content before coating operations shall be allowed to proceed.

3. Do not use form oils incompatible with the coating, concrete curing agents, or concrete hardeners on concrete surfaces to be coated.

4. Old paint and unremoved tar stains shall be solvent cleaned with naphtha, trichloroethylene, or perchloroethylene. Proper safety precautions shall be observed if this step is necessary. The surface shall be flushed with fresh water and dried.

5. Concrete and/or cinder block walls to receive a coating shall be air-blasted with 100 psi clean, dry, oil-free air to remove dust, etc., and wire brushed to remove all loose and/or weak mortar. See the requirements for sumps, tanks and other water-bearing structures below.

6. Concrete floors shall be thoroughly swept clean and then acid etched. Acid etching consists of first dampening the entire surface with clean water (avoid and excess of water that will for puddles). Acid etch the damp floor with a 10 to 15 percent solution of hydrochloric (muriatic) or phosphoric acid. Allow the acid to stand on the floor until the bubbling stops. For best results, while the acid is bubbling scrub the floor with a stiff bristled brush. Do not allow the "spent" acid to dry on the floor.

Rinse the surface thoroughly with fresh water. If the surface does not appear as rough as medium grit sandpaper, repeat the above steps. Neutralize the surface with a five percent (5%) solution of soda ash, tri-sodium phosphate, or ammonium hydroxide in clean water. Let the solution stand for ten (10) minutes on the surface. Rinse thoroughly with water. The surface must be slightly alkaline (pH of 9.0) prior to coating.

7. The floors or concrete sumps, tanks or other water-bearing structures should be acid etched as described above or they may be sandblasted. The walls of concrete sumps and tanks must be sandblasted. Roughen the surface to a texture equivalent to that of medium grit sandpaper. Use a compressed air blast nozzle with oil-free air. The abrasive used should be dry silica sand with the maximum particle size that will pass through a sixteen (16) mesh screen and minimum particle size retained on a thirty (30) mesh screen. After the blast cleaning is completed, sand, dust and loose particles should be removed from the surface by vacuuming or blowing off with high pressure oil-free air. Examine the surface for texture and uniformity, as well as the removal of dust, efflorescence and laitance. Patch voids and cracks that will cause discontinuities in the coating or unsightly appearance using a patching compound compatible with the coating system.

U. Galvanized Steel and Non-Ferrous Metal

1. Galvanized steel and aluminum will only be coated when so specified.

2. Surfaces shall be clean and dry. Remove dust and dirt by blowing off the surface with high pressure air or wiping clean with dry rags. Oil, grease and protective mill coatings should be removed by solvent cleaning in accordance with SSPC-SP1.

3. White mst should be removed from galvanized steel or aluminum by hand or power brushing. Care should be taken not to damage or remove the galvanizing. Rust should be removed from old galvanized steel by Hand or Power Tool Cleaning in accordance with SSPC - SP2 or SSPC - SP11.

4. All surfaces shall be scarified by brush blasting for immersion service or hand sanding for non-immersion service.

5. Other surface preparation, as outlined in the coating manufacturer's latest written Application Instructions, shall be observed for more demanding exposures.

V. Stainless Steel

1. Stainless steel will only be coated when so specified, or when it is adjacent to areas to be coated such as piping supports, anchor bolts or flange bolts.

2. Stainless steel requires only solvent cleaning prior to coating using any one of the methods in SSPC - SP1. Only solvents and cleaning solutions containing less than

200 ppm of halogens should be used to prevent stress corrosion cracking.

3. Stainless steel may be whip-blasted to provide a surface profile to increase the mechanical bond of the coating system. The height of the profile and the texture required should be defined for the operator and as a standard for the acceptance of the work. Pictorial standards for the surface cleanliness of carbon steel are not applicable to stainless steel, since there are no corrosion products or mill scale to remove from the surface.

4. Abrasive blast cleaning procedures outlined by the Steel Structures Painting Council for carbon steel may also be used for stainless steel. Only very hard silica sand or other abrasive media should be used for a fast cutting action and to obtain a sharp angular profile.

W. PVC or Other Plastic Piping or Ductwork

1. Solvent clean.

2. If recommended by the manufacturer, lightly abrade surface with medium grade sandpaper. Remove dust by wiping with clean rags.

X. Previously-Painted Surfaces (Except Ferrous Metal, Non-immersion)

1. Careful examination of the old coating is necessary in order to determine the condition of the coating prior to recommending the degree of surface preparation that will be needed. The old coating shall be shaved with a knife to ascertain its present adhesion to the substrate, as well as the flexibility of the film. If the old coating has a tendency to powder or shatter easily under the knife, or disbonds freely from the substrate or underfilms, it would indicate total removal is necessary.

    a. When up to ten percent (10%) of the total area has failed, spot blasting back to at least one (1) inch into sound film, feathering of edges and spot priming is required.

    b. When the coating system has deteriorated to approximately twenty-five percent (25%) of the total area, or if the coating is brittle, eroded or underfilm rusting is present, completely remove the original coating system by sandblasting as specified.

2. Tank linings, immersion-service coatings, and some other types of high-performance coatings generally require total removal before recoating. Consult the manufacturer's recommendations for which of the other types of high-performance coatings require total removal.

3. In instances where the film has been eroded due to weathering or worn thin due to abrasion or impingement with no rusting, the surface contaminants may be removed

through high pressure water blasting (approximately 2,000 to 3,000 psi, over 4 gallons per minute) with emulsifying agents or cleaners, rinsed and dried. Roughening of the surface shall be used to improve the adhesion of subsequent coats. Recoat with the recommended finish coat(s).

3.5 Materials Preparation

A. Mix and prepare painting materials in strict accordance with the manufacturer's recommendations and directions, stirring materials before and during application to maintain a mixture of uniform density, free of film, dirt, and other foreign materials. Colors shall be thoroughly mixed with no streaks or separation of color.

B. Mechanical mixers, capable of thoroughly mixing the pigment and vehicle together, shall mix the paint prior to use where required by manufacturer's instructions; thorough hand mixing will be allowed for small amounts up to one (1) gallon.

C. Pressure pots shall be equipped with mechanical mixers to keep the pigment in suspension, when required by manufacturer's instructions. Otherwise, intermittent hand mixing shall be done to assure that no separation occurs.

D. All mixing shall be done in accordance with SSPC Vol. 1, Chapter 4, "Practical Aspects, Use and Application of Paints" and/or with manufacturer's recommendations.

E. Except where otherwise specified, thinning shall be done only if necessary for the workability of the coating material and then, only in accordance with the coating manufacturer's most recent printed application instructions. Use only the thinner provided by the coating manufacturer. If thinning is used, sufficient additional coats shall be applied to assure the required dry film thickness is achieved. The manufacturer's recommended thinner or cleanup solvent shall be used for all cleanup. Do not incorporate in the coating any thinners or solvents used for cleaning brushes or equipment.

F. Exercise care to keep fire hazards to a minimum. Provide an approved hand fire extinguisher near each paint storage and mixing area. No oily waste, rags, or painting equipment shall be left scattered throughout the premises.

G. Protect all adjacent areas against damage and leave storage and mixing areas clean at the completion of painting.

H. Application by brush, spray, airless spray or roller shall be as recommended by the manufacturer for optimum performance and appearance.

3.6 Application

A. Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather, unless otherwise allowed by the paint manufacturer.

1. Except as provided below or where the manufacturer allows, painting shall not be permitted when the atmospheric temperature is below 50°F, or when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or when it can be anticipated that these conditions will prevail during the drying period.

2. No exterior painting shall be done during inclement weather when relative humidity exceeds 85%, or under conditions identified by the manufacturer as unsuitable.

B. No coatings shall be applied unless surface temperature is a minimum of 5°F above the dew point; the temperature must be maintained during curing.

DEW POINT* CALCULATION CHART "Surface Temperature at which Condensation begins"											
RH	Ambient Air Temperature (°F)										
	20	30	40	50	60	70	80	90	100	110	120
90%	18	28	37	47	57	67	77	87	97	107	117
85%	17	26	36	45	55	65	76	84	95	103	113
80%	16	25	34	44	54	63	73	82	93	102	110
75%	15	24	33	42	52	62	71	80	91	100	108
70%	13	22	31	40	50	60	68	78	88	96	105
65%	12	20	29	38	47	57	66	76	85	93	103
60%	11	19	27	36	45	55	64	73	83	92	101
55%	9	17	25	34	43	53	61	70	80	89	98
50%	6	5	23	31	40	50	59	67	77	86	94
45%	4	13	21	29	37	47	56	64	73	82	91
40%	1	11	18	26	35	43	52	61	69	78	87
35%	-2	8	16	23	31	40	48	57	65	74	83
30%	-6	4	13	20	28	36	44	52	61	69	77

*Dew Point: Temperature at which moisture will condense on a surface. No coating shall be applied unless the surface temperature is a minimum of 5°F above this point. The temperature must be maintained during curing.

Example: If the air temperature is 70°F and the relative humidity is 65%, then the dew point is 57°F. No coating shall be applied unless the surface temperature is 62°F.

C. Paint all exposed surfaces in rooms scheduled for painting whether or not colors are designated in schedules, except where the natural finish of material is obviously intended and specifically noted as a surface not be painted. Where items orsurfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If the color of the finishes are not designated, the Engineer will select them from the standard colors available for the materials systems as specified.

D. Ventilation

1. Provide adequate ventilation for safe application and for proper drying of coatings on interior surfaces.

2. Ensure solvent vapors are released during and after application of coatings. Remove vapors by exhausting air from the lowest portions of tanks and enclosed spaces and keep tops open and clear.

3. During coating application in enclosed areas, the capacity of ventilating fans shall be at least 300 cfm per gallon of coating applied per hour.

4. Provide continuous forced ventilation at a rate of at least one complete air change per four (4) hours for at least five (5) days after the coating application is completed.

E. The average rate of application shall not exceed the theoretical rate of coverage recommended by the coating manufacturer for the type of surface involved, less an allowance for losses. Average dry film thickness shall not be less than thickness set forth under Painting Systems. Not more than 10-20% of points inspected may beless than 90% of the specified thickness. Deficiencies shall be corrected by application of additional coating.

F. Each coat shall be uniform in coverage and color. Successive coats shall perceptibly vary in color. Each coat shall be carefully examined and faulty material, poor workmanship, holidays, damaged areas and other imperfections shall be touched up prior to applying succeeding coats. Comply with coating manufacturers' recommendations for drying time between coats.

G. Bottoms, sides and edges of doors shall receive same finish as faces of doors. If refitting of wood doors is done prior to final acceptance, refinish at no extra cost.

H. Incidental niches, recesses, passages, closets, etc., shall be finished to match similar or adjacent spaces.

I. Access doors, panels, convectors, grilles and similar items shall be coated the same color as adjacent work, except for non-ferrous metal or where otherwise directed by the Engineer.

J. Primed hardware shall be coated to match adjacent work to which they are attached.

K. In the event that the finished surfaces are not acceptable, completely refinish entire unit areas and sections as necessary to eliminate visible laps or other indications of repairs.

L. Color Selection

1. Colors for Multi-Coat Systems

a. Each coat shall be applied in a different color or shade from the preceding coat to aid in determining the uniformity and coverage of the coating.

b. The finish coat color shall be selected by the Engineer and Owner.

c. When a white finish coat is specified, the last two (2) coats shall be white.

2. Color Coding Piping

a. All exposed piping shall be identified as specified in Section 09905, “Piping and Equipment Identification System”.

b. The pipe identification system shall include color coding or banding, legends, and arrows.

M. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship.

N. **Apply paint in accordance with the manufacturer's directions**. Use applicators and techniques best suited for the type of material being applied. All equipment shall be maintained in good working order and shall be comparable to that described in the coating manufacturer's most recent application instructions. It

shall be thoroughly cleaned and inspected daily. Worn spray nozzles, tips, etc., shall be replaced regularly. Effective oil and water separators shall be used and serviced on all air lines.

O. All paints and coating materials shall be stored under cover and at a temperature within 10°F of the anticipated application temperature and at least 5°F above the dew point.

P. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color, and appearance.

Q. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps, and brush marks. Edges of paint adjoining other colors or materials shall be sharp and true. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness. Allow each coat to dry thoroughly before applying the next coat, follow manufacturer's recommendations taking into account temperature and relative humidity as indicated in Article 3.06(B) of this specification section.

R. All interior surfaces of structures shall be finish coated prior to installation of equipment, conduit, and other exposed items by mechanical, electrical, or instrumentation.

1. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.

S. Finish exterior doors on tops, bottoms, and side edges the same as the exterior faces, unless otherwise indicated.

T. Sand lightly between each succeeding enamel or varnish coat.

U. Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise specified.

V. <u>Retouching Existing Painted Surfaces</u>

1. Existing painted surfaces damaged by the modification work or other operations of the Contractor shall be retouched to conform to the above coating systems and blend in with the new and existing work.

2. Damaged surfaces shall be repainted with not less that two (2) coats, and other existing surfaces that are listed shall be repainted with the coating system specified.

W. The prime and intermediate coats as specified for the various coating systems may be applied in the shop by the manufacturer. The shop coats shall be of the type specified and shall be compatible with the field coat or coats. Such items as pumps, motors, equipment, electrical panels, etc shall be given at

least one touch-up coat with the intermediate coat material and one complete finish coat in the field.

X . Field Painting in the immediate vicinity of, or on, energized electrical and rotating equipment, and equipment and/or pipes in service shall not be performed without the approval of the Engineer.

Y. Extreme care shall be exercised in the painting of all operable equipment, such as valves, electric motors, etc., so that the proper functioning of the equipment will not be affected.

Z. The Contractor's scaffolding shall be erected, maintained, and dismantled without damage to structures, machinery, equipment or pipe. Drop cloths shall be used where required to protect buildings and equipment. All surfaces required to be clear for visual observations shall be cleaned immediately after paint application.

AA. Painting shall not be performed on insulated pipe within three (3) feet of insulation operations or, on insulation whose covering and surface coat have not had time to set and dry. Painting shall not be performed on uninsulated pipe within one (1) foot of any type of connection until the connection has been made, except as directed by the Engineer.

BB. The prime coat shall be applied immediately following surface preparation and in no case later than the same working day. All paint shall be applied by brushing, paint mitt and roller, conventional spraying, or airless spraying, using equipment approved by the paint manufacturer.

CC. Each coat of paint shall be recoated as per manufacturer's instructions. Paint shall be considered recoatable when an additional coat can be applied without any detrimental film irregularities such as lifting or loss of adhesion.

DD. Surfaces that will be inaccessible after assembly shall receive either the full specified paint system or three shop coats of the specified primer before assembly.

EE. Finish colors shall be in accordance with the Painting and Color Schedule and shall be factory mixed (i.e., there shall be no tinting by the Contractor, unless authorized by the Engineer).

FF. All edges and weld seams in immersion service shall receive a "stripe coat" (applied by brush) of the first coat prior to application of the full first coat.

GG. All open seams in the roof area of tanks shall be filled after application of the topcoat with a flexible caulking such as Sika Flex 1A, or approved equal.

HH. <u>Unsatisfactory Application</u>

1. If the item has an improper finish, color or insufficient dry film thickness, the surface shall be cleaned and top coated with the specified material to obtain the specified color and coverage. Specific surface preparation information is to be secured from the coatings manufacturer.

2. All visible areas of chipped, peeled or abraded paint shall be hand or power- sanded, feathering the edges. The areas shall then be primed and finish coated in accordance with the specifications.

3. Work shall be free of runs, bridges, shiners, laps or other imperfections. Evidence of these conditions shall be cause for rejection.

4. Any defects in the coating system shall be repaired by the Contractor per written recommendations of the coating manufacturer.

5. Any repairs made on steel surfaces for immersion service shall be holiday detected in accordance with ASTM G-62 - Low Voltage Holiday Detection.

    a. Areas found to have holidays shall be marked and repaired in accordance with the paint manufacturer's instructions.

    b. The Engineer shall be notified of the holiday testing time so that he may be present during the testing.

3.7 Application Restrictions

A. Environmental Requirements

1. Comply with the manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.

    a. The conditions below shall be adhered to even if the manufacturer's recommendations are less stringent. If the manufacturer's recommendations are more stringent, they shall apply.

    b. No coatings shall be applied when the air, surface, and material temperature is below 55°F or above 95°F for 24 hours prior to and 24 hours after coating application. Surface temperature shall be at least 5°F above the dew point for 24 hours prior to and 24 hours after coating application. The dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Weather Bureau psychometric tables. Do not apply coatings when the relative humidity exceeds 85% percent or to damp or wet surfaces, unless otherwise permitted by the coating manufacturer's printed instructions. The Contractor is referred to Article 3.06(B) of this specification section for additional information.

    c. No painting shall be done when the surfaces may become damaged by rain, fog or condensation or when it is anticipated that these conditions will prevail

during the drying period, unless suitable enclosures to protect the surface are used. Provisions shall be made, at the Contractor's expense, to control atmospheric conditions artificially inside the enclosure, within the limits suitable for painting throughout the painting operations. Where heat is necessary, it shall be supplied by the painting applicator and shall be of such type that it will maintain an air and coated surface temperature of 55°F minimum prior to and after the coating application as described above, and 90°F minimum during the cure stage if hot air forced curing is recommended by the coating manufacturer for special coatings. Further, this heater shall be of such type as not to contaminate the surface area to be or being coated with combustion products. The Contractor shall supply utilities to run electric or gas heaters. Any surface coating damaged by moisture or rain shall be removed and redone as directed by the Engineer or Owner.

2. Do not apply finish in areas where dust is being or will be generated during application through full cure.

3. **All exterior painting shall be done only in dry weather.**

4. **Spray application shall occur only when wind velocities, including gusts, are less than ten (10) miles per hour. All materials, equipment, etc. in the vicinity of spray application shall be protected from overspray.**

B. Weather Conditions

1. Do not paint in the rain, wind, snow, mist and fog or when the steel or metal surface temperatures are less than 5°F above the dew point.

2. No coatings shall be applied unless the relative humidity is below 85%.

3. Do not paint when the temperature of the metal to be painted is above 120°F.

4. Do not apply alkyd, chlorinated rubber, inorganic zinc, silicone aluminum, or silicone acrylic paints if the air or surface temperature is below 40°F or expected to be below 40°F within twenty-four (24) hours.

5. Do not apply epoxy, acrylic latex, and polyurethane paints on an exterior or interior surface if the air or surface temperature is below 60°F or is expected to drop below 55°F within twenty-four (24) hours.

C. Application of materials shall be done only on properly prepared surfaces as herein specified. Between any two (2) coats of material, unless specifically cover in the coating manufacturer's most recent printed application instructions, if more than one (1) week passes between subsequent coats, the coating manufacturer will be contacted for his recommended preparation of the surface **prior** to application of the next coat. This preparation might include brush-off blasting, steam cleaning, or solvent wiping (with an indicated solvent) and shall be specified in writing by the material supplier and followed by the applicator. Any surface coating damaged by

moisture or rain shall be removed and redone as directed by the Engineer or Owner.

D. **In no case shall paint be applied to surfaces which show a moisture content greater that fourteen percent (14%)**. The presence of moisture shall be determined prior to coating by testing with a moisture detection device such as a Delmhorst Model DLM2E, or equal.

3.8 Minimum Coating Thickness

A. Coating thickness shall meet or exceed the specified minimum dry film thickness (DFT) in all areas. The average coating thickness as determined by multiple representative DFT measurements shall meet or exceed the mid-point of DFT range. If below this DFT value, the surface shall be recoated with at least the minimum DFT until the total DFT meets or exceeds the mid-point DFT.

B. Coverage rates are theoretical as calculated by the coating manufacturer and are, therefore, the maximum allowable.

C. Apply a prime coat to material which is required to be painted or finished, and which has not been prime coated by others.

D. On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, is shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

E. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

3 9 Finishes

A. Pigmented (Opaque) Finishes

1. Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

B. Complete Work

1. Match approved samples for color, texture, and coverage.

2. Remove, refinish, or repaint work not in compliance with specific requirements.

3.10 Workmanship

A. The Contractor must show proof that all employees associated with this project shall have been employed by the Contractor for a period of not less than six (6) months.

B. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship.

C. Painting shall be performed by experienced painters in accordance with the recommendations of the paint manufacturer. All paint shall be uniformly applied without sags, runs, spots, or other blemishes. Work which shows carelessness, lack of skill, or is defective in the opinion of the Engineer, shall be corrected at the expense of the Contractor.

D. The Contractor shall provide the names of at least six (6) other projects of similar size and scope that they have successfully completed under their current company name.

3.11 Field Quality Control

A. All non-ferrous surfaces shall be checked for the number of coats and thickness by use of a Tooke gauge, or equal.

B. **All ferrous surfaces shall be checked for film thickness** by use of an Elcometer or Micro-Test magnetic dry film gauge, or equal, properly calibrated.

C. In addition, submerged tank linings and metals shall be tested for freedom from holidays and pinholes by use of a Tinker-Rasor, K-D Bird Dog Holiday Detector, or equal.

3.12 Protection

A. **All other surfaces shall be protected while painting**.

B. Protection of furniture and other movable objects, equipment, fittings, and accessories shall be provided throughout the painting operation. Remove all electric plates, surface hardware, etc., before painting; protect and replace when completed.

C. **Mask all machinery nameplates and all machined parts not to receive paint**. Lay drop cloths in all area where painting is being done to adequately protect flooring and other work from all damage.

3.13 Cleaning

A . The Contractor shall perform the work under this Section while keeping the premises free from accumulation of dust, debris, and rubbish and shall remove all scaffolding, paint cloths, paint, empty paint containers, and brushes from buildings and the project site when completed.

B. All paint brushed, splattered, spilled, or splashed on any surface not specified to be painted shall be removed.

C. **The Contractor shall insure that all glass throughout that portion of the facility in which he worked is cleaned of dirt and paint before he leaves the job site**. Further, the Contractor shall insure that all glass in this area is thoroughly washed and polished.

D. All cloths and waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, all staging, scaffolding and containers shall be removed from the Project Site and/or destroyed in an approved and legal manner.

E. Upon completion of the Project, remove from the premises all rubbish and accumulated material and leave the work in a neat and clean condition, acceptable to the Engineer and Owner.

3.14 Extra Stock

A. Upon completion of painting work, the Owner shall be furnished, at no additional cost, unopened containers providing **a minimum of two (2) gallons of each type and color of finish paint for touching up**.

B. Multi-component coatings shall have each component supplied in separate containers boxed together. Paint container labels shall be complete with manufacturer's name, generic type, number, color, and location where used.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 09901
COATINGS AND LININGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This specification pertains to the specialty coating and lining of manholes and lift station wet wells and valve vaults. As well as the coating of above ground assets including but not limited to: steel, ductile iron pipe, ductile iron fittings, valves, hydrants, hardware and all appurtenances. Brass, bronze and 316 Stainless Steel shall not be coated.

B. Precast concrete rehabilitation and new structures: The Work shall include the furnishing and installation of an interior protective lining/coating corrosion protection system including all necessary materials, equipment and tools as required for a complete installation in accordance with the manufacturers recommendations. The completed system shall provide a waterproof, corrosion protection system to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.

1.02 QUALITY ASSURANCE

A. All work shall be proved to be in first class condition and constructed in accordance with the Drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor at no expense to the City.

B. Fiberglass liner manufacturers shall certify that the liner has been manufactured, sampled, tested, and inspected in accordance with ASTM D 3753.

C. Polyethylene liner manufacturers shall certify that the liner has been designed and manufactured in accordance with ASTM F 1759 and these specifications.

D. Holiday Testing: Each coat shall be holiday tested at the recommended 100-125 volts DC per mil in accordance with the latest edition of the following standards: NACE SP0188-2006, NACE Standard RP0490, ASTM G62

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the City for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

1.04 COVERAGE

A. The protective lining/coating corrosion protection shall cover all concrete surfaces within the wetwell or manhole including the adjustment ring area.

B. Coatings and lining surfaces shall be holiday free and all defects shall be repaired in accordance with the manufacturer's recommendations prior to the next coat being applied.

1.05 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   1. ASTM C1244: Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
   2. ASTM D3299: Filament-Wound Glass-Fiber Reinforced Thermoset Resin Corrosion-Resistant Tanks
   3. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
   4. ASTM D3753: Glass-Fiber-Reinforced Polyester Manholes and Wetwells
   5. ASTM D6365: Nondestructive Testing of Geomembrane Seams using the Spark Test.
   6. ASTM F1759: Design of High-Density Polyethylene (HDPE) Manholes for Sub-surface Applications
   7. ASTM F1869: Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
   8. ASTM G62: Standard Test Methods for Holiday Detection in Pipeline Coatings.

B. NACE INTERNATIONAL (Formerly The National Association of Corrosion Engineers)
   1. NACE SP0188-2006 (formerly RP0188): Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
   2. NACE Standard SP0490-2007 (formerly RP0490): Holiday Detection of Fusion-Bonded Epoxy External Pipeline Coating of 250 to 760 μm (10 to 30-mils).
   3. NACE Standard SP0178-2007 (formerly RP0178): Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix B "List of Approved Products" appended to these technical specifications.

2.02 HDPE LINERS

A. The Work shall include the furnishing and installation of an interior protective liner system including all necessary labor, materials, equipment and tools as required for a complete installation. Liner shall be high-density polyethylene (HDPE). This liner shall provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.

B. Manhole HDPE Liner shall have a minimum thickness of 2-mm (78-mil) and wetwell HDPE shall have a minimum thickness of 5-mm (195-mil). All HDPE liner sheets shall be extruded with a large number of anchoring studs, a minimum of (420/m^2, 39/ft^2), manufactured during the extrusion process in 1-piece with the sheet so there is no welding and no mechanical finishing work to attach the studs to the sheet. The liner shall have a pull out of 112.5-lbs/anchoring stud. A manufacturer certified fabricator shall custom fit the liner to the formwork in order to protect the concrete surfaces from sewer gases.

C. All welding shall be performed in accordance with the published directives and procedures of the manufacturer and by welders certified by the manufacturer and documentation shall be provided to the City prior to the Work. Completion of welding will provide a 1-piece monolithic HDPE protective liner system that will provide excellent resistance to hydrogen sulfide attack and will not pull off the wall in the event that infiltration occurs. Flat liner sheet, not anchored, used for overlapping joints, shall have a minimum thickness of 3-mm for manholes or 5-mm for wetwells and shall contain a co-extruded bottom surface layer of conductive polyethylene. Conductive cap strip material shall have a free path from the back side of the sheet to a portion of the concrete surface.

D. Field welding of the liner at the riser joints shall be completed only after vacuum testing (ASTM C1244) of the new structure has been completed and any concrete joint deficiencies have been rectified. Vacuum testing is not required on rehabilitation of existing structures.

E. Testing and supervision of the installation and welding shall be performed by qualified staff only and must be checked when completed by visually checking and by Spark Testing all welded joints per ASTM D6365. Holiday testing 20,000 to 35,000 volts. All high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor model AP/W Holiday Detector or equal.

F. Penetrations (Forcemain, conduit, etc) shall have an internal boot comprising of minimum of 3/8-inch 316SS band clamp compressing a 2-inch wide neoprene with full circumferential welded boot around each penetration in accordance with the manufacturer’s details.

2.03 PREFORMED POLYPROPYLENE (PP) LINERS

A. The Work shall include the furnishing and installation of an interior protective liner system including all necessary labor, materials, equipment and tools as required for a complete installation. This liner shall provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.

B. All joints shall be field welded by hot air extrusion welding with PP welding bead. Field welding of the PP liner at the riser joints shall be completed only after vacuum testing (ASTM C1244) of the new structure has been completed and any concrete joint deficiencies have been rectified. Vacuum testing is not required on rehabilitation of existing structures.

C. Testing and supervision of the installation and welding shall be performed by qualified staff only and must be checked when completed by visually checking and by Spark Testing all welded joints per ASTM D6365. Holiday testing 20,000 to 35,000 volts. All high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor model AP/W Holiday Detector or equal.

D. Penetrations (Forcemain, conduit, etc) shall be gasketed PP pipe bell connectors or PP sleeves for boot type connectors and shall be attached to the PP liner by hot air extrusion welding with PP welding bead in accordance with the manufacturer’s details.

2.04 FIBERGLASS LINERS

A. General: Fiberglass reinforced polyester wetwell and manhole liners shall be manufactured from commercial grade polyester resin or other vinyl ester resin with fiberglass reinforcements. The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid, as well as other gases associated with the wastewater collection systems. Fiberglass products shall be manufactured in accordance with National Bureau of Standards, Voluntary Product Standard PS 1569 and ASTM D-3753. All inserts and sleeves for piping shall be in accordance with the liner manufacturer's recommendations and shall result in complete coverage of all pre-cast sections and be capable of passing a spark test. The manufacturer shall have a minimum of 5-years experience in manufacturing products which meet the specified standards and shall provide 3 references to verify the qualifications of the manufacturer.

B. Materials: Resins shall be a commercial grade unsaturated polyester resin. Reinforcing materials shall be commercial grade "E" type glass in the form of mat, chopped roving, continuous roving, roving fabric or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and resin. All materials including resins, glass reinforcement, fillers and additives shall be chemically resistant to hydrogen sulfide gas and the sanitary sewer environment. The combined thickness of the inner surface and the interior layer shall not be less than 0.10-inch. Seams shall be sealed

at the factory with the same glass-resin jointing process.

C. Fabrication: The exterior surface shall be relatively smooth with no sharp projections and no exposed fibers. The exterior surface shall have a gray Gel-coat coating. The interior surface shall be resin rich with no exposed fibers and shall be free of crazing, de-laminations, blisters larger than 1/2-inch diameter, wrinkles of 1/8-inch or greater in depth, resin runs, dry areas, sharp projections, or surface pits greater than 6 per square foot if they are less than 3/4-inch diameter and less than 1/16-inch deep. The exterior surface shall be free of blisters larger than ½-inch in diameter. To provide UV protection, the exterior surface shall have a factory applied gray pigment for a minimum thickness of 0.125-inches.

D. Physical Properties: The fiberglass reinforced wetwell and manhole liner shall be designed for H-20 wheel loading and tested in accordance with ASTM D 3753 8.5 (note 1). The fiberglass reinforced wetwell liner and manholes shall meet the following physical requirements:

	Hoop Direction	Axial Direction
Tensile Strength (psi)	18,000	5,000
Tensile Modulus (psi)	0.6×10^6 for MH's 0.8×10^6 for Wetwell's	0.7×10^6
Flexural Strength (psi)	26,000	4,500
Flexural Modulus (psi)	1.4×10^6	0.7×10^6
Compressive MH's(psi)	18,000	12,000

E. Chemical Resistance: When tested in accordance with ASTM D3753 8.7 the log of percent retention of each property after immersion testing when platted against the log of immersion time and extrapolated to 100,000-hours shall assure retention of at least 50% of the initial properties.

F. FRP liner shall be 1-piece with no vertical or horizontal seams allowed. The FRP shall be fabricated in accordance with NBS PS 15-69, and shall consist of commercial grade polyester resin, UV inhibitor, chopped strand, woven roving, and continuous reinforcement. Minimum liner thickness shall be 1/2-inch for all diameter wells, and shall not have external ribs. Liner size shall be field verified by liner manufacturer's representative. Tolerance of the inside diameter shall be +/- 1% of the required liner diameter.

G. Testing: All tests shall be performed as specified in ASTM D3753 latest edition, Section 8, test method D-790 (note 5) and test method D695. Each completed liner shall be examined for dimensional requirements, hardness and workmanship. All required ASTM D3753 testing shall be completed and records of all testing provided to the City. As a basis of acceptance, the manufacturer shall provide an independent certification which shall consist of a copy of the manufacturer's test report, and be accompanied by a copy of the test results that the liner has been sampled, tested and inspected in accordance with the provisions of this specification and meets all its requirements. The independent certification and manufacturer's test report shall be provided to the City prior to delivery of the Liner.

H. Fiberglass Reinforced Top: The fiberglass manhole liner top shall be fabricated using fiberglass material as above. Material and installation to meet all physical requirements as above. Top to be attached to wetwell liner pipe with fiberglass layup to comply with ASTM D3299. When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to the inside of the liner top and shall comply with ASTM D3299. 4,000-psi concrete shall be poured around the entire manhole fiberglass cone section. Lift station top slabs shall be re-poured with HDPE interior liner. Contractor shall ensure an airtight connect between the Pump Station HDPE lined top slab and interior wetwell liner.

I. Non-Shrink Grout: Non-shrink grout used in the bench area of manholes and fillet areas of wetwells, or on pipe penetrations shall be 100% calcium aluminate, un-thinned and un-altered, as manufactured by Sewpercoat, Strong-Seal, or an approved equal.

J. Miscellaneous Materials: Additional items of construction necessary for the complete installation of the fiberglass liner shall conform to specific details on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these Specifications.

2.05 FERROUS METAL SURFACES (INCLUSIVE OF STEEL AND DIP, HYDRANTS, FITTINGS AND APPURTENANCES)

Cleaning, surface preparation, coating application, and thickness shall be as specified herein and shall meet or exceed the coating manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations. All cleaning, surface preparation, coating application, thickness, testing, and coating materials (where available) shall be in accordance with the referenced standards of AWWA, ANSI, NACE, SSPC, NSF, and ASTM. Color-coding shall be Safety Blue, Safety Green and Pantone Purple 522-C for water, wastewater and reclaimed water respectfully. Surfaces shall be holiday detected in accordance with ASTM G 62. Areas found to have holidays shall be marked and repaired in accordance with the paint manufacturer's instructions. The City shall be notified of time of testing so that he might be present to witness testing.

A. Procedures for Coating Exterior of DIP, Hydrants, Fittings and Appurtenances
   1. Surface Preparation: Do not abrasive blast or prepare more surface area than can be coated in the same day; prepare surfaces and apply prime coatings within an 8-hour period.
      a. Steel: Shall require NACE-1/SSPC-SP5 White Metal Blast Cleaning minimum angular anchor profile of 1.5-mils. White metal blast cleaning removes all of the coating, mill scale, rust, oxides, staining, corrosion products, and other foreign matter from the surface.
      b. DIP: DIP with asphaltic seal coat, Hydrants, FBE (Valves and appurtenances), Shall require NACE-3/SSPC-SP6 Commercial Blast Cleaning minimum angular anchor profile of 1.5-mils. Commercial blast cleaning removes all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other

foreign matter from all surfaces and allows stains to remain on 33% (percent) of each unit area of surface.

c. Note: Primer Option - Hydrants, FBE (Valves and appurtenances), existing factory coatings: Where specifically called out in the Coating System Table below, NACE-4/SSPC-SP7 may be substituted for the commercial blast for hydrants and factory applied FBE (Valves and appurtenances) where the coating manufacturer has specifically provided compatible coatings with existing coatings including urethane, epoxy, alkyd and water-based coatings. Under no circumstances shall DIP with asphaltic seal coat be over-coated. NACE-4/SSPC-SP7 Brush-Off Blast Cleaning shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Tightly adherent mill scale, rust, and coating may remain on the surface. Mill scale, rust, and coating are considered tightly adherent if they cannot be removed by lifting with a dull putty knife after abrasive blast cleaning has been performed.

2. Contaminants: Remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating in accordance with SSPC-SP1 for the substrate and between each coating layer.
3. Temperature: Surface temperature of substrate shall be a minimum of 5°F above the dew point and rising and generally between 40°F to 100°F. Temperatures shall not exceed manufacturer's recommendations.
4. Stripping: Edges, corners, crevices, welds, and bolts shall be given a brush coat/stripe coat for each material/layer. The stripe coat shall be applied by a brush and worked in both directions.
5. Coatings Systems: Two (2) options for coating systems are provided. Each coat shall be a distinctive color or shade to verify each coating in the system.
6. Prime coat: DIP, DIP with asphaltic seal coat, Hydrants, FBE (Valves and appurtenances) prime coat shall be zinc-rich. Zinc-rich shall only be used on bare metal. Factory applied FBE/Asphaltic/Mastic coatings on valves and appurtenances shall be completely removed per NACE 3 / SSPC-SP6.
7. Note: Where specifically called out in the Coating System Table for factory applied FBE (Valves and appurtenances) surface preparation may be NACE-4/SSPC-SP7 and the prime coat shall be an Inorganic water based epoxy. Asphaltic seal coats and mastics shall not be overcoated with Inorganic water based epoxy.
8. Intermediate coat: Varies per coating system.
9. Final Coat: Varies per coating system.
10. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-125 volts DC per mil in accordance with the latest edition of the following standards: NACE SP0188-2006, NACE Standard RP0490, ASTM G62 and per the manufacturers recommendations. All low voltage holiday testing shall be performed using a Tinker & Rasor model M-1 Holiday Detector or equal.
11. Coating Systems: Either System 1 or System 2 shall be used for above ground, non-immersion ferrous metal surfaces (Inclusive of Steel, DIP, Hydrants, Fittings and Appurtenances).

Color Codes

Generic Name	Application	Tnemec	Carboline	PPG / Ameron
Safety Blue	Water Master Meters	True Blue / Safety 11SF	9122	BL Safety Blue
Safety Green	Pump Station Piping	Hunter Green 08SF	V358	GN Safety Green
Pantone Purple 522C	Reclaimed Master Meters	Purple Rain / Safety 14 SF	7528	PL Safety Purple
Safety Green	Hydrant Bonnet & Caps	Hunter Green 08SF	V358	GN Safety Green
Safety Orange	Hydrant Bonnet & Caps	Tangerine Orange / Safety 04 SF	1420	OR 2Safety Orange
Safety Red	Hydrant Bonnet & Caps	Candy Apple Red / Safety 06SF	7573	RD 2 Safety Red
Safety Silver	Hydrant Barrel	Aluminum 57GR	J766	SL Safety Silver

System 1 - Zinc / Urethane / Fluoropolymer

Description	Generic Coating Name	Tnemec	DFT mils	Carboline	DFT mils
Prime Coat all materials. Surface Prep NACE 1 or NACE 3	Zinc-Rich	Zinc Series 90-97	2.5 - 3.5	Carbozinc 621	3.0 - 8.0
Prime Coat - option for FBE or Hydrants only. Surface Prep NACE 4	Inorganic water based epoxy – overcoat existing coatings	Typoxy Series 27WB	4.0 - 14.0	NA	NA
Intermediate Coat.	Aliphatic Acrylic Polyurethane	Endura-Shield Series 73	2.0 - 3.0	Carbothane 133 HB	3.0 - 5.0
Final Coat.	Advanced Thermoset Fluoropolymer Polyurethane	Hydroflon Series 700	2.0 - 3.0	Carboxane 950	2.0-3.0

System 2 - Zinc / Epoxy / Urethane

Description	Generic Coating Name	Tnemec	DFT mils	Carboline	DFT mils	PPG / Ameron	DFT mils
Prime Coat all materials. Surface Prep NACE 1 or NACE 3	Aromatic Urethane, Zinc-Rich	Zinc Series 90-97	2.5 - 3.5	Carbozinc 621	3.0 - 8.0	Amercoat 68HS	3
Prime Coat option for FBE, Hydrants. Surface Prep NACE 4	Inorganic water based epoxy – overcoat existing coatings	Typoxy Series 27WB	4.0 - 14.0	NA	NA	NA	NA
Intermediate Coat.	Polyamidoamine Epoxy	Color Hi-Build Epoxoline II Series N69	4.0 - 10.0	Carboguard 60	4.0 - 6.0	Amerlock 2/400	4.0 - 6.0
Final Coat.	Aliphatic Acrylic Polyurethane	Endura-Shield Series 73	2.0 - 3.0	Carboxane 950	2.0 - 3.0	Amercoat 450H	2.0 - 3.0

2.06 SPECIALTY COATINGS

A. The Specialty Coatings are for rehabilitation of existing precast concrete manholes and existing valve vaults. New precast structures shall be lined only. All specialty coatings applicators shall follow the procedure as outlined below:

1. Pre-Inspection: Applicator shall take appropriate action to comply with all local, state and federal regulations including those set forth by OSHA, EPA, the City and any other applicable authorities. Prior to conducting any work, perform inspection of structure to determine need for protection against hazardous gases or oxygen-depleted atmosphere and the need for flow control or flow diversion.
2. Bypass plan: Bypass plan for flow control or bypass shall be submitted to the City for approval prior to conducting the work. Any active flows shall be dammed, plugged, or diverted as required to ensure all liquids are maintained below or away from the surfaces to be coated until final applications are cured as recommended by the corrosion protection system manufacturer.
3. Surface Preparation: NACE 6/SSPC-SP13 "Surface Preparation of Concrete." Dry abrasive blasting, wet abrasive blasting, vacuum-assisted abrasive blasting, and centrifugal shot blasting, high pressure water cleaning (5,000 to 10,000-psig), water jetting (10,000 to 30,000-psig) or combination of methods to remove deteriorated concrete, brick or mortar, laitance, hard contaminants, existing coatings, localized micro-organisms and gas contaminants from the concrete walls, floor, ceiling, and other concrete surfaces and shall display a surface profile suitable for application of the system. Minimum surface profile shall be ICRI CSP-5 or greater. Containment shall be provided to capture spent abrasive material and deteriorated concrete for removal by the Contractor.
4. Substrate Inspection: After completion of surface preparation, the Contractor shall inspect for: Leaks, Cracks, Holes, Exposed Rebar, Ring and Cover Condition, Invert Condition, Inlet and Outlet Pipe Condition. After the defects in the structure have been identified, repair with a manufacturer approved underlayment or material to assure proper rehabilitation of the surface defect and compatibility with the specialty coating system product to be applied. Repairs to exposed rebar, defective pipe penetrations or inverts, shall be recommended by the specialty coating manufacturer and approved by the City prior to proceeding with the repair. Final preparation and cleaning of repaired surfaces is required prior to application of the coating and shall comply with the corrosion protection system manufacturer's recommendations.
5. Manufacturer's certification: Applicators, installers, welders and application equipment shall be certified by the manufacturer of the corrosion protection system and documentation shall be provided to the City prior to the work.
6. Area to be coated: All exposed concrete of the entire interior surface of precast structure including but not limited to benching, pipe penetrations, walls, bottom of top slab, chimney, etc. Flow channel inverts are not necessary to coat. Corrosion protection system shall interface with adjoining construction materials/components throughout the manhole structure to effectively seal and protect substrates from attack by corrosive elements and to ensure the effective elimination of infiltration into the sewer system.

7. Application: Application of specialty coating system shall be in strict accordance with manufacturer's recommendation. Specified surfaces should be shielded to avoid exposure of direct sunlight, other intense heat source or, where cementitious products are employed, excessive ventilation. Where varying surface temperatures do exist, coating installation should be scheduled when the temperature is falling versus rising. Verification of the corrosion protection system thickness shall be verified during application via wet gauge methods or following cure of the system using appropriate non-destructive or destructive methods.
8. Holiday Testing: Cure time shall be in accordance with the Manufacturers product data sheet. Final concrete structure corrosion protection system shall be completely free of holidays, pinholes or voids. High voltage Holiday testing shall be required and holidays marked and repaired with same material and to same thickness as required of original installation. All high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor model AP/W Holiday Detector or equal and at 100-125 volts DC per mil or per the manufacturers recommendations.
9. Destructive Testing: Destructive testing may be performed as directed by the City to verify coating adhesion and coating DFT. Repairs to areas tested by destructive means shall be repaired by the certified applicator at the Contractor's expense.
10. Reporting: Provide final written report to the City detailing the location, date of report, description of repair or original installation and manufacturer data and cut sheets of the corrosion protection system and applicable testing results as per sections 7, 8 and 9.
11. Warranty: The report shall contain a copy of the warranty.

B. System SC-1: Sauereisen Sewergard 210 (Trowelable), 210FS (Trowelable Fast Set), 210S (Sprayable) or 210RS (Rotary Spray) shall be applied and then shall be finished with a coat of Sauereisen Sewergard Glaze 210G. The lining system to be utilized shall be an epoxy mortar or aggregate filled epoxy. Material furnished under this specification shall be a pre-packaged from the manufacturer. Materials shall be trowel applied or sprayed and shall conform to the Manufactures product data sheet as supplied by the manufacturer.
    1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be thoroughly vacuumed to remove all sand and debris and surface shall be dry prior to application.
    2. Surfacer for Rehabilitation/repair: Substrate in requiring repairs in excess of 1/8-inch shall be repaired with Sauereisen Underlayment No F-120, F-121 or F-209 Filler prior to application of protective lining/coating corrosion protection system.
    3. Thickness:
        a. Sewergard 210 / 210FS / 210RS: The material shall be applied in 1 or more layers for a total thickness of minimum of 125-mils DFT (1/8-inch). After application, the material shall be damp rolled with excess water shaken off prior to back rolling.
        b. Sprayable 210S: The material shall be applied in 1 or more layers for a total thickness of minimum of 60-mils shall be required for the Spray applied 210S.
    4. Finishing Glaze: After application, and curing of either the 210, 210FS, 210RS or 210S, the material shall be coated with a minimum of 20-mils of Sauereisen Sewergard Glaze 210G by roller or spray application in accordance with the manufacturers recommendations.

5. Holiday Testing: The protective lining/coating protection system shall be cured in accordance with the manufacturer's recommendations prior to holiday testing at a minimum of 14,500 volts.

C. System SC-2: Tnemec Perma-Shield Coating System.
   1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be thoroughly vacuumed to remove all sand and debris and surface shall be dry prior to application and surface shall be minimum 5°F above the dew point. Moisture content not to exceed 3-pounds per 1,000 square feet in a 24-hour period verify dryness using a "plastic film tape-down test" ASTM D4263 and perform Anhydrous Calcium Chloride ASTM F1869.
   2. Surfacer for Rehabilitation/repair: Substrate in requiring repairs in excess of 1/8-inch shall be repaired Series 217 or 218 Filler prior to application of protective lining/coating corrosion protection system. Concrete surface shall be pre-wet or dampened with potable water prior to surfacer application.
   3. Thickness: Lining Series 434: The material shall be applied in 1 or more layers for a total thickness of minimum of 125-mils DFT (1/8-inch).
   4. Finishing Glaze: After application, and curing, the material shall be coated with 15-20-mils of Series 435 in accordance with the manufacturer's recommendations.
   5. Holiday Testing: The protective lining/coating protection system shall be cured in accordance with the manufacturer's recommendations prior to holiday testing at a minimum 14,500 volts.

D. System SC-3: Sewercoat (PG and 2000 HS) Calcium aluminate mortar: The lining system to be utilized shall be 100% calcium aluminate cement with 100% calcium aluminate aggregate. Materials shall be spray applied by either a wet gunning (low-pressure spray) or dry gunning (shotcrete) method and shall conform to the manufacturer's product data sheet as supplied by the manufacturer. The equipment shall be clean and free of any hydrated or un-hydrated Portland Cement.
   1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be fully saturated with water prior to application.
   2. Thickness: The material shall be applied in 1 or more layers to such total thickness as required. A minimum of 1-inch shall be applied.
   3. Finishing: After spraying, the material shall be brushed or trowel finished.
   4. Curing: Curing by appropriate methods (curing compound, water mist, etc.) should be implemented as the surface begins to harden and dry (as early as 1-hour after application).

E. System SC-4: Raven 405: System shall be 100% solids epoxy. Thinning with solvents shall not be permitted. Surface preparation, mixing, pot life, ambient conditions, application, film thickness per coat, cure time, and recoat time shall be in accordance the manufacturer's recommendations.
   1. Applicator/installer shall be certified by the Manufacturer.
   2. Surfacer/Repair: Raven 710, 705CA or Raven 700 shall be spray applied or trowelled to repair/fill minor surface defects or applied as an underlayment.

3. Primer: Concrete exhibiting a moisture vapor emission rate greater than 3-lbs/1,000 square feet/24-hours, when tested according to ASTM F1869, shall be primed with Raven 155. Raven 155 primer (2 component waterborne epoxy) shall be applied at a maximum of 8-mil WFT (3-mil DFT). Recoat window minimum 2-4-hours at 72°F with maximum 72-hours at 72°F.
4. Top Coat: Raven 405 shall be applied with an approved plural component airless spray system. Coating thickness shall be in relation to the profile of the surface to be coated as recommended by the coating product manufacturer. In all cases the coating shall be applied with minimum of 2 coats applied at 40-80-mils WFT/DFT each for minimum final film thickness at 125-mils DFT. Subsequent top coating or additional coats of the coating product(s) shall occur within the product's recoat window: minimum cure to a tacky state; maximum cure of 18-hrs at 72ºF substrate temperature. Additional surface preparation procedures will be required if this recoat window is exceeded including inspection for and removal of amine blush and/or other potential contaminants.
5. Holiday Testing: The protective lining/coating protection system shall be cured in accordance with the manufacturer's recommendations prior to holiday testing at a minimum of 12,500 volts.

F. SC-5: Spectrashield Multicomponent Liner System. Spectrashield multi-component stress panel liner system composed of moisture barrier (modified polymer), surfaces (polyurethane/polymeric blend foam) and final barrier coat (modified polymer). The system is applied in three-steps and the applicator/installer shall be certified by the Manufacturer.
1. Application
   a. Moisture barrier: Silicone Modified Polyurea Minimum 40-mils DFT
   b. Surfacer: Polyurethane/Polymeric blend foam
   c. Final corrosion barrier: Silicone Modified Polyurea Minimum 60-mils DFT
2. Film Thickness: Final installation shall be a minimum of 500-mils. A permanent identification and date of work performed shall be affixed to the structure in a readily visible location.
3. Holiday Testing: The protective lining/coating protection system shall be cured in accordance with the manufacturer's recommendations prior to holiday testing at a minimum of 50,000 volts.

PART 3 - EXECUTION

3.01 QUALITY ASSURANCE

A. All materials shall be delivered to the job in original sealed and labeled containers of the coating manufacturer, and shall be subject to inspection by the City. Labels shall show name of manufacturer, type of coating, formulation, date, color and manufacturers recommendations. Coatings manufacturer date shall not exceed the manufacturer's recommendations for storage and useful life and Coatings manufactured in excess of 1-year prior to application shall be rejected.

B. Oil and grease shall be completely removed in accordance with SSPC-SP1 before beginning any other surface preparation method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter.

C. All components of equipment that can be properly prepared and coated after installation shall be installed prior to surface preparation. Components that will be inaccessible after installation shall have the surfaces prepared and coated before installation.

D. All ferrous metal surfaces shall be free of all defects and have all sharp edges, welds, slag, defects and weld splatter ground smooth in accordance with NACE Standard RPO178.

E. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) for each coating. The stripe coat shall be applied by a brush and worked in both directions. Special attention shall be given to filling all crevices with coating.

F. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be carefully examined and faulty material, poor workmanship, holidays, damaged areas and other imperfections shall be touched up prior to applying succeeding coats. Each coat shall be thoroughly dry and hard before the next coat is applied in accordance with the coating manufacturer's recommendations for drying time between coats. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer. Each coat shall be uniform in coverage and color. Successive coats shall perceptibly vary in color.

G. Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to holidays, sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination.

H. Surfaces not required to be coated: Brass, Bronze, Stainless steel (Not including SS bolts and nuts)

3.02 INSPECTION FOR ACCEPTANCE

A. The quality of materials, the process of manufacture and the finished sections shall be subject to inspection and approval by the City. Such inspection may be made at the place of manufacture, at the site after delivery or at both places and the sections shall be subject to rejection at any time due to failure to meet any of the specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. Sections that have been damaged after delivery will be rejected and if already installed removed and replaced, entirely at the Contractor’s expense.

B. At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation and with the approved manufacturer's drawings. Sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

C. Precast concrete structures shall be inspected by the City and defective materials shall replaced by the Contractor at the Contractor's expense.

D. Any repairs made on surfaces shall be holiday detected. Areas found to have holidays shall be marked and repaired in accordance with the coating manufacturer's instructions. The City shall be notified of time of testing so that he might be present to witness testing.

3.03 FIBERGLASS LINER INSTALLATION

A. Do not drop or impact the fiberglass liner. Use of chains or cables in direct contact with the liner is prohibited.

B. The Contractor shall sequence the Work so that wastewater service is maintained to existing customers at all times.

C. The interior of the wetwell shall be pressure washed with an 800 to 1,000-psi water blast, acid washed with a 20% muratic acid solution, and pressure washed a second time. All loose materials, grease/fats, and hydrogen sulfide contamination shall be removed. The existing bench/fillet areas in the wetwell/manhole shall be removed prior to pressure washing. An inspection of the structures shall be conducted by the City prior to the fiberglass liner installation.

D. Exterior liner diameter shall be approximately 4-inches smaller than the inside diameter of the barrel section of the structure.

E. Liner depth shall be from invert to top elevation of manhole and wetwell. The top 12-inches of the manhole liner shall be a fiberglass neck that extends from the liner corbel or cone section to the bottom of the ring and cover. The neck is used to protect the concrete grade rings or brick and mortar adjustments from the sewer environment.

F. The wetwell top slab and manhole corbel or cone section shall be removed and discarded by the Contractor in accordance with all applicable regulations at the Contractor's expense.

G. Measure and cut wetwell liner to exact length and invert configuration. Measure and cut all incoming and outgoing line openings.

H. Lower wetwell liner into wetwell and level.

I. Extend all incoming and outgoing lines inside the liner with PVC or other approved pipe.

J. The existing concrete bench area of manholes and fillet areas of wetwells shall be removed

completely during initial preparation. Upon installation of the liner, a new bench/fillet shall be constructed with non-shrink grout and shall be field coated with resin and fiberglass in a dry environment after wastewater flows are diverted. The newly constructed bench shall sufficiently overlap the newly installed liner to prevent migration of fluids or gases between the liner and the bench. There shall be no exposed concrete between the factory manufactured fiberglass liner and the field installed fiberglass bench overlay.

K. Pipe Penetrations: Piping shall extend past the liner into the fiberglass wetwell or flush with the liner. If the existing piping does not fully penetrate the fiberglass liner, the Contractor must extend similar material piping into the fiberglass wetwell. Any gaps on joints must be sealed with a non-shrink grout specified herein.

L. Pour or pump 3,000-psi pump mix into the annular space between the liner and existing wet well.

M. Use concrete grade rings on top of the liner cone section to bring ring and cover to finish grade. Manhole liner neck section shall extend from the ring and cover support area up to the ring and cover. The neck section shall be designed to protect the adjustment ring(s), brick and mortar used to bring the ring and cover to final grade

N. A non-shrinking grout as specified herein shall be applied to areas that cannot be fiber-glassed due to water.

O. Following installation, the Contractor shall determine soundness by applying air or water pressure (3-5-psi) to the wet well or manhole liner. While holding at the established pressure, inspect the entire wetwell and manhole for leaks, based on loss of measured pressure. Any leakage through the laminate is cause for failure of the task. The City shall be present during testing. The Contractor shall be responsible for isolating the work of this Contract from existing work and shall be solely responsible for the method of such isolation. Refer to ASTM D-3753 8.6. Any repairs required shall be repaired in accordance with the manufacturer's recommendations at the Contractor's expense.

P. Prior to final acceptance and final inspection of the fiberglass liner installation, flush and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the wetwell or manhole

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SECTION 09905

PIPING, VALVE AND EQUIPMENT IDENTIFICATION SYSTEM

1. GENERAL

1.1 Description

A. Scope of Work

1. The work included under this Section consists of providing an identification system for piping systems and related equipment.

1.2 Quality Assurance

A. Standards

1. Unless otherwise indicated, all materials, workmanship and practices shall conform to the following standard(s):

STANDARD	DESCRIPTION
American National Standard Institute (ANSI)	
ANSI A13.1	Scheme for the Identification of Piping Systems

1.3 Submittals

A. The Contractor shall submit shop drawings, manufacturer's descriptive literature, illustrations, specifications, and other pertinent data in accordance with Section 01300, "Submittals".

B. Schedules

1. Provide a typewritten list of all tagged valves giving tag color, shape, letter code and number, the valve size, type, use, and general location.

2. Provide a complete list of materials to be furnished and surfaces on which they will be used.

C. Samples

1. Provide a sample of each type of valve tag supplied.

2. Provide a sample of each type of identification tape and marker balls supplied.

3. Provide manufacturer's color charts for color selection by the Engineer.

1.4 Product Delivery, Storage and Handling

A. Delivery of Materials

1. Except for locally mixed custom colors, deliver sealed containers with labels legible and intact.

B. Storage of Materials

1. Store only acceptable project materials on project site.

2. Store in a suitable location.

3. Restrict storage to paint materials and related equipment.

4. Comply with all health and fire regulations.

1.5 Job Conditions

A. Environmental Requirements

1. Comply with manufacturer's recommendations as to the environmental conditions under which coatings and coating systems can be applied.

2. Do not apply finish in areas where dust is being generated.

B. Protection

1. Cover or otherwise protect all finished work of other trades and surfaces not to be painted.

2. PRODUCTS

2.1 Materials

A. Materials for painting shall conform to requirements of Section 09900, "Painting".

B. Materials selected for coating systems for each type surface shall be the product of a single manufacturer.

C. Aboveground piping shall be identified by painting the name of the material flowing through the pipe as well as flow arrows (text and arrow type to be provided by the Engineer).

1. Markers shall be of wording and color as shown in Table 09905-1.

2. Lettering shall be as follows:

   a. 2¼-inches high for pipes 3 inches in diameter and larger.

   b. 1 1/8-inches high for pipes less than 3 inches in diameter.

3. Flow arrows shall be as follows:

   a. 2¼-inches by six (6) inches for pipes three (3) inches in diameter and larger.

   b. 1 1/8-inches by three (3) inches for pipes less than three (3) inches in diameter.

D. Buried piping shall be identified by identification tape installed over the centerline of the pipelines or by color coded pipe polywrap when required for use with aggressive soils or as conditions may warrant.

1. Identification Tape for Steel or Iron Pipe and Conduit

   a. Identification tape shall be manufactured of inert polyethylene film so as to be highly resistant to alkalies, acids, or other destructive agents found in the soil, and shall have a minimum thickness of four (4) mils.

   b. The tape width shall be six (6) inches and shall have the background color specified below, imprinted with black letters. The imprint shall be as specified below and shall repeat itself a minimum of once every two (2) feet for the entire length of the tape.

   c. The tape shall be Terra Tape Standard 250, or approved equal.

2. Identification Tape for Plastic or Non-Magnetic Pipe and Conduit

   a. Identification tape shall be manufactured of reinforced polyethylene film with a minimum overall thickness of 9.7 mils and shall have a 0.5 mil thick magnetic metallic foil core.

   b. The tape shall be highly resistant to alkalies, acids, and other destructive agents found in the soil.

   c. The tape width shall be three (3) inches and shall have the background color specified below, imprinted with black letters. The imprint shall be as specified below and shall repeat itself a minimum of once every two (2) feet for the entire length of the tape.

   d. The tape shall be Terra Tape Sentry Line 1350, or approved equal.

3. Tape background colors and imprints shall be as follows:

Imprint	Pipe Service	Background Color
"Caution: Wastewater Line Buried Below"	RWW	Green
"Caution: Electrical Line Buried Below"	ELECT	Red
"Caution: Water Line Buried Below"	RW, FW, PW	Blue
"Caution: Telephone Line Buried Below"	TELE	Orange
"Caution: Gas Line Buried Below"	GAS	Yellow
"Caution: Reuse Line Buried Below"	REUSE	Purple

4. Identification tape shall be "Terra Tape" as manufactured by Reef Industries, Inc., Houston, TX; Allen Systems, Inc., Wheaton, IL; or approved equal.

5. Polyethylene encasement for buried piping

   a. Provide virgin polyethylene encasement in conformance with AWWA C105/A21.5. Polyethylene to be Type I, Grade E-1, 0.4 maximum flow rate, 1200 psi minimum tensile strength, 300 percent minimum elongation, 800 volt/mil thickness minimum dielectric strength.

   b. Polyethylene material shall have a minimum nominal thickness of .008 inch (8 mils). The minus tolerance on thickness shall not exceed 10 percent of the nominal thickness.

   c. Polyethylene material shall be color coded in accordance with the standards for identification of the conveyance system being encased.

E. Aboveground Valve Identification

1. A coded and numbered tag attached with a stainless steel chain and/or stainless steel "S" hooks (Type 304) shall be provided on all valves.

2. Tag Types

   a. Tags for valves on pipe shall be stainless steel, or anodized aluminum, 19 gauge thick.

   b. Colors for aluminum tags shall, where possible, match the color code of the pipe line on which it is installed.

   c. Tags shall be stamped with NC for "normally closed" valves and stamped with NO for "normally open" valves.

3. Coding

a. In addition to the color coding, each tag shall be stamped or engraved with wording or abbreviations to indicate the information presented in Article 2.1(G)(1)(a-g).

b. All color and letter coding shall be approved by the Engineer.

c. Above ground valve tags shall be furnished with stainless steel (Type 304) wire for attachment thereof. The tag shall not be attached to the handwheel or crank operators or any part of the valve which would inhibit operation of the valve.

d. Valve service shall either be as listed in Table 09905-1, or by equipment abbreviation if associated with a particular piece of equipment. Valve numbering shall be as approved by the Owner.

F. Belowground Valve Identification

1. Buried valves shall have valve boxes protected by a concrete pad as identified on the Contract Drawings. The concrete pad for the valve box cover shall have a 3-inch diameter, 19 gauge thick, bronze disc embedded in the surface as shown on the Contract Drawings. The bronze disc shall have the following information neatly stamped on it:

   a. Valve Service: See Table 09905-1 for the abbreviations to be used

   b. Valve Identification No.: To be provided by the Engineer and Owner

   c. Size of valve, inches

   d. Type of valve

      1) GV: Gate Valve

      2) BFV: Butterfly Valve

      3) PV: Plug Valve

      4) Other valve abbreviations shall be provided by the Engineer.

   e. Number of turns to fully open the valve

   f. Direction to open the valve

   g. Year of Installation

2. The valve schedule, abbreviations, words, identification, etc. shall be approved by the Engineer and Owner prior to submission for casting.

3. The information contained in the valve schedules shall be coded on the tags in a system provided by the Engineer and Owner.

G. The valve schedule, abbreviations, words, identification, etc. shall be approved by the Engineer and Owner prior to submission for casting.

H. The information contained in the valve schedules shall be coded on the tags in a system provided by the Owner.

I. Above ground valve tags shall be furnished with stainless steel chain and/or stainless steel “S” hooks (Type 316) for attachment thereof. The tag shall not be attached to the handwheel or crank operators or any part of the valve which would inhibit operation of the valve.

3. EXECUTION

3.1 Color Coding for Pipes and Equipment

A. Piping color codes, and code labels for pipe identification on this project shall conform to Table 09905-1.

TABLE 09905-1

Service	Mark	Conduit, Pipe, and Valve Color Code	Letter and Flow Arrow Color
Fire Hydrant	---	Red	---
Potable Water	PW	Dark Blue	White
Pumps	---	Battleship Grey	---
Raw Water	RW	Light Blue	Black

Note: All pipe hangers shall be painted to match the color of the piping.

B. General Notes and Guidelines

1. Pipelines, equipment, or other items which are not listed here shall be assigned a color by the Owner and Engineer and shall be treated as an integral part of the contract, with no additional cost to the Owner.

2. Color coding shall consist of color code painting and identification of all exposed conduits, through lines and pipelines for the transport of gases, liquids, or semi-liquids including all accessories such as valves, insulated pipe coverings, fittings, junction boxes, bus bars, connectors and any operating accessories which are integral to a whole functional mechanical pipe and electrical conduit systems.

3. All moving parts, drive assemblies, and covers for moving parts which are potential hazards shall be “Safety Orange”.

4. All safety equipment shall be painted in accordance with OSHA standards.

5. All in-line equipment and appurtenances not assigned another color shall be painted the same base color as the piping. The pipe system shall be painted with the pipe color up to, but not including, the flanges attached to pumps and mechanical equipment assigned another color.

6. All pipe hangers and pipe support floor stands shall be painted, unless specified otherwise due to material of construction.

C. All hangers and pipe support floor and accessories stands shall be painted to match their piping. The system shall be painted up to, but not including, the face of flanges or the flexible conduit connected to electrical equipment. Structural members used solely for pipe hangers or supports shall be painted to match their piping. Where the contact of dissimilar metals may cause electrolysis and where aluminum will contact concrete, mortar or plaster, the contact surface of the metals shall be coated in accordance with Section 09900, “Painting”.

D. All systems which are an integral part of the equipment, that is originating from the equipment and returning to the same piece of equipment, shall be painted between and up to, but not including, the face of flanges or connections on the equipment.

E. All insulated surfaces, unless otherwise specified, shall be given one (1) coat of glue sizing, one (1) prime coat and one (1) finish coat.

F. System code lettering and arrows shall conform to the requirements of ANSI A13.1 marked on piping as follows:

1. Legends shall be of the following color for the respective pipe color.

Key to Classification of Predominant Colors for Piping		Color of Letters, if not otherwise specified
(F) Fire Protection	Red	White
(D) Dangerous	Yellow	Black
	Orange	Black
(S) Safe	Green	Black
	White	Black
	Black	White
	Light Grey	Black
	Dark Grey	White
	Aluminum	Black
(P) Protective	Blue	White

2. All piping containing or transporting corrosive or hazardous chemicals shall be identified with labels every ten (10) feet and with at least two (2) labels in each room. Otherwise, markers shall be placed no more than twenty (20) feet apart with at least one (1) marker on every straight run and additional markers at turns and where pipe passes through walls.

3. An arrow indicating direction of flow shall be placed adjacent to each marker.

3.2 Fabricated Equipment

A. Unless otherwise indicated or specifically approved, all fabricated equipment shall be shop primed and finished. See Section 09900, “Painting”.

B. The Contractor shall be responsible for and take whatever steps are necessary to properly protect the shop prime and finish coats against damage from weather or any other cause.

C. Where specified in other Sections of these specifications for mechanical equipment, the Contractor shall apply field coat or coats of paint in accordance with Section 09900, “Painting”. If the shop finish coat is unsatisfactory due to poor adhesion or other problems with primer or finish coats, the coatings shall be removed and replaced by sandblasting, priming and finishing in accordance with Section 09900, “Painting” and this Section.

D. Wherever fabricated equipment is required to be sandblasted, the Contractor shall protect all motors, drives, bearings, gears, etc., from the entry of grit. Any equipment found to contain grit shall be promptly and thoroughly cleaned. Equipment contaminated by grit in critical areas, such as bearings, gears, seals, etc., shall be replaced at no cost to the Owner.

3.3 Installation of Identification Tape

A. Identification tape shall be installed for all buried pipelines, as applicable to the Project, in accordance with the manufacturer's installation instructions and as specified herein.

B. Identification tape for piping shall be installed at two (2) locations:

1. One (1) foot below finished grade along centerline of pipe, and;

2. Directly on top of the pipe.

3.4 Buried Valves

A. In paved or concrete areas, the tops of valve box covers shall be set flush with the pavement or top of the concrete. In concrete areas, valve boxes shall be embedded.

B. Following paving operations, a twenty-four (24) inch square shall be neatly cut in the pavement around the box and the paving removed. The top of the box shall then be adjusted to the proper elevation and a twenty-four (24) inch square by six (6) inch thick concrete pad (with #5 rebar installed) poured around the box cover. Concrete pads in traffic areas shall be reinforced with No. 4 reinforcement bars as shown on the Contract Drawings. Concrete for the pad shall be Class B, with a compressive strength of 3,000 psi.

C. In unpaved areas, the tops of valve box covers shall be set 0.10-foot above finished grade. After the top of the box is set to the proper elevation, a twenty-four (24) inch square by six (6) inch thick concrete pad (with #5 rebar installed) shall be poured around the box cover. Concrete for the pad shall be Class B, with a compressive strength of 3,000 psi.

D. The bronze valve identification disc shall be embedded in the concrete pad.

END OF SECTION

SECTION 15044

PRESSURE TESTING OF PIPING

1. GENERAL

1.1 Description

A. Scope of Work

1. This Section specifies the general requirements for testing (pneumatic, hydrostatic, and leakage) the various piping systems shown on the Contract Drawings and specified elsewhere in these Specifications.

B. Test Pressures

1. Test pressures for the various services and types of piping are shown in Table 15044-1, at the end of this specification section.

2. **Testing of piping shall be at a minimum of 150% of the working pressure**.

1.2 Submittals

A. Submittals shall be submitted in accordance with Section 01300, “Shop Drawings, Submittals and Samples”, for the Engineer's review.

B. Testing Plan

1. **Submit a testing plan (paper copy and PDF) prior to testing** and include at least the information that follows:

   a. Testing dates.

   b. Piping systems and section(s) to be tested.

   c. Test type.

   d. Method of isolation.

   e. Calculation of maximum allowable leakage for piping section(s) to be tested.

C. Certifications of Calibration of all testing equipment.

D. Certified Test Report.

E. Testing Records

1. **Provide a record of each piping installation during the testing (paper copy and PDF)**. These records shall include, but not be limited to, the following:

a. Date of the test.

b. Identification of the pipeline tested or retested.

c. Identification of the pipeline material.

d. Identification of the pipe specification.

e. The test fluid.

f. The test pressure.

g. Remarks

1) Leaks identified (type and location).

2) Types of repairs.

3) Corrections made.

h. Certification by the Contractor that the leakage rate measured conformed to the Specifications.

i. Signature of the Engineer's or Owner's representative witnessing the pipe test.

2. **Submit three (3) copies of the test records (paper copy and PDF)** to the Engineer's representative upon completion of the testing.

1.3 Reference Standards

A. American Waterworks Association (AWWA)

1. AWWA C600

2. AWWA M23

1.4 Quality Assurance

A. Hydrostatic tests consisting of pressure tests and leakage tests shall be conducted on all newly-installed pressure pipes and appurtenances.

B. The tests shall be in accordance with the provisions listed in this specification and with the provisions of AWWA C600 or M23 as applicable.

2. PRODUCTS

2.1 Tests

A. Hydrostatic Tests

1. The testing fluid shall be water for all hydrostatic tests whenever possible.

2. In those systems where water cannot be used the test fluid may be either the one to be used in the system or one agreed upon by the Engineer and the Contractor.

B. Service Pressure Tests

1. The fluid for which the system is designed shall be the test fluid.

C. Pneumatic Test

1. Compressed air shall normally be used. Other gases may be used when specified or directed by the Engineer.

2. **Test pressures shall be one hundred ten percent (110%) of the anticipated maximum operating pressure, but not exceeding 100 psig, and not less than 5 psig at the highest point in the system**.

2.2 Testing Equipment

A. The Contractor shall provide pressure gauges, pipes, bulkheads, pumps, test plugs, all necessary bracing and restraint, meters and all other ancillary equipment to perform the hydrostatic and/or pneumatic testing.

B. Hydrostatic Testing

1. Water: Of sufficient capacity to deliver the required test pressure.

2. Strainer: On inlet side of the pump to prevent foreign matter from entering the system.

3. Valves: Shall be provided on the suction and discharge side of the pump.

4. Heater: To allow heating of the test fluid when elevated temperatures are required for test.

5. Relief Valve: Set at a pressure to relieve at 20 to 25 percent above the required test pressure.

6. Pressure Gauge(s): Capable of reaching 50 percent over the test pressure. These should be located at the pump discharge and any other place deemed convenient by the Contractor. The pressure gauges shall be marked in one (1) psi increments.

7. Pressure gauges and relief valves shall be checked for accuracy before use in all test procedures.

C. Service Testing

1. A pressure gauge capable of registering 25 psi (minimum) over the design pressure shall be installed down-stream from the supply shut-off valve if one is not included in the system. The pressure gauge shall be marked in one (1) psi increments.

D. Pneumatic Testing

1. Building supply air to deliver the required test pressure if available, or provide a compressor capable of the required test pressure.

2. Valves shall be provided on the discharge side of the pump.

3. **A relief valve shall be provided to relieve at 10 - 15 percent over the test pressure**.

4. **Pressure gauge(s) capable of reaching fifty percent (50%) over the test pressure shall be provided**. A gauge shall be located on the pump discharge and other location as required by the Engineer. The pressure gauges shall be marked in one (1) psi increments.

3. EXECUTION

3.1 Preparation

A. Pipes shall be in place and anchored before commencing pressure testing.

B. Conduct the hydrostatic and/or pneumatic tests on exposed and aboveground piping **after** the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters.

C. Before conducting the hydrostatic tests, verify that all pipes are clear and clean of all dirt and debris. For pneumatic tests, blow air through all of the pipes.

D. Test new pipelines which are to be connected to existing pipelines by isolating the new line from the existing line by means of pipe caps, special flanges, or blind flanges. After the new pipeline has been successfully tested, remove all caps or flanges and connect to the existing piping.

E. **Conduct hydrostatic tests on buried pipe after the trench has been completely backfilled**. The pipe may be partially backfilled and the joints left exposed for inspection for an initial leakage test. Perform the final leakage test, however, after completely backfilling and compacting the trench.

F. **The Contractor shall provide any temporary piping needed to carry the test fluid to the piping that is to be tested**. After the test has been completed and demonstrated to comply with the specifications, disconnect and remove all temporary piping. Do not remove exposed vent and drain valves at the high and low points in the tested piping; remove any temporary buried valves and cap the associated outlets. Plug taps or connections to the existing piping from which the test fluid is obtained.

G. **The Contractor shall provide temporary drain lines needed to carry testing fluid away from the pipe being tested**. Remove such temporary drain lines after completing the pressure testing. Drain the pipes after they have been tested.

H. **The Contractor shall notify the Engineer, in writing, a minimum of twenty-four (24) hours prior to conducting the pressure testing**.

I. Chlorine Piping

1. Chlorine piping shall be tested, dried and cleaned in accordance with the requirements of the Chlorine Institute, Pamphlet 6.

J. New Piping Connected to Existing Piping

1. Isolate new piping with grooved-end pipe caps, spectacle blinds, blind flanges or as acceptable to the Engineer.

K. Items that do not require Testing

1. Piping between wet wells and wetwell isolation valves.
2. Equipment seal drains.
3. Tank overflows to atmospheric vented drains.
4. Tank atmospheric vents.

L. Cleaning

1. **Before conducting hydrostatic tests, verify that all pipes are clean and clear of all dirt and debris**. For pneumatic test, blow air through the pipes.
2. **If flushing is necessary, maintain a flushing velocity of at least 2.5 feet per second for water testing and at least 2,000 feet per minute for pneumatic testing**. Flushing shall continue until clean water flows from the pipeline. **The minimum amount of flushing time shall be as follows**:

$$T = 0.667\ L$$

Where: T= Flushing Time (seconds),

L = Pipe Length (feet)

M. **Performed all required disinfection after hydrostatic testing is complete and acceptable, in accordance with these specifications**.

N. Length of Test Section for Buried Piping

1. The maximum length of the test section for buried pipe shall be as follows:

Pipe Diameter (inches)	Maximum Allowable Test Section Length (feet)
< 12	3,500
> 12	5,280

2. Provide intermediate test bulkheads where the pipeline length exceeds these limits.

O. Initial Pipeline Filling for Hydrostatic Testing

1. The maximum rate of filling shall not cause the water velocity in the pipeline to exceed one-half (½) foot per second.

P. Gravity Piping

1. Perform testing after service connections, manholes and backfilling have been completed between stations to be tested.

2. Determine the groundwater level at the time of testing by excavating exploratory holes or other methods acceptable to the Engineer.

Q. Pressure Test

1. **All tests shall be made in the presence of and to the satisfaction of the Engineer and/or Owner** and also, to the satisfaction of any local or state inspector having jurisdiction.

   a. **Provide not less than twenty-four (24) hours written notice to the Engineer, Owner**, and the authority having jurisdiction when it is proposed to make the tests.

   b. Any piping or equipment that has been left unprotected and subject to mechanical or other injury, in the opinion of the Engineer, shall be retested in part or in whole as directed by the Engineer.

   c. The piping systems may be tested in sections as the work progresses, but no joint or portion of the system shall be left untested.

2. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.

3. **Repair all damage done to any existing or adjacent work or materials due to or on account of the tests**.

3.2 Inspection and Testing

A. Hydrostatic Testing of Above Ground or Exposed Piping

1. **The maximum filling velocity shall be 0.50 feet per second**, applied over the full area of the pipe.

2. Open vents at high points of the piping system to purge air while the pipe is being filled.

3. Subject the piping system to the test pressure indicated.

4. **Maintain the test pressure for a minimum of two (2) hours**.

5. Examine all joints, fittings, valves, and connections for leaks.

6. **The piping system shall show no leakage or weeping**.

7. **Correct leaks and retest until no leakage is obtained**.

B. Hydrostatic Testing of Buried Piping

1. **Testing shall begin after backfilling operations have been completed. Expel air from the piping system during filling**.

2. Where any section of the piping contains concrete encasement, do not make the pressure test until at least ten (10) days after the concrete has been poured. When testing mortar-lined piping, fill the pipe to be tested with water and allow it to soak for at least forty-eight (48) hours to absorb water before conducting the pressure test.

3. Apply and maintain the test pressure by means of a hydraulic force pump. **Maintain the test pressure for a minimum duration of two (2) hours**. **After the test pressure is reached, use a meter to measure the additional water added to maintain the pressure during the two (2) hours**. This amount of water is the loss due to leakage in the piping system. **The allowable leakage volume is defined by the following formula**:

   a. AWWA C-600 Ductile Iron Mains

$$V = \frac{S \, x \, D \, x \, \sqrt{P} \, x \, T}{133,200}$$

   b. AWWA Manual No. M-23 PVC Mains

$$V = \frac{0.90 \, x \, S \, x \, D \, x \, \sqrt{P} \, x \, T}{133,200}$$

   c. Where:

V	=	Allowable Leakage (gallons)
S	=	Length of Pipe Tested (feet)
D	=	Diameter of the Pipe Tested (inches)
P	=	Specified Test Pressure (psig)

T = Pressure Test Time (hours)

d. **Repair and retest any and all pipes showing leakage rates greater than that allowed.**

C. Pneumatic Testing

1. This procedure for a pneumatic test of piping systems shall be used when directed by the Engineer when water, or other liquid, cannot be introduced into the line, or as a supplement to a hydrostatic test. **It shall not be used to test non-metallic (plastic) pipe, including, but not limited to, PVC, CPVC, E-CTFE, etc**.

2. All pneumatic tests shall be done under the supervision of Contractor and in the presence of the Engineer and/or Owner's representative.

3. **The Engineer and the Owner must be informed, in writing, at least twenty-four (24) hours prior to the proposed pressure test**.

4. Only those people actively participating in the test shall be allowed in the test area. Protect test personnel and the Owner's/Engineer's operating personnel.

5. Safety glasses and hard-hats must be worn.

6. Perform tests only after the piping has been completely installed including supports, hangers and anchors. Secure piping to be tested to prevent the pipe from moving and to prevent damage to adjacent piping and equipment. Remove or isolate from the pipe any appurtenant instruments or devices that could be damaged by the test, prior to applying the test.

7. Fluid: **Oil-free, dry air**.

8. Procedure

   a. **The test pressure shall be 150% of the working pressure**.

   b. Apply an initial pneumatic test pressure of 25 psig maximum to the piping system prior to final leak testing, to locate visible leaks. Apply a soap bubble mixture to joints and connections, and examine the system for leakage.

   c. Correct visible leaks and repeat the preliminary test until all visible leaks are corrected.

   d. **Gradually increase the pressure in the system to one-half (50%) of the test pressure**. Thereafter, increase the pressure in steps of approximately

one- tenth of the specified test pressure until the required test pressure has been reached.

e. **Maintain the pneumatic test pressure continuously for a minimum time of two (2) hours and for such additional time as may be necessary to conduct a soap bubble examination for leakage**.

f. **The piping system shall show no leakage**. **Correct any visible leakage and retest. All leaks shall be noted on the Pressure Test Record Form**.

g. After satisfactory completion of the test, vent the line and allow it to return to atmospheric pressure. Connection can then be made to the supply line as necessary.

D. Hydrostatic Test for Gravity Piping

1. **The testing equipment accuracy shall be ± 0.5 gallons of water leakage** under the specified conditions.

2. **The maximum allowable leakage shall be 0.10 gallons per hour per inch diameter per 100 feet**. Include service connection footage in the test section, subjected to the minimum head specified.

3. Gravity Sanitary and Roof Drain Piping

a. Test with fifteen (15) feet of water to include the highest horizontal vent in filled piping.

b. Where vertical drain and vent systems exceed fifteen (15) feet in height, test systems in fifteen (15) foot vertical sections as piping is installed.

4. Exfiltration Test

a. Hydrostatic Head

1) At least six (6) feet above the maximum estimated groundwater level in the section being tested.

2) No less than six (6) feet above the inside top of the highest section of pipe in the test section, including service connections.

5. Infiltration Test

a. Groundwater Level

1) At least six (6) feet above the inside top of the highest section of pipe in the test section, including service connections.

6. Piping with a groundwater infiltration rate greater than the allowable leakage rate for exfiltration will be considered defective even if pipe previously passed a pressure test.

7. Defective Piping Sections

a. Replace or test and seal individual joints, and retest as specified.

E. Pressure Testing of Double-Walled Containment Piping

1. Test the primary pipe as described for buried and aboveground or exposed piping.

2. Test the secondary containment piping by performing a pneumatic test as described above of the annual space between the primary and secondary pipes at a pressure of 5 psi.

F. Repetition of Test

1. If the actual leakage exceeds the allowable leakage, locate and correct the faulty work and repeat the test.

2. Restore the work and all damage resulting from the leak and its repair. Eliminate visual leakage.

G. Test Pressure

1. **All pipe shall be tested at the pressures shown in Table 15044-1 and at a minimum of 150% of the normal working pressure of the pipe**.

TABLE 15044-1

PIPING PRESSURE TEST SCHEDULE

Service	Pipe Designation	Test Pressure (psig)
Chemical Vacuum Pipe	CG	See note 3
Chemical Solution Lines	---	150
Domestic Water Pipe	DW	150

Gravity Flow Pipe	DR	See notes 2 and 3
Irrigation Pipe	IW	150
Non-Potable Water	NPW	150
Potable Water	PW	150
Pressure Process Pipe	RW, PW, FW	150
Reuse Water	RW	150

NOTES

1. Piping not listed and sections of piping in gross conflict with the listed pressure, with the prior approval of the Engineer, shall be tested at a minimum of 150% of the working pressure.

2. Non pressure process piping shall be tested at 150% of the maximum head pressure on the pipe.

3. Gravity drain lines within buildings shall be hydrostatically tested by capping or plugging drain lines and system ends and filling the system through the vent lines to the top of the vents. Leaking shall be calculated from this static head pressure and amount of water required to refill the vent pipe after the test duration.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

SECTION 15062
DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install, all ductile iron piping, ductile iron fittings, and appurtenances as shown on the Drawings and as specified herein.

B. General Design: The equipment and materials specified herein are intended to be standard types of ductile iron pipe and cast or ductile iron fittings for use in transporting wastewater, potable water, and reclaimed water.

1.02 QUALITY ASSURANCE

A. Qualifications: All of the ductile iron pipe and ductile or cast-iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

B. Standards:
   1. ANSI A 21.50/AWWA C150
   2. ANSI A-21.51/AWWA C151
   3. ANSI A-21.41/AWWA C104

C. Factory Tests: The manufacturer shall perform the factory tests described in ANSI A-21.51/AWWA C151.

D. Quality Control
   1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards. All pipe on this Project shall be supplied by a single manufacturer unless otherwise accepted in writing by the City.
   2. In addition to the manufacturer's quality control procedures, the City may select an independent testing laboratory to inspect the material at the foundry for compliance with these specifications. The cost of foundry inspection requested by the City will be paid for by the City.

1.03 SUBMITTALS

A. Materials and Shop Drawings
   1. Submit Shop Drawings and piping layouts, including areas within and under buildings and structures. Shop Drawings shall include dimensioning, methods and locations of supports and all other pertinent technical specifications. Show locations of all field cuts. Shop Drawings shall be prepared by the pipe manufacturer. Shop Drawings for piping within and under buildings and structures shall be submitted within 30-days of Execution of Contract.

B. Operating Instructions: Submit Operation and Maintenance Manuals in accordance with Section 01001 "General Work Requirements."

C. Manufacturer's Certification
   1. Submit manufacturer's sworn certification of factory tests and test results.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

The Contractor shall be responsible for all materials furnished and stored until the date of project completion. The Contractor shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The Contractor shall, if requested by the City, furnish certificates, affidavits of compliance, test reports, samples or check analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations. Stored pipe shall be covered for protection against contamination and UV light. Joint gaskets shall be stored in clean, dark and dry location until immediately before use.

B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe and fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All pipe or fittings shall be examined before installation and no piece shall be installed which is found to be defective. Pipe shall be handled to prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of the City or be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on level ground, graded to eliminate all rock points and to provide uniform support along the full pipe length. When being transported, the pipe shall be supported at all times in a manner which will not permit distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of the City, is damaged beyond repair by the Contractor shall be removed from the site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Ductile Iron Pipe
   1. Standards: ANSI A-21.50, AWWA C150 and ANSI A-21.51, AWWA C151
   2. Thickness/Pressure Class:
      a. Below ground piping: Class 350 (4-inch to12-inch), Class 250 (16-inch to 24-inch) and Class 200 (30-inch to 64-inch) unless otherwise noted or specified.
      b. Above ground piping: Flanged, Class 350 (minimum) unless otherwise noted or specified.
   3. Joints
      a. Push-on or Mechanical Joints (below ground piping)
         (1) Standards: ANSI A21.11, AWWA C111
         (2) Class: 350-psi working pressure rating
         (3) Gaskets
            (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type.
            (b) Wastewater Service: Neoprene rubber ring type.
      b. Flanged (above ground or inside below ground vaults)
         (1) Standards: ANSI A21.15, ANSI B16.1
         (2) Class: 125-pound factory applied screwed long hub flanges, plain faced without projection.
         (3) Gaskets
            (a) Spans less than 10-feet: full-face 1/8-inch thick neoprene rubber
            (b) Spans greater than 10-feet: Toruseal gaskets as manufactured by American Cast Iron Pipe or acceptable equal.
      c. Restrained Joints
         (1) Manufacturers: Lok-Ring system (all sizes) or locking type gasket systems (for 16-inch diameter and smaller) as manufactured by American Ductile Iron Pipe; MEGALUG System as manufactured by EBBA Iron; or acceptable equal.
         (2) Class: 250-psi minimum design pressure rating.
         (3) Standard mechanical joint retainer glands shall not be acceptable.
      d. Joint Accessories
         (1) Mechanical joint bolts, washers and nuts: Ductile iron or Corten steel.
         (2) Flanged joint bolts, washers and nuts: 316 stainless steel with bolts and nuts conforming to ASTM A193 Grade B8M.
      e. Pipe Length (below ground installation): 20-feet maximum nominal length.
   4. Pipe Identification
      a. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. Pipe which is not clearly marked is subject to rejection. The Contractor shall remove all rejected pipe from the project site within five NORMAL WORKING DAYS.

B. Fittings
   1. Ductile iron fittings 4-inch through 24-inch shall be pressure rated at 350-psi minimum, except flanged joint type fittings which shall be rated at 250-psi minimum. All 30-inch and larger fittings shall be pressure rated to 250-psi minimum. All fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53, latest revision, and shall be ductile iron only. All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline. All fittings shall be designed to be capable to withstand, without bursting, hydrostatic tests of three times the rated water working pressure. All fittings shall have a date code cast (not printed or labeled) with identification of date, factory, and the factory unit from which it was cast and machined. Fittings shall have the pressure rating, nominal diameter of openings, manufacturer's name, and the country where cast and number of degrees or fraction of the circle distinctly cast on them. Ductile iron fittings shall have the letter "DI" or "Ductile" cast on them.
   2. Joints shall be as described for ductile iron pipe for above ground/exposed and buried service.
   3. All potable water main fittings shall have NSF 61 certification, and ISO 9001 certification for both the foundry and manufacturer. The NSF 61 certification shall be issued on all coatings and linings, from the said manufacturers that are used for potable water applications.

2.02 COATINGS, LININGS AND IDENTIFICATION MARKINGS

A. Exterior Coatings
   1. Below ground/buried or in a casing pipe:
      a. Type: Asphaltic coating, 1.0-mil DFT in accordance with ANSI/AWWA A21.51/C151.
      b. Markings: (continuous 3-inch wide strip within top 90 degrees of pipe - min. drying time 30-minutes before backfill).
      c. Color:
         (1) Raw Wastewater: Safety Green
         (2) Reclaimed Water: Purple (Pantone 522C)
         (3) Potable Water: Safety Blue
   2. Above ground/Exposed/In vaults
      a. Coatings and coating testing for ductile iron pipe and fittings for above ground/exposed applications shall be accordance with Division 9. Primer, intermediate and final coats whether shop or field applied shall be compatible and applied in ac cordance with the coating system manufacturer's recommendations. Refer to Appendix D "List of Approved Products" for approved coating system suppliers. Asphaltic seal coat applied to the exterior of above ground piping and fittings shall be blasted and completely removed prior to coating per NACE-3/SSPC-SP6 commercial blast cleaning minimum angular anchor profile of 1.5-mils.

b. Color
   (1) Raw Wastewater: Safety Green
   (2) Reclaimed Water: Purple (Pantone 522C)
   (3) Potable Water: Safety Blue

3. Inside Wetwell
   a. All piping inside of wastewater wetwell shall be 316 stainless steel.

B. Interior Lining (Applied by pipe manufacturer)
   1. Wastewater: Interior coating shall be Protecto 401 (amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment) for all pipe and fittings. All ductile iron pipe and fittings shall be delivered to the manufacturer certified applicator without asphalt, cement lining, or any other lining on the interior surface and no coating shall have been applied to the first 6-inches of the exterior of the DIP spigot ends. Minimum surface preparation shall be SSPC-SP 1 Solvent Cleaning method to remove oil and grease followed by NACE-4 / SSPC-SP7 Brush-Off Blast Cleaning. Protecto 401 shall be applied within 12-hours of surface preparation to the interior of the pipe and fittings so as to obtain a continuous and relatively uniform and smooth integral lining with a total minimum dry film thickness of 40-mils for the complete system. No lining shall take place when the substrate or ambient temperature is below 40°F. The lining shall not be used on the face of the flange of fittings or flanged pipe. The system shall be holiday free and holiday testing (minimum 2000 volts) shall be conducted and pinholes shall be repaired prior to shipping.
   2. Potable Water and Reclaimed Water: Interior coating shall be fusion-bonded epoxy (FBE) or Cement Mortar lined with asphaltic seal coat.
      a. FBE for Fittings: Fittings shall be supplied with a FBE coating, both inside and outside for total protection including flanged and buried fittings. The exterior of flanged fittings for above ground assemblies shall adhere to final exterior coating requirements per 3119 2.04 A. The FBE coating system shall meet or exceed ANSI/AWWA C-550 and C116/A21.116 requirements and shall have NSF 61 certification. FBE coating thickness shall be 6 to 8-mils dry film thickness, shall be applied for secure adhesion, shall have a smooth surface and shall be holiday free.
      b. Cement mortar lining with a seal coat of asphaltic material shall be in accordance with ANSI/AWWA A21.4/C104.

C. Polyethylene Encasement is required when pipe is within 10-feet of a gas main or as indicated on the Drawings:
   1. Standard: ANSI A 21.5/AWWA C105, 8-mil minimum thickness.

2.03 LOCATION MARKERS AND LOCATION WIRE

A. Electronic Markers and Locator System (for reclaimed water and wastewater ONLY)
   1. Markers: Markers shall consist of a passive device capable of reflecting a specifically designated repulse frequency tuned to the utility (service) being installed. Markers shall be color coded in accordance with American Public Works Association's "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be installed directly above the centerline of the respective pipeline at intervals not to exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends) or change in horizontal direction and at each valve along the pipeline. Markers shall be hand backfilled to 1-foot above the pad and have a finished depth of burial of not less than 2-feet or more than 6-feet. No separate payment shall be made for furnishing and installing the respective frequency and color-coded electronic pad type marker.
   2. Locator System: Marker locator set shall be the Scotch Mark EM II Electronic Marker Locator Path Tracing Receiver, or acceptable equal. The Contractor shall furnish 1-locator set for each type of service piping installed on the project (i.e.: reclaimed water, wastewater) to the City. Each unit shall incorporate the following features and accessories:
      a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
      b. Field strength meter that provides visual indication of the return signal.
      c. Function switch for selection of operation mode.
      d. Sensitivity control to adjust the receiver gain.
      e. Audio speaker for signal response.
      f. Battery access panel containing condensed operating instructions.
      g. Auxiliary headset and heads set jack.
      h. Permanently attached shoulder straps.
      i. Rugged shockproof and weatherproof storage/carrying case.
   3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

B. Location Detection Wire
   1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe identification).
   2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of each valve box collar and be capable of extending 12-inches above top of box (stored inside the 2-inch brass pipe through the valve box collar) in a manner so as not to interfere with valve operation. For direction drilling installations, a minimum of 2 (two) 10-gauge wires shall be pulled along with the pipe.
   3. Continuity: Continuity of wire to be tested using Metrotech 810/9860 or acceptable equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ductile iron pipes shall be installed in accordance with AWWA C600 and AWWA Manual M-42. When a restraining type gasket is used, the bell shall be painted red.

B. Underground Ductile Iron Pipe and Fittings.
   1. Bedding firm, dry and even bearing of suitable material. Blocking under the pipe will not be permitted.
   2. Placement
      a. Alignment: In accordance with lines and grades shown on the Drawings. Deflection of joints shall not exceed 75% of the values recommended by the pipe manufacturer.
      b. The Contractor shall provide line and grade stakes at a 100-foot maximum spacing and at all line and/or grade change locations. The Contractor shall provide temporary benchmarks at a maximum of 1,000-foot intervals. The minimum pipe cover shall be 30-inches below the finished grade surface or 30-inches below the elevation of the edge of pavement of the road surface whichever is greater.
      c. All pipe and fittings shall be inspected prior to lowering into trench to insure no cracked, broken or otherwise defective materials are being used. All homing marks shall be checked for the proper length so as to not allow a separation or over homing of connected pipe. Homing marks incorrectly marked greater than 1-inch shall result in rejection of pipe and removal from site. The Contractor shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of pipe and keep clean during and after installation.
      d. Proper implements, tools and facilities shall be used for the safe and proper protection of the Work. Pipe shall be lowered into the trench in such a manner as to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped into trenches under any circumstances.
      e. Trench Dewatering and Drainage Control: Contractor shall prevent water from entering trench during excavation and pipe-laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.
      f. Pipe Laying in Trench: Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. Pigging of pipe may be used to remove foreign materials in lieu of flushing. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the City to ensure absolute cleanliness inside the pipe. The pipe shall be installed with the color stripe and pipe text on the top of pipe.

3. Cutting: When required, cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of the pipe to be used with a push-on bell shall be beveled. Bare metal exposed at ends of the pipe shall be field coated in accordance with pipe manufacturer's recommendations. Cut pipe for wastewater service shall have exposed bare metal ends repaired with Protecto 401 using the coating system manufacturer's field repair kit.
4. Joints
   a. Joint Placement
      (1) Push on joints: Pipe shall be laid with the bell facing upstream. The gasket shall be inserted and the joint surfaces cleaned and lubricated prior to placement of the pipe. After joining the pipe, a metal feeler shall be used to verify that the gasket is correctly located.
      (2) Mechanical Joints: Pipe and fittings shall be installed in accordance with the "Notes on Method of Installation" under ANSI A21.11/AWWA C111. The gasket shall be inserted and the joint surfaces cleaned and lubricated with soapy water before tightening the bolts to the specified torque.

C. Thrust Restraint
   1. General: Thrust restraint shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein.
   2. Length of Restrained Joints: In accordance with the lengths listed in the table as shown on the Drawings.

D. Installation of Pipes on Curves
   1. Maximum deflections at pipe joints, fittings and laying radius for the various pipe lengths shall not exceed 75% (percent) of the pipe manufacturer's recommendation.

3.02 CLEANING AND FIELD TESTING

A. General: At the conclusion of the Work, the Contractor shall provide all associated cleaning and field testing as specified in other related sections of these specifications.

END OF SECTION

SECTION 15065

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

1. GENERAL

1.1 Scope of Work

A. Furnish all labor, materials, equipment and incidentals required and install, disinfect and test polyvinyl chloride (PVC) pipe, fittings and appurtenances of the sizes and in the locations shown on the Contract Drawings and as specified herein.

B. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference between pipes, or for other reasons. Pipe fitting notation is for the Contractor's convenience and does not relieve him/her from installing and jointing different or additional items where required to achieve a complete piping system.

C. Pipe/piping refers to all pipe, fittings, material and appurtenances required to construct PVC pressure piping systems throughout the Project, as specified, complete and in place.

1.2 Reference Standards

A. Unless otherwise indicated, all materials, workmanship and practices shall conform to the following standards:

STANDARD	DESCRIPTION
American Society for Testing and Materials (ASTM)	
ASTM A-242	Standard Specification for High-Strength Low-Alloy Structural Steel
ASTM A-320	Standard Specification for Alloy-Steel Bolting Materials for Low-Temperature Service
ASTM A-536	Standard Specification for Ductile Iron Castings
ASTM D-1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D-1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D-2464	Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D-2467	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D-2564	Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D-2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping

ASTM D-2855	Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D-3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F-437	Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F-477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
American Water Works Association (AWWA)	
AWWA C-110	Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
AWWA C-111	Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C-651	Disinfecting Water Mains
AWWA C-900	Polyvinyl Chloride (PVC) Pressure Pipe, 4-in Through 12-in for Water Distribution
AWWA C-905	Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-in Through 36-in.
AWWA M-23	PVC Pressure Pipe and Fittings
National Sanitation Foundation (NSF)	
Std No. 14	Plastic Piping Components and Related Materials
Std No. 61	Drinking Water System Components - Health Effects

B. Where reference is made to one of the above standards, the revision in effect at the time of Bid Opening shall apply.

1.3 Quality Assurance

A. All PVC pipe and fittings shall be from a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these specifications.

B. Pipe for use with domestic potable water shall have an NSF seal of approval. The Supplier shall be responsible for the provisions of all test requirements specified in NSF Standard No. 14 as applicable.

C. Acceptable Manufacturers of PVC shall include Certain-Teed Products, Corporation; Johns-Manville (J-M), or approved equal.

1.4 Submittals

A. Submit to the Engineer, in accordance with the General Conditions, Supplementary Conditions and Section 01300, "Submittals", within thirty (30) days of the Effective Date of the Agreement, the name of the pipe and fitting manufacturers and a list of materials to be furnished by each manufacturer. The submittal shall include information on the local representative for each manufacturer, if the product is sold

through a distributor, descriptive literature, illustrations, specifications, installation instructions and related information.

B. Shop Drawings including piping layouts and schedules shall include dimensioning, fittings, types and locations of valves and appurtenances, joint details, methods and location of supports, anchorage, gasket material, grade of material and all other pertinent technical information for all items to be furnished.

C. Prior to each shipment of pipe, certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM and AWWA Standards specified herein shall be submitted.

1.5 System Description

A. The equipment and materials specified herein are intended to be of standard types for use in transporting water, wastewater and reclaimed water.

B. Note information in pipe schedule on Contract Drawings, if any, and in this Section, especially concerning pressures, minimum thickness, etc.

C. The Contractor is responsible for compatibility between pipe materials, fittings and appurtenances.

1.6 Product Delivery, Storage and Handling

A. PVC pipe shall be delivered to the Project Site in unbroken bundles packaged in such a manner as to provide protection against damage. When possible pipe should be stored at the Project Site in unit packages ready for use. Package units shall be handled using a forklift or a spreader bar with fabric straps. Packaged units shall not be stacked higher than two (2) units high at the Project Site. Any pipe damaged in shipment shall be replaced as directed by the Engineer, at no additional cost to the Owner.

B. When it is necessary to store PVC pipe and fittings for more than thirty (30) days, exposure to direct sunlight shall be prevented by covering the pipe with an opaque material. Adequate air circulation above and around the pipe shall be provided as required to prevent excessive heat accumulation. PVC pipe shall not be stored close to heat sources or hot objects such as heaters, fires, boilers or engine exhaust. Pipe gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease. The interior and all sealing surfaces of pipe, fittings and other appurtenances shall be kept clean and free of dirt and foreign matter.

C. All pipe and fittings shall be thoroughly cleaned before installation and the interior shall be kept clean until testing.

D. Care shall be taken in handling and laying pipe and fittings to avoid severe impact blows, crushing, abrasion damage, gouging or cutting. Pipe shall be lowered, not dropped, from trucks or into trenches. All cracked, damaged or defective pipe and fittings, or any length of pipe having a gouge, scratch or other permanent indentation of more than ten percent (10%) of the wall thickness in depth, shall be

rejected and removed at once from the work and replaced with new acceptable pipe at no additional cost to the Owner.

1.7 Job Conditions

A. Water in Excavation

1. Water shall not be allowed in the trenches while underground pipes, fittings, valves and/or accessories are being laid and/or tested.

2. The Contractor shall not open more trench than the available pumping facilities are able to dewater to the satisfaction of the Engineer. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working.

3. In no case shall the pipelines being installed be used as drains for such water, and the ends of the pipe shall be kept properly and adequately plugged during construction by the use of approved stoppers and not by improvised equipment.

4 . All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the work any such materials has entered the pipelines, it must be cleaned as directed by the Engineer so that the entire system will be left clean and unobstructed.

2. PRODUCTS

2.1 General

A. All materials that come into contact with potable water shall be on either the EPA or NSF lists of products approved for use in contact with potable water. Manufacturers shall submit an affidavit with the shop drawings indicating approval by the EPA or NSF for the materials used in products that come into contact with potable water, in accordance with Rule 62-555.320(3), Florida Administrative Code.

2.2 Polyvinyl Chloride (PVC) Pipe and Fittings

A. Small Diameter Gravity Drainage Piping (< 4-inches)

1. PVC pipe smaller than four (4) inches nominal diameter used for gravity drainage piping shall be Schedule 40 pipe in accordance with ASTM D-1785.

2. Schedule 40 PVC pipe shall have solvent welded joints as specified for PVC pressure pipe.

B. Large Diameter Gravity Drainage Piping (≥ 4-inches)

1. Unless otherwise noted, large gravity drainage piping shall conform to the requirements and shall have gasketed integral bell ends:

Pipe Size (inches)	Pipe Requirements
4 -12	AWWA C900, DR25
> 12	AWWA C905, DR25

2. Pipe shall be designed for a maximum working pressure at not less than 100 psi and with not less than a 4 to 1 sustained hydrostatic pressure safety factor.

3. Fitting shall be ductile iron fittings with restrained mechanical joints and as specified in Section 15062, “Ductile Iron Pipe and Fittings”.

4. Pipe shall be made of ductile iron pipe O.D.'s instead of IPS.

C. Small PVC Pressure Piping (< 4-inches)

1. Unless otherwise specified, PVC pressure pipe smaller than four (4) inches nominal diameter shall conform to the following requirements, as shown on the Contract Drawings or specified in other Sections.

Pipe Size (inches)	Pipe Requirements
< 4	Schedule 80, ASTM D-1785

2. Schedule 80 pipe shall have solvent welded joints unless otherwise shown on the Contract Drawings or specified in other Divisions.

3. PVC pressure pipe shall bear the approved seal of the National Sanitation Foundation (NSF).

4. PVC pipe that is exposed to sunlight shall be manufactured with UV additives to provide resistance to ultraviolet light deterioration.

5. Fittings

   a. Socket type, solvent welded fittings for Schedule 80 PVC pipe, less thanthree (3) inches in diameter, shall be in conformance with ASTM D-2467. Socket type, solvent welded fittings for Schedule 80 CPVC pipe, less than three (3) inches in diameter, shall be in conformance with ASTM F-439.

   b. Threaded type fittings for Schedule 80 PVC pipe, less than three (3) inches in diameter, shall be in conformance with ASTM D-2464. Threaded type fittings for Schedule 80 CPVC pipe, less than three (3) inches in diameter, shall be in conformance with ASTM F-437.

   c. Solvent weld solvent welded or threaded joints shall be “water-tight”.

   d. All fittings for PVC pipelines greater than or equal to three (3) inches shall be ductile iron. All adapters, fittings and transition gaskets necessary to connect PVC fittings shall be furnished.

6. Flanges

   a. Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B-16.1 dimensions and bolting pattern.

   b. Flanges shall be connected to PVC piping with either solvent welded or threaded joints in accordance with ASTM D-2467 or ASTM D-2464, respectively. Gaskets shall be neoprene, full faced type with a minimum thickness of 1/8-inch.

   c. Nuts and bolts shall be hexagonal with machine threads, manufactured of Type 316 stainless steel in accordance with ASTM A-320, Class 2.

   d. Type 304 stainless steel flat washers with lock washers shall be used against PVC flanges.

   e. The nuts shall have a hardness that is lower than that of the bolts and washers by a difference of 50 Brinnell hardness to prevent galling during installation.

7. PVC solvent cement shall be in compliance with ASTM D-2564 and in accordance with the pipe manufacturer's recommendations. The Contractor shall use a cleaner recommended by the manufacturer for cleaning the pipe/fittings prior to solvent welding. Lubricant for Schedule 80 threaded joints shall be Teflon tape only.

8. Provide suitable adapters for connections to equipment and other piping systems.

D. Large PVC Pressure Piping (≥ 4-inches)

1. Unless otherwise noted, PVC pressure pipe for the nominal diameters shown shall conform to the following requirements, have gasketed integral bell ends, and be manufactured to ductile iron O.D.'s instead of IPS.

Pipe Size (inches)	Pipe Requirements	Max. Working Pressure (psi)
4 - 12	AWWA C900, DR-18	150
> 12	AWWA C905, DR-18	235

2. PVC pipe shall bear the NSF marking of approval when used for potable water applications.

3. PVC Pipe shall be designed for maximum working pressure as indicated above and with not less than a 4 to 1 sustained hydrostatic pressure safety factor.

4. Fittings shall be ductile iron fittings with restrained mechanical joint ends as specified in Section 15062, “Ductile Iron Pipe and Fittings”. All adapters, fittings and transition gaskets necessary shall be furnished.

5. PVC pipe that is exposed to sunlight shall be manufactured with UV additives to provide resistance to ultraviolet light deterioration.

6. Bell and Spigot

    a. Pipe joints shall be made with integral bell and spigot pipe ends meeting ASTM D-3139, “Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals”. The bell shall consist of an integral thickened wall section designed to be at least as strong as the pipe wall.

    b. The bell shall be supplied with factory glued rubber ring gasket which conforms to the manufacturer's standard dimensions and tolerances.

    c. The gasket shall meet the requirements of ASTM F-477, "Elastomeric Seals (Gaskets) for Joining Plastic Pipe".

    d. PVC joints shall be "Ring-Tite" as manufactured by Johns-Manville Manufacturing Company, Inc. or an equal approved by the Engineer.

7. Fittings

    a. All fittings for use with PVC pipe three (3) inches and larger in size shall be ductile iron with a minimum working pressure of 250 psi and shall conform to ANSI/AWWA A21.10/C-110, latest revision except as shown on the Contract Documents.

    b. Fittings shall have mechanical joint bell ends manufactured in accordance with ANSI/AWWA A21.11/C-111, latest revision. Jointing materials for mechanical joints shall be provided by the fitting manufacturer. Materials, assembly and bolting shall be in accordance with ANSI/AWWA A21.11/C-111, latest revision.

    c. Tee head nuts and bolts for mechanical joints shall be manufactured of corrosion resistant high strength, low alloy COR-TEN steel meeting the requirements of ASTM A-242, or approved equal.

    d. All cast iron and ductile iron fittings for use with PVC pipe shall be coated and lined, as specified for ductile iron pipe in Section 15062, “Ductile Iron Pipe and Fittings”, intended for similar service, as noted on the Contract Drawings.

8. Restrained Joints

    a. In accordance with the Contract Drawings, to prevent pipe joints and fittings from separating under pressure, pipe joints and fittings shall be restrained

as follows, or with EOR approved equal:

1) PVC pipe bell and spigot joints shall be restrained with the EBBA Iron MEGALUG® Series 1500 Restrainer or an equal approved by the Engineer. The restraining device and tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A-536, Grade 65-45-12. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy COR-TEN steel meeting the requirements of ASTM A-242.

2) Mechanical joint fittings used with PVC pipe shall be restrained with the EBBA Iron MEGALUG® Series 2000 PV Restrainer or an equal approved by the Engineer. The restraining device and tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A-536, Grade 65-45-12. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy COR-TEN steel meeting the requirements of ASTM A-242.

E. Clear PVC Reinforced Tubing

1. Clear PVC tubing, for chemical applications shown on the Contract Drawings, shall be nylon reinforced, PVC clear tubing.

2. The inside diameter shall be as shown on the Contract Drawings or as specified in Sections of this Project Manual.

3. Tubing shall be able to withstand a working pressure of 150 psi.

4. Tubing shall be Amaclear "R" as manufactured by Amazon Hose Rubber Company, or approved equal.

F. All ductile iron fittings and accessories for pipelines (above grade - flanged; below grade - mechanical joint) shall be compatible with the pipe.

G. PVC fittings shall meet the requirements of AWWA C-900/C-905 and be of the same, or higher, pressure rating as the pipeline.

H. PVC color shall be in accordance with the Contract Documents.

3. EXECUTION

3.1 Storage and Handling of PVC Pipe

A. Delivery, Storage and Handling of PVC pipe shall follow the requirements of Article 1.7 of this Section.

3.2 Installation of PVC Pipe and Fittings

A. No single piece of pipe shall be laid unless it is straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than $^{1}/_{16}$-inch per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the pipe manufacturer shall be explicitly followed.

B. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner.

C. All PVC pipe and fittings and cast or ductile iron fittings shall be laid in accordance with the pipe manufacturer's published installation guide, the AWWA Manual of Practice No. M23, "PVC Pipe - Design and Installation" and the Uni-Bell Plastic Pipe Association installation recommendations.

D. In preparation of pipe installation, placement (stringing) of pipe should be as close to the trench as practical on the opposite side of the trench from the excavated material. The bell ends of the pipe should point in the direction of the work progress.

E. Pipe and fittings shall be laid accurately to the lines and grades indicated on the Contract Drawings or as indicated by the Engineer. Care shall be taken to insure a good alignment both horizontally and vertically and to give the pipe a firm bearing along its entire length. Any pipe that has its grade or joint disturbed after laying shall be taken up and re-laid.

F. All pipe and fittings shall be cleared of sand, dirt and debris before laying. All precautions shall be taken to prevent sand, dirt or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any sand, dirt or other foreign material that enters the pipe shall be removed fro the pipe immediately. The interior of all pipe and fittings shall be kept clean after installation until accepted in the complete work.

G. Any time that pipe installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by a watertight plug or other method approved by the Engineer. Plugs shall remain in the pipe ends until all water is removed from the trench. No pipe shall be installed when trench conditions are unsuitable for such work, including standing water, excess mud, rain or snow.

H. Good alignment shall be preserved during installation. The deflection at joints shall not exceed that recommended by pipe manufacturer. Fittings, in addition to those shown on the Contract Drawings, shall be provided, if required, in crossing utilities which may be encountered upon opening the trench.

I. <u>Field Cutting of PVC Pipe</u>

1. Field cutting of pipe shall be done in a neat workmanlike manner without

creating damage to the pipe. The pipe shall be cut square with a fine-toothed hand or power saw or other cutter or knife designed for use with plastic pipe.

2. Prior to cutting, the pipe shall be marked around its entire circumference or a square-in vise shall be used to ensure the pipe end is cut smooth at right angles to the axis of the pipe.

3. Remove burrs by smoothing edges with a knife, file, or sandpaper.

4. Bevel the cut end of the pipe with a pipe beveling tool, wood rasp or portable sander to prevent damage to the gasket during joint assembly. A factory finished beveled end should be used as a guide to ensure a proper beveling angle and correct depth of bevel. Round off any sharp edges on the leading edge of the bevel with a knife or file.

J. Any pipe having defective joint surfaces shall be rejected, marked as such and immediately removed from the job site.

K. Each length of the pipe shall have the assembly mark aligned with the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place.

L. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.

M. Precautions shall be taken to prevent flotation of the pipe in the trench.

N. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below top of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, pipe bedding shall be placed to fill any voids created and the backfill shall be recompacted to provide uniform side support for the pipe.

3.3 Jointing PVC Pipe (Push-On Type)

A. **Pipe shall be laid with bell ends looking ahead**.

B. The PVC bell and spigot joint shall be assembled in accordance with the pipe manufacturer's installation instructions, ASTM D-2774, and AWWA Manual M-23. Clean the interior of the bell, the gasket, and the spigot of the pipe to be jointed with a rag to remove any dirt or foreign material before assembling. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation.

C. Lubricate the spigot end of the pipe with a lubricant supplied or specified by the pipe manufacturer for use with gasketed PVC pipe in the application being installed

(potable water, wastewater, effluent, or reclaimed water). The lubricant should be applied as specified by the pipe manufacturer. After the spigot end is lubricated, it must be kept clean and free of dirt and sand. If dirt and sand adhere to the lubricated end, the spigot must be wiped clean and relubricated.

D. Insert the spigot into the bell so that it contacts the gasket uniformly. Align the pipe sections and push the spigot end into the bell until the manufacturer's reference mark on the spigot is flush with the end of the bell. The pipe should be pushed into the bell using a bar and block. The joint shall not be assembled by "stabbing" or swinging the pipe into the bell, nor shall construction machinery be used to push the pipe into the bell.

E. If undue resistance to insertion of the spigot end is encountered or if the reference mark does not reach the flush position, disassemble the joint and check the position of the gasket. If the gasket is twisted or pushed out of its seat, inspect the components, repair or replace damaged items, clean the components, and repeat the assembly steps. Be sure the pipe is in proper alignment during assembly. If the gasket was not out of position, check the distance between the spigot end and the reference mark and relocate the mark if it is out of position.

F. The weight of valves and fittings shall not be carried by the PVC pipe. The valve or fitting shall be supported by a concrete cradle as shown on the standard details. Concrete for the cradle shall be poured against undisturbed soil.

3.4 Jointing Mechanical Joint Fittings

A. Mechanical joints at valves, fittings and where designated shall be in accordance with the AWWA C-111 and the instructions of the pipe manufacturer. Suitable PVC to cast iron adapters shall be installed prior to installing fittings. PVC beveled spigots shall be cut flush prior to insertion in mechanical joint pipe. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts.

B. Bolts shall be tightened to the specified torques. Under no condition shall extension wrenches or pipe over handle of ordinary ratchet wrench be used to secure greater leverage.

3.5 PVC Joint Assembly for Threaded and Solvent Welded Pipe

A. All threaded and solvent welded joints shall be made watertight in accordance with ASTM D-2855, ASTM D-2564, and AWWA Manual M-23. All pipe cutting, threading, and jointing procedures for threaded and solvent welded PVC pipe joints shall be in strict accordance with the pipe and fitting manufacturer's printed installation instructions. Thread lubricant for threaded joints shall be teflon tape only.

B. At threaded joints between PVC and metal pipes, the metal side shall contain the socket end and the PVC side the spigot. A metal spigot shall not, under any circumstances, be screwed into a PVC socket.

C. The Contractor shall make sure that the proper cement is used with the proper pipe and fittings. Never use CPVC cement on Type I PVC pipe or, conversely, never use PVC cement on CPVC pipe and fittings.

3.6 Restrained Joints

A. Restrained joints shall be made in strict, complete accordance with the manufacturer's recommendations.

B. All piping shall be restrained as indicated on the Contract Drawings.

C. All fittings shall be restrained.

D. In cases where the calculated required length of restrained pipe is not evenly divisible by nominal laying lengths of pipe, the total required length of restrained pipe shall be rounded up to the next closest nominal length that is evenly divisible by the standard laying length.

3.7 Field Painting

A. Pipe normally exposed to view shall be painted and marked as specified in Section 09900, "Painting" and Section 09905, "Piping, Valve and Equipment Identification System".

3.8 Separation of Non-Potable Water Mains and Potable Water Mains

A. Horizontal Separation

1. Existing and proposed water and wastewater or non-potable force mains shall be separated at least six (6) feet horizontally.

2. Horizontal separation between water mains and wastewater or non-potable force mains must always be a minimum of six (6) feet unless a closer than separation has been specifically detailed on the Contract Drawings that have been approved under the FDEP Permit.

B. Vertical Separation

1. Parallel Lines

a. Whenever potable water and non-potable water lines (reclaimed, sanitary, stormwater, force mains) run parallel and do not meet the horizontal separation requirements, then the lines shall be vertically separated with the potable water line at least eighteen (18) inches above the top of the non- potable lines.

2. Crossings

a. Force mains crossing water mains shall be installed to provide a minimum

vertical distance of eighteen (18) inches measured from the outside of the potable water line to the outside of the non-potable line. The potable water line may be either above or below the non-potable line at crossings. The constructed pipeline shall be installed so that the pipeline joints are as far from the crossing as possible.

3.9 Concrete Pipe Encasement

A. Concrete for concrete pipe encasement shall have a minimum strength of 3,000 psi at twenty-eight (28) days and encasement shall be constructed in accordance with details shown on the Contract Drawings. Encasement shall be constructed where:

1. Indicated on the Contract Drawings.

2. Piping is laid under buildings, structures and structure pads.

B. The points of beginning and ending of concrete pipe encasement shall not be more than six (6) inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the erects of superimposed live loads.

C. Pipe encasement, if necessary shall provide a minimum coverage of twelve (12) inches all around the pipe including pipe bells.

3.10 Connection to Existing Water, Wastewater and Reuse Systems

A. The Contractor shall coordinate making connection of the new mains to mains which are in service at the time of construction with the Owner.

B. The Contractor shall not connect to existing facilities unless the Engineer and a representative of the Owner are present.

C. Operation of all system valves shall be the responsibility of the Owner's personnel only. At no time shall the Contractor operate any system valves. System valves shall be defined as any valve which has main pressure against either side of the valve. The Contractor shall notify the Owner to request that a valve be operated, in writing, at least twenty-four (24) hours prior to the time operation is required.

3.11 Cleaning and Flushing of Pipelines

A. Following the hydrostatic and leakage tests, all the mains constructed under this Contract shall be cleaned and flushed to remove sand, loose dirt, and other debris. The minimum flushing velocity shall be 2.5 feet per second. Flushing shall continue until clean water flows from the main. However, the Contractor shall endeavor to use the minimum amount of flushing water required to complete the work.

B. Upon completion of testing for the gravity drain line system, drain lines shall be flushed to remove dirt, sand, stones, and other debris which may have entered the lines during construction and settled out in the lines and/or manholes. Materials and debris flushed from the drain lines shall be removed from a downstream manhole, basin or lift station and disposed of at an approved disposal area.

C. Temporary blowoffs may be required for the purpose of flushing mains. Temporary blowoffs shall be installed as close as possible to the ends of the main being flushed. Blowoffs installed on the main shall be the same diameter as the main. Temporary blowoffs shall be removed and plugged after the main is flushed. All costs for installing and removing temporary blowoffs shall be at no additional cost to the Owner.

D. Blowoffs and temporary drainage piping used for flushing shall not be discharged into any gravity sewer or pumping station wetwell. The Contractor shall obtain prior approvals from the Engineer and the Owner as to the methods and locations of flushing water discharge.

3.12 Disinfection of Potable Water Pipelines

A. Before any portion of the potable water piping systems is to be placed in service, it shall be disinfected; and its disinfection shall be demonstrated by bacteriological tests conducted in accordance with Standard Methods for Examination of Water and Wastewater, latest edition, for the coli-aerogenes group, by an approved laboratory, acceptable to the Engineer and the County Health Department.

3.13 Pressure Testing of Pipe

A. After installation, the pipe shall be tested for compliance with the specifications. The Contractor shall furnish all necessary equipment and labor for the pressure test and leakage test on the pipelines.

B. Pressure testing of pipeline shall be in accordance with Section 15044, “Pressure Testing of Piping”.

END OF SECTION

SECTION 15100

VALVES AND APPURTENANCES

1. GENERAL

1.1 Description

A. The Work included in this Section consists of furnishing all labor, equipment, materials, and incidentals required to install and test, complete and ready for operation, all valves and appurtenances as shown on the Contract Drawings and as specified herein.

B. The equipment shall include, but is not limited to, the following:

1. Gate Valves

2. Pressure Relief Valves

3. Backpressure Sustaining Valves

4. Valve Boxes

C. General Design

1. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of water, air, chemicals, etc., depending on the application.

1.2 Quality Assurance

A. All types of valves and appurtenances shall be the products of well established reputable firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

B. Compliance with Standards

1. Valves and appurtenances shall meet the requirements of the following applicable standards that shall be made a part of the Contract Documents by reference:

a. American Water Works Association (AWWA).

b. American Society for Testing and Methods (ASTM)

c. American National Standard Institute (ANSI)

d. American Society of Mechanical Engineers (ASME)

1) ASME B31.9 for building services piping valves

2) ASME B16.10 and B16.34 compliance for ferrous valves (dimension and design criteria).

e. National Sanitation Foundation (NSF)

1) NSF 61 for valve materials for potable water use.

C. Valving and Appurtenance Inspection

1. The Contractor shall obtain from the valve and appurtenance manufacturer's, a certificate of inspection to the effect that the equipment supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications.

2. All valving and appurtenances shall be subject to visual inspection at the time of delivery by rail or truck and also just before they are installed. Equipment that does not conform to these specifications will be rejected and must be removed immediately by the Contractor and shall be replaced at no additional cost to the Owner.

3. The entire product of any plant may be rejected when, in the opinion of the Engineer, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce valves or appurtenances.

1.3 Submittals

A. All shop drawings shall be submitted to the Engineer for approval in accordance with Section 01300, "Submittals", prior to construction.

B. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval prior to ordering of materials. The valve manufacturers shall certify, in writing, that the valve design and materials of construction are suitable for the intended service.

C. Shop drawings for valves and appurtenances shall include, at a minimum, the following:

4. Certified Dimensional Drawings of all piping, fittings, valves and appurtenances.

5. A separate shop drawing submittal will be required for each major item and for each different type of an item within a major item. For example, separate submittals will be required for butterfly, plug, ball, solenoid, check, and automatic air release valves. All submittals shall be in accordance with the

General and Supplementary Conditions and Section 01300, “Submittals”.

D. Quality Control Submittals

1. Certificate of Compliance for:

   a. Electric Operators: Full compliance with AWWA C-540

   b. Butterfly Valves: Full compliance with AWWA C-504

   c. Plug Valves: Full compliance with AWWA C-517

2. Test and inspection data.

3. Manufacturer’s certificate of proper installation and check-out.

4. Operation and Maintenance Manuals.

E. Submit manufacturer’s catalog data and detail construction sheets showing all valve parts. Describe each part by material of construction, specification (such as AISI, ASTM, SAE, CDA, etc.), and grade and type. Identify each valve by tag number to which the catalog data and detail sheets pertain.

F. Show valve dimensions including layout lengths. Show port sizes. Show dimensions and orientation of valve actuators, as installed on the valve. Show the location of internal stops for gear actuators. State differential pressure and fluid velocity used to size the actuators. For worm gear actuators, state the radius of the gear sector in contact with the worm and state the handwheel diameter.

G. Show valve linings and coatings and submit the manufacturer’s catalog data and descriptive literature.

H. Submit three (3) copies of a report verifying that the valve interior linings and exterior coatings have been tested for holidays and lining thickness. Describe test results and repair procedures for each valve. Do not ship valves to the Project Site until the reports have been returned and marked either “Approved” or “Approved as Noted”.

I. For butterfly and eccentric plug valves, show the clear diameter or size of the port. Show the actual area of the port as a percentage of the area as calculated for the nominal valve size.

J. Acceptance of Material and Certifications

1. The Manufacturer/Supplier shall furnish a certified Affidavit of Compliance for all valves, appurtenances and other products or materials furnished under this Contract complies with all applicable provisions of current AWWA, ASTM, NSF and ANSI standards, and these specifications.

2. No valves and/or appurtenances will be accepted for use in the Work on this project until the Affidavit has been submitted.

K. Submit O&M Manuals for valves, appurtenances and other products and materials requiring periodic maintenance and/or explanation of operation.

1.4 Delivery, Storage and Handling

A. All valves and appurtenances shall be handled in such manner as to ensure a sound undamaged condition during shipping, delivering, and installing.

B. Care shall be taken not to injure the valve and/or appurtenance coating and/or lining.

C. The Contractor shall exercise care when handling lined valves and appurtenances.

D. The insides of valves and appurtenances shall be kept free of dirt and debris.

1.5 Job Conditions

A. Water in Excavation

1. Water shall not be allowed in the trenches while underground valves and/or appurtenances are being laid and/or tested.

2. The Contractor shall not open more trench than the available pumping facilities

are able to dewater to the satisfaction of the Engineer. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working.

3. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the valves and appurtenances. If on completion of the work any such materials has entered either valves or appurtenances, it must be cleaned as directed by the Engineer so that the entire system will be left clean and unobstructed.

2. PRODUCTS

2.1 General

A. Install valves complete with operating handwheels or actuators, levers, chain wheels, extension stems, floor stands, gear operators, operating nuts, chains, wrenches and accessories required for operation.

B. All valves and appurtenances shall be of the size shown on the Contract Drawings and all equipment of the same type shall be from a single manufacturer.

C. All valves and appurtenances shall have the name of the manufacturer, size of the valve and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.

D. All bolts, washers and nuts shall be Type 304 stainless steel.

2.2 Finishes

A. Potable Water

1. Epoxy Lining and Coating:

a. An epoxy lining and coating shall be applied to all potable water valves and appurtenances in accordance with AWWA C-550, unless otherwise specified and NSF approved.

b. Either two-part liquid material or heat-activated (fusion) material shall be used, except only heat-activated material shall be used if the specifications call for “fusion” or “fusion bonded” epoxy.

c. A minimum seven (7) mil dry film thickness shall be provided except where limited by valve operating tolerances.

2. Exposed Valves:

   a. Exposed valves shall be coated in accordance with Section 09900, “Painting”.

   b. Safety isolation valves and lockout valves with handles, handwheels or chain wheels shall be painted “safety yellow”.

B. Raw Wastewater, Secondary Effluent and Reclaimed Water

1. Exterior Coating for Buried Valves and Appurtenances:

   a. All exterior surfaces of valves and appurtenances shall be clean, dry and free from rust and grease before coating.

   b. Valves and appurtenances to be installed underground shall be coated on the exterior at the factory with a two (2) coat coal tar epoxy system with a minimum total finish dry film thickness of twenty (20) mils.

   c. Prior to back filling, all uncoated nuts, bolts, glands, rods, and other parts of joints for underground installation shall be coated in the field with coal tar epoxy equal to Koppers Bitumastic No. 300-M.

2. Exterior Coating for Exposed Valves and Appurtenances:

   a. All exterior surfaces of valves and appurtenances shall be clean, dry and free from rust and grease before coating.

   b. For valves and appurtenances installed above-ground, the exterior ferrous parts of all valves shall be shop primed at the factory with one (1) coat, minimum dry film thickness of four (4) mils, of a lead/chromate free, rust-inhibitive universal epoxy primer. The primer shall be suitable for the finish paint specified. Following installation, all above-ground valves shall be finish painted.

   c. Exposed piping shall be painted in accordance with Sections 09900, “Painting” and 09905, Piping, Valve and Equipment Identification System”.

3. Interior Valve and Appurtenance Lining:

   a. The interior of the valve body and valve disc shall be coated with a two-coat fusion bonded or thermosetting epoxy coating in accordance with AWWA C-550, latest revision.

   b. The coating shall be NSF approved, with a minimum thickness of six (6) mils. Surfaces shall be clean, dry, and free from rust and grease before coating.

2.3 Gate Valves (GV)

A. General

1. Gate valves shall have a clear waterway equal to the nominal diameter of the pipe when fully open.

2. The opening nut or wheel shall have an arrow cast in the metal indicating the direction of the opening. Each valve shall have the manufacturer's distinctive markings, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by applying to it a hydrostatic pressure equal to twice the specified working pressure.

3. Hydrostatic and leakage testing shall be conducted in strict accordance with ANSI/AWWA C-500, latest revision or ANSI/AWWA C-509, latest revision whichever is applicable.

4. All gate valves which are installed on pipe sizes larger than three (3) inches shall have mechanical joint or flanged ends to fit the pipe run in which they are to be used. Flanged valves shall be faced and drilled to the ANSI 125/150 pound standard. Mechanical joint ends shall be to the AWWA Standard C111-72. Gate valves installed on pipes three (3) inches and smaller shall have slip on joints or screwed ends. Screwed ends shall be to the NPT Standard.

5. Gate valves shall open left or counter-clockwise when viewed from the stem.

6. Buried gate valves shall be furnished with two (2) inch square AWWA standard nut operators with a valve box and cover. Gate valves located above ground or inside structures shall be furnished with handwheel operators and shall have a suitable indicator arrow to give the valve position from fully open to fully closed.

B. Bronze Gate Valves: Aboveground - Two (2) inches and Smaller

1. The aboveground gate valves, two (2) inches in size and smaller, for water and air service, shall be Class 150 all bronze valves conforming to Federal Specification WW-V-54d, Type 1, Class B designed for a non-shock water pressure of 300 psi at a working temperature of 200°F.

2. Bronze for the valve body and internals shall be in accordance with ASTM B 16.18.

3. Valves shall be furnished with screwed ends, handwheel operator (aluminum or brass), non-rising stem, one-piece solid wedge disc and screwed bonnet.

4. Packing shall be teflon or kevlar aramid fiber.

5. Valves shall be as manufactured by Crane, Powell, or an approved equal.

6. The minimum weight of valves shall be as follows:

Valve Size (Inches)	Valve Weight (Pounds)
½	1
¾	1.5
1	2.5
1¼	3.6
1½	4.6
2	7.6

C. Iron Gate Valves: Two (2) inches and Larger

1. Iron gate valves shall open by turning to the left (counter-clockwise), when viewed from the stem. When fully open, gate valves shall have a clear waterway equal to the nominal diameter of the pipe. The operating nut or hand wheel shall have an arrow cast in the metal indicating the direction of opening. Each valve shall have the manufacturer's distinctive marking, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by applying to it a hydrostatic pressure equal to twice the specified working pressure. Hydrostatic and leakage tests shall be conducted in strict accordance with ANSI/AWWA C-500 or ANSI/AWWA C-509, latest revisions, whichever is applicable.

2. Gate valves with nominal sizes from 2 to 2 ½ inches shall conform to ANSI/AWWA C-500, latest revision, and shall be designed for a minimum working pressure of 200 psi. Valves shall be iron body, bronze-mounted, double disc, parallel seat, non-rising stem type with double, Buna-N, O-ring stem seals. Bronze items of construction shall include the stems, seat rings, stem nuts, wedge bushings, and upper and lower wedges. Bronze used for construction of these items shall be low zinc alloy bronze. Valve ends shall be screwed and as specified for steel pipe and fittings. Interior ferrous surfaces of the valve, except for finished or bearing surfaces, shall be coated with a two-part fusion bonded or thermosetting epoxy coating in accordance with AWWA C-550, latest revision. The coating shall be holiday-free, NSF approved, with a minimum thickness of sixteen (16) mils. Surfaces shall be clean, dry, and free from rust and grease before coating. Exterior surfaces shall be coated as specified hereinafter. Operators shall be handwheel, lever or AWWA 2-inch square nut as required and approved by the Engineer. Gate valves for this size range shall be as manufactured by Mueller Company, Dresser Industries, Inc., American Valve and Hydrant Valve Company, Kennedy Valve Manufacturing Company, Pratt Valves, or equal.

3. Gate valves with nominal sizes greater than three (3) inches shall conform to ANSI/AWWA C-509, latest revision, and shall be designed for a minimum working pressure of 200 psi. Valves shall be of the iron body resilient seat type with O-ring stem seals. The valve stem, stem nut, glands, and bushings shall be bronze. The valve disc shall be constructed to assure uniform seating pressure between the disc seat ring and body seating surface. The bottom seating surface shall be machined. The resilient seat of valve shall be formed by replaceable resilient seat ring seals made from internally reinforced molded

rubber which are attached to the disc ring with stainless steel screws, or by a special corrosion and chlorine resistant, synthetic elastomer that is permanently bonded to and completely encapsulates a cast iron valve disc. Valve ends for underground installation shall be of the mechanical joint type as specified for ductile iron pipe and flanged for above-ground valves. Resilient-seated type gate valves shall be manufactured by Mueller Company, Dresser Industries, Inc., American Valve and Hydrant Valve Company, Kennedy Valve Manufacturing Company, Pratt Valves, or equal.

4. Valve Joints:

   a. All gate valves shall have either mechanical joint, restrained joint, or flanged ends to fit the pipe run in which they are to be used.

   b. Gate valves installed on push-on joint pipe shall have mechanical joint ends unless otherwise specified.

5. Valve Operators:

   a. Unless otherwise shown on the Contract Drawings or specified herein, gate valves shall have non-rising stems.

   b. Buried gate valves shall be furnished with a two (2) inch square AWWA standard nut operator with a valve box and cover and the nut shall be brought to approximately six (6) inches from the valve box pad elevation and “pinned”.

   c. Gate valves located aboveground or inside structures shall be furnished with a handwheel operator which shall have an arrow cast in the metal indicating the direction of opening.

   d. Gate valves used as isolation valves for reduced pressure back flow preventers shall be of the open screw and yoke (OS&Y) design with a handwheel operator.

D. Gate Valves for Tapping Valves and Sleeves

1. Tapping Valves:

   a. Tapping valves shall conform to ANSI/AWWA C-500 or C-509, latest revision, and shall be designed for a minimum working pressure of 150 psi.

   b. Tapping valves three (3) inches to twelve (12) inches shall be resilient seat type gate valves as specified in Article 2.3. Resilient seat type tapping valves shall be furnished with a raised guide ring cast integrally on the flanged end which is designed to match the groove in the tapping sleeve. The purpose of this guide ring shall be to ensure true alignment of the valve with the tapping sleeve.

c. Tapping sleeves larger than twelve (12) inches shall be iron body, bronze mounted gate valves, with double disc, parallel seat and non-rising stem. The stem shall be bronze and sealed by two “O” rings. The stem nut shall be bronze and cast integrally into the top wedge. The valve disc seating mechanism shall be bottom wedging, hook and wedge type, with disc hooks and wedges as separate interacting parts. The valve shall be designed for vertical mounting in approximately level setting on buried water lines. The valve ends shall be flanged American Standard Class 125 pound steam pressure ratings on one side of the valve and mechanical joint on the other side for use with the class and type of pipe to be installed from the tapping sleeve. Tapping sleeves twelve (12) inches and larger shall be furnished with a raised guide ring cast integrally on the flanged end as specified above for resilient seat type tapping valves.

d. The valve shall open left or counter-clockwise when viewed from the stem. The valve shall be furnished with a 2-inch square AWWA standard nut operator with a valve box and cover as specified herein.

2. Tapping Sleeves:

a. Tapping sleeves shall be of the cast iron, mechanical joint type, with a working pressure rating of 200 psi for sizes four (4) inches through twelve (12) inches and 150 psi for sizes fourteen (14) inches and larger, and shall conform to the applicable sections of AWWA Standard C-110, latest revision.

b. Sleeve and glands shall be of the split-type for assembly on the pipe, and the sleeve and mechanical joint glands and gaskets shall be sized for use with the class and type of pipe being tapped. Sleeve and glands shall be standard bituminous coated, and shall be furnished complete with all accessories. The outlet flange shall be Class 125 Standard. The Contractor shall obtain approval from the Engineer for drilling machine used prior to tapping connections.

3. Operator:

a. Two (2) inch square nut or other operator specified on the Contract Drawings or by the Engineer.

4. Gate valves shall be manufactured by Mueller Company, Dresser Industries, Inc., American Valve and Hydrant Valve Company, Kennedy Valve Manufacturing Company, or equal.

5. Interior and Exterior coatings shall be in accordance with Article 2.2.

E. <u>Knife Gate Valves (KGV) - Stainless Steel</u>

1. Knife gate valves shall be resilient seated, full, round port design for high flow capacity and minimal pressure drop. The valve body port area shall not be less

than eighty percent (80%) of the nominal pipe diameter. Valves shall be designed for positive drip-tight shutoff at 150 psi. All materials of construction shall be as specified herein and shall be suitable for use with raw wastewater. The valves shall be equipped with a floor stand operator with handwheel and extensions where shown on the Contract Drawings. Provide bevel gear actuators for valves fourteen (14) inches and larger.

2. Body and Gate:

   a. The body material shall be carbon steel ASTM A-36 with a liner of Type 316 stainless steel ASTM A-240.

   b. The body shall have a lugged design drilled tapped in accordance with ANSI 150 standards.

   c. The gate shall be constructed of Type 316 stainless steel in accordance with ASTM A-240, finish ground on each side to prevent packing or seat damage.

3. Packing and Gland Material:

   a. The packing gland shall be Type 316 stainless steel in accordance with ASTM A-240.

   b. Valve packing shall be square braided PTFE impregnated synthetic fiber. Removal or replacement of the packing shall be accomplished without necessitating the removal of the valve from the pipeline.

4. Yoke Sleeve:

   a. The yoke super structure shall be constructed of ASTM A-36. The yoke sleeve shall be aluminum bronze in accordance with ASTM B-30, Alloy C84400.

   b. The bonnet shall be Type 316 stainless steel.

5. Seat Ring and Seat:

   a. The seat ring shall be Type 316 stainless steel in accordance with ASTM A-240.

   b. The resilient seat material shall be EPDM or Neoprene and shall be bonded to the seat ring.

6. The stem and gate shall be manufactured of Type 316 stainless steel in accordance with ASTM A-240.

7. Interior and Exterior coatings shall be in accordance with Article 2.2.

8. The valve shall be cast of stainless steel and shall be manufactured by DeZurik, or approved equal.

2.4 Butterfly Valves

A. General

1. Butterfly valves for shall meet or exceed the design standards of ANSI/AWWA C-504-150B, latest revision and designed for a minimum working pressure of 150 psi.

2. Valves shall be bubble tight in either direction at the rated pressure and shall be suitable for throttling and/or operation after long periods of inactivity.

3. The manufacturer shall provide the Engineer with a letter of compliance, within twenty (20) calendar days of the Notice to Proceed indicating that the valve and all materials are compatible with the liquid to flow through it and applicable for the intended use.

4. All valves shall be furnished with position indication.

5. Valve discs shall rotate 90° from the fully open position to the fully closed position.

6. Thrust Bearings:

   a. Provide thrust bearings to hold the valve disc in the center of the valve seat. No bearings shall be mounted inside the valve body within the waterway.

   b. Do not use thrust bearings in which a metal bearing surface on the disc rubs in contact with an opposing metal surface on the inside of the body.

7. Bronze Components:

   a. Bronze components in contact with water shall comply with the following requirements:

Constituent	Maximum Content (%)
Zinc	7
Aluminum	2
Lead	8
Copper + Nickel + Silicon	83

8. Port Sizes:

   a. For valves twenty-four (24) inches and smaller, the actual port diameter shall be at least ninety-three percent (93%) of the nominal valve size. For valves larger than twenty-four (24) inches, the port diameter shall not be more than 1.25- inches smaller than the nominal valve size.

   b. The dimension of the port diameter shall be the clear waterway diameter plus the thickness of the seat.

B. Valve Bodies

1. Valve bodies shall be constructed of high-strength cast iron conforming to ASTM A126, Class B or ductile iron conforming to ASTM A536.

2. Buried valves shall have integrally cast mechanical joint ends as specified for ductile iron pipe and above-ground valves shall have cast iron flanges.

3. End flanges shall conform in dimensions and drilling to ANSI B 16.1, Class 125.

4. Two trunnions for shaft bearings shall be integral with each valve body.

5. Valve body thickness shall be in strict accordance with ANSI/AWWA C-504, latest revision, for Class 150B valves.

C. Valve Seat Ring

1. The valve seat ring shall be constructed of Type 316 stainless steel. The seating edges of the seat ring shall be smooth and polished.

2. The seat ring shall be capable of compensating for changes in direction of flow to assure a bubble tight seal in either direction.

D. Valve Discs

1. Valve discs shall be solid (no cores) for 24-inch and smaller valves; and shall be either solid or hollow core for valves greater than 24-inch. Valve discs shall be constructed of ductile iron in conformance with AWWA C-504.

2. The valve disc shall be of the offset type design to provide 360° uninterrupted seating.

E. Valve Shafts

1. Valve shafts may consist of a one piece unit extending completely through the valve disc bearings and into the operating mechanism or may be of the "stub shaft" type, which comprises two separate shafts inserted into the valve disc

hubs. If used, stub shafts shall extend a minimum of 1½ shaft diameters into the valve disc hubs.

2. Valve shafts shall be constructed of Type 304 stainless steel or a stainless steel with greater overall corrosion and oxidation resistance.

3. The minimum shaft diameter shall conform to ANSI/AWWA C-504, latest revision, for Class 150B valves.

4. The valve disc shall be attached to the shaft by means of "O" ring sealed taper pins.

5. The valve shaft seal shall consist of "O" rings in bronze cartridge or self adjusting nitrile Vee-type ring seals.

F. Valve Seats

1. Valve seats shall be of a corrosion and chlorine resistant synthetic rubber compound bonded to a high grade stainless steel retaining ring and secured to the valve disc by Type 316 stainless steel set screws or shall be molded in, vulcanized, and bonded to the body.

2. Seats bonded to the body shall withstand a 75-pound pull tested in accordance with ASTM D429, Method B.

3. The valve seat shall be adjustable and replaceable in the field without dismantling operator, disc, or shaft.

G. Valve Bearings

1. Valve shafts shall be fitted with sleeve-type bearings.

2. Bearings shall be corrosion resistant and self-lubricating (Nylon or Teflon).

3. Bearings shall be designed for a pressure not exceeding the published design load for the bearing material, or 1/5 of the compressive strength of the bearing or shaft material.

H. Valve Operators

1. All butterfly valves shall open left or counter-clockwise (CCW) when viewed from the stem. Automatic valve operators shall have motorized valve actuators as specified hereinafter. Manual valve operators shall be of the worm gear or traveling nut type and shall be fully enclosed suitable for buried or submerged service.

2. All operators shall have adjustable mechanical stop limiting devices to prevent over travel of the disc. Should an adjustment of the disc be required to maintain a bubble tight seal, this adjustment shall be made externally without removing

the operator housing cover. The operator shall be designed such that all adjustments can be made under pressure and without the possibility of dirt getting into the operator lubricant. Any adjustments through the lower shaft will not be acceptable.

3. Units furnished for buried service shall be fully gasketed and grease packed.

4. Manual valves located above ground and above grating shall be equipped with handwheel or chainwheel operators and shall have a suitable indicator arrow to give valve position from “fully open” to “fully closed”.

5. Buried butterfly valves and valves below grating shall be furnished with a two (2) inch square AWWA nut operator with valve box and cover. The stems shall be “pinned” and shall bring the 2-inch square nut to approximately six (6) inches from the finished valve pad elevation. Operator components shall, at the extreme operator positions, withstand without damage a pull of 200 lbs. for handwheel or chainwheel operators or an input torque of 300 ft-lbs. for operating nuts.

I. Interior and Exterior coatings shall be in accordance with Article 2.2.

J. Valve Testing

1. Prior to shipment from the factory, hydrostatic and leakage tests shall be conducted on each butterfly valve. Hydrostatic and leakage tests shall be conducted in strict accordance with ANSI/AWWA C-504, latest revision, and results shall be submitted to the Engineer.

2.5 Ball Valves

A. PVC Ball Valves

1. General:

a. All PVC ball valves ½-inch through 4-inch in size shall be of one piece capsule type manufactured of Type I, Grade 1 PVC.

b. All ball valves shall be true union design with two-way blocking capability and shall have solvent welded socket or NPT threaded ends.

c. All ball valves shall be designed for a 150 psi water working pressure at 120°F.

d. Manually operated ball valves shall be supplied with an ABS lever operating handle. Motorized ball valves shall be equipped with an electric actuator as specified hereinafter.

2. PVC Ball Valves for Anti-Scalant, Sodium Hydroxide, Hydrofluosilicic Acid, Phosphate Inhibitor and Ammonia:

a. The ball valves shall be manufactured with Teflon seats.

b. Seals shall be EPDM except for use with Hydrofluosilicic Acid and chlorine service which shall be Viton.

c. The valves shall be provided with double unions and a ball blocking feature.

d. The operator type shall be a manually operated ABS lever handle.

e. PVC ball valves shall be manufactured by Plast-O-Matic, Asahi/America, Hayward, or an approved equal.

3. PVC Ball Valves Used with Halar (ECTFE) Sulfuric Acid Piping Systems:

a. The ball valves shall be of the diaphragm type manufactured of Halar with Teflon seats and diaphragm material.

b. The valve shall be flanged and provide a bubble-tight closure at the operating pressure and temperature.

c. The operator type shall be a manually operated ABS lever handle.

d. PVC ball valves shall be manufactured by Plast-O-Matic, Asahi/America, Hayward, or an approved equal.

4. PVC Ball Valves Used with Teflon-Lined Carbon Steel Sulfuric Acid Piping Systems:

a. The ball valves shall be of the plug type manufactured of a carbon steel body with a solid one piece Teflon PFA lining and a Teflon PFA encapsulated plug. The Teflon lining shall line all wetted surfaces and the flange faces. The valve shall provide in-line reseating of the plug. The exterior body shall have a factory applied chemically resistant coating that is resistant to sulfuric acid. The valve shall be flanged.

b. The valve shall be flanged and provide a bubble-tight closure at the operating pressure and temperature.

c. The operator type shall be a manually operated ABS lever handle.

d. PVC ball valves shall be manufactured by Flowserv, Mueller Chem-Plug, Richter or approved equal.

5. PVC Ball Valves for Bulk Sodium Hypochlorite:

a. The ball valves shall be manufactured of Grade I, Type 1 PVC and shall be of the true union design with a two-way blocking capability.

b. All O-rings shall be Viton with Teflon seats. Teflon seats shall have an elastomeric backing cushion of the same material as the valve seals.

c. The stem shall have double O-rings and be of the blowout-proof design.

d. The addition of a 1/8-inch vent hole drilled and deburred by the manufacturer is required (relief orifice to prevent the build-up of pressure from chemical trapped within the valve). The valve shall be installed with the vent hole on the upstream side of the system to keep the cavity of the ball fluidized.

e. The valve handle shall double as carrier removal and/or tightening tool.

f. The operator type shall be a manually operated ABS lever handle or an electric motorized operator where identified on the Contract Drawings.

g. PVC ball valves shall be manufactured by Asahi/America DuoBloc-21 or an approved equal.

6. Standard PVC Ball Valves for Water and Reclaimed Water Service:

a. All PVC ball valves ½-inch through 4-inch in size shall be of one piece capsule type manufactured of Type 1, Grade 1 PVC.

b. Ball valves shall be true union design with two-way blocking capability and shall have solvent welded socket or NPT threaded ends.

c. Ball valves shall have Teflon seats with Viton backing cushions and Viton O-ring seals, and shall be designed for a 150 psi water working pressure at 120°F.

d. Manually operated valves shall be supplied with ABS lever operating handles. Motorized ball valves shall be equipped with an electric actuator as specified hereinafter.

e. PVC ball valves shall be manufactured by Plast-O-Matic, Asahi/America, Hayward, or an approved equal.

B. Stainless Steel Ball Valves

1. Stainless steel ball valves shall be of the standard port type with flanged connections for the sizes indicated on the Contract Drawings or specified herein.

2. Stainless Steel ball valves shall be designed for a working pressure of 200 psi with positive shut off when in the closed position.

3. The valve shall be a one (1) piece, Grade CF-8M, Type 316 stainless steel body, ANSI B16 with a solid Type 316 stainless steel ball and stem.

4. The seats and seals shall be Teflon.

5. The ball shall have a full bore port design machined from a solid metal piece with highly polished surfaces.

6. Manually operated ball valves shall be furnished with level operators manufactured of forged Type 316 stainless steel with a molded vinyl sleeve.

7. Stainless steel ball valves shall be manufactured by KTM, DeZurik, Neles-Jamesbury, or an approved equal.

C. Electric Actuator for PVC Ball Valves

1. Where indicated on the Contract Drawings, PVC ball valves shall be provided with an electric actuator. The actuator shall be matched to the valve and shall have sufficient operating torque to operate the valve for its maximum expected breakaway torque.

2. The actuator shall be capable of full 90° actuation within ten (10) seconds. The actuator shall be UL listed and suitable for 120 volt AC, 60 Hz, one-phase electric power, and shall be provided with a corrosion-resistant, NEMA 4 enclosure.

3. The valve actuator shall be provided with a manual operator override which is disengageable such that the valve cannot be operated electrically while the manual override is engaged.

4. The actuator shall be furnished with a high torque, reversible, brushless, capacitor run, heavy duty motor with built-in motor overload protection, and gears and shafts shall be heat treated, high allow steel.

5. The unit shall be permanently lubricated and travel limit switches shall be independently adjustable. The actuator shall be provided with an integral electrical terminal strip, position indicator, over-torque protection, and travel limit switches for position light operation.

6. The valve actuator enclosure shall be provided with a combination heater and thermostat to maintain the case interior above 40°F.

7. Two additional limit switches shall be provided to energize and de-energize a pump interlocked with the valve.

2.6 Diaphragm Valves

A. Diaphragm Valves for Anti-Scalant, Sodium Hydroxide, Hydrofluosilicic Acid, Phosphate Inhibitor and Ammonia

1. The diaphragm valves shall be constructed on Type I, Grade I PVC with Teflon seats.

2. The diaphragm shall be EPDM except for use with Hydrofluosilicic Acid and chlorine service which shall be Viton.

3. The valve shall be provided with double unions and a bubble-tight closure at the operating pressure and temperature.

4. Diaphragm valves shall be manufactured by Asahi/America, Simtech, or an approved equal.

B. Diaphragm Valves Used with Halar (ECTFE) Sulfuric Acid Piping Systems

1. The diaphragm valves shall be constructed of Halar with Teflon seats.

2. The diaphragm material shall be teflon.

3. The valve shall be flanged and provide a bubble-tight closure at the operating pressure and temperature.

4. The diaphragm valves shall be manufactured by Asahi/America, or an approved equal.

C. Diaphragm Valves for Bulk Sodium Hypochlorite

1. The diaphragm valves shall be manufactured of Grade I, Type 4 PVC with Teflon seats for use with twenty percent (20%) bulk sodium hypochlorite.

2. Diaphragms shall be PTFE and shall accept the installation of a PVDF gas barrier between the layers of EPDM and PTFE.

3. The valve shall be flanged and provide a bubble-tight closure at the operating pressure and temperature.

4. The valves shall come standard with a position indicator, travel stop, and bonnet O- ring sealing arrangement.

5. The operator shall be a handwheel with capped indicator stem.

D. Bronze Angle Hose Valves

1. Angle-type hose valves, less than two (2) inches in size, shall have a brass or bronze body (ASTM B-62 or ASTM B-584, Alloy C83600) with rising or non-rising stem, composition disc, and bronze or malleable iron handwheel.

2. The stem shall be bronze, ASTM B-62, ASTM B-584 (Alloy 83600), or ASTM B-198 (Alloy 87600).

3. The valve shall have a cold water service pressure rating of 150 psi.

4. Provide a cap and chain with the valve.

5. Threads on the valve outlet shall be American National Standard fire hose coupling screw thread.

6. Valves shall be Nibco T-301-HC, Powell Figure 151 with Figure 527 nipple adapter, Crane 17TF with hose nipple adapter, or approved equal.

E. Bronze Hose Bibbs

1. Hose bibbs of size ½-inch, ¾-inch and 1-inch shall be all bronze (ASTM B-62 or ASTM B-584, Alloy C83600) with rising or non-rising stem, composition disc, and bronze or malleable iron handwheel.

2. The stem shall be bronze, ASTM B-99, Alloy 651; ASTM B-371, Alloy C69400; or ASTM B-584, Alloy 87600. The packing shall be Teflon or graphite.

3. The valve shall have a cold water service pressure rating of 150 psi.

4. Provide a cap and chain with the valve.

5. Threads on the valve outlet shall be American National Standard fire hose coupling screw thread (ANSI B1.20.7).

6. Provide a vacuum breaker approved by the State of Florida Health Department on each hose bibb.

7. Valves shall be Jenkins Figure 112, 113 or 372; Nibco T-113-HC; Powell Figure 503H, or approved equal.

F. Electric Actuator for Diaphragm Valves

1. Where indicated on the Contract Drawings, diaphragm valves shall be provided with an electric actuator. The actuator shall be matched to the valve and shall have sufficient operating torque to operate the valve for its maximum expected breakaway torque.

2. The actuator shall be capable of full 90° actuation within ten (10) seconds. The actuator shall be UL listed and suitable for 120 volt AC, 60 Hz, one-phase electric power, and shall be provided with a corrosion-resistant, NEMA 4 enclosure.

3. The valve actuator shall be provided with a manual operator override which is disengageable such that the valve cannot be operated electrically while the manual override is engaged.

4. The actuator shall be furnished with a high torque, reversible, brushless, capacitor run, heavy duty motor with built-in motor overload protection, and gears and shafts shall be heat treated, high allow steel.

5. The unit shall be permanently lubricated and travel limit switches shall be

independently adjustable. The actuator shall be provided with an integral electrical terminal strip, position indicator, over-torque protection, and travel limit switches for position light operation.

6. The valve actuator enclosure shall be provided with a combination heater and thermostat to maintain the case interior above 40°F.

7. Two additional limit switches shall be provided to energize and de-energize a pump interlocked with the valve.

2.7 Plug Valves

A. General

1. Plug valves shall be of the non-lubricated eccentric type for use in wastewater service with flanged or mechanical joint ends as specified herein. Valves shall open by turning to the left (counter-clockwise), when viewed from the stem. The port area of the valves shall be rectangular with a minimum of eighty percent (80%) of the full pipe area. The valves shall be capable of providing a drip-tight shutoff to the full valve rating with the pressure in either direction.

2. Plug valves shall be tested in accordance with AWWA C-517 – latest edition. Each valve shall be performance tested in accordance with AWWA requirements and shall be given a leakage test and hydrostatic test. The leakage test shall be applied to the face of the plug tending to unseat the valve. The leakage test shall be performed at the valve rating pressure as specified herein. The manufacturer shall furnish certified copies of the reports covering proof of design testing.

3. All interior ferrous surfaces of the valve that will come into contact with the wastewater shall be coated with a factory applied, thermally bonded epoxy coating in accordance with AWWA C-550, latest revision. Surfaces shall be clean, dry and free from rust, oil and grease before coating. Exterior surfaces shall be coated as specified hereinafter.

4. Valve Joints:

   a. All plug valves installed above-ground, in valve vaults or on flange piping shall have flanged ends. Flanges shall comply with facing, drilling and thickness requirements of the ANSI Standards for Class 125 dimensions.

   b. Nuts and bolts for flanged connections in valve vaults or corrosive environments shall be Type 304 stainless steel in accordance with ASTM A-320, Class 2.

   c. Nuts and bolts for above-ground installations or non-corrosive atmospheres shall be Type 304 stainless steel in accordance with ASTM A-320, Class 2.

d. All buried plug valves shall have mechanical joint ends with dimensions, bolting patterns and assembly in strict accordance with ANSI/AWWA C-111, latest revision.

e. Tee head bolts and nuts for mechanical joints shall be manufactured of CORTEN-A, high strength, low alloy, corrosion resistant steel as manufactured by NSS Industries, or an approved equal.

f. Plug valves four (4) inch in size and larger buried underground, and all plug valves six (6) inch in size and larger installed above-ground, buried or in valve vaults shall be furnished with mechanical gear actuators. Gear actuators shall be furnished with AWWA Standard 2-inch square operating nuts for buried valves, or handwheel, chainwheel or 2-inch square nut operators for above- ground or valve vault installation, as shown on the Contract Drawings. The gear actuator shall be sized for the maximum pressure differential across the valve, equal to the pressure rating of the valve. All gearing shall be enclosed in a high strength cast iron housing, suitable for running in a lubricant.

B. Prior to shipment from the factory, each valve shall be hydrostatically tested as follows. Valve seats shall be tested to provide leak tight shut off to 175 psi for valves through 12-inch and 150 psi for valves 14 inches and larger, with pressure in either direction. In addition, a hydrostatic shell test shall be performed with the plug open to a pressure twice that of rating specified above to demonstrate overall pressure integrity of the valve body.

C. Plug valves shall be eccentric plug valves as manufactured by DeZurik, Henry-Pratt Co., or approved equal.

D. Eccentric Plug Valves

1. Valve bodies and cover shall be constructed of high strength cast iron conforming to ASTM A126, Class B and AWWA C517, latest revisions. Valve bodies shall be cast with raised eccentric seats which have a corrosion-resistant welded-in overlay of not less than ninety percent (90%) pure nickel on all surfaces contacting the plug face. Valve seats shall be in accordance with AWWA C517, latest revisions.

2. Valves shall be furnished with resilient faced plugs with neoprene facing, suitable for use with wastewater or sludge. Valves shall be furnished with replaceable, permanently lubricated, stainless steel sleeve-type bearings in the upper and lower plug stem journals. Plug stem bearings shall comply with AWWA C517, latest revisions.

3. The valves shall be of the bolted bonnet design with shaft seals designed so that they can be repackaged without removing the bonnet or gear operator and the packing shall be adjustable. Packing material shall be Buna-Vee type packing. Valve shaft seals shall be in accordance with AWWA C517, latest revisions.

4. All exposed valve nuts, bolts, springs, washers, and the like shall be Type 304 stainless steel.

5. Eccentric plug valves shall be as manufactured by DeZurik, Henry-Pratt Co., or approved equal.

E. Interior and Exterior coatings shall be in accordance with Article 2.2.

F. Pressure Rating for the valves shall be in accordance with ANSI B16.1-1967 and shall be as follows:

Pipe Size (inches)	Pressure Rating (psi)
< 12	175
> 14	150

2.8 Check Valves

A. Slanting Disc Check Valves with Bottom Mounted Oil Dashpot

1. Slanting disc check valves shall conform to AWWA specifications and shall be designed for a minimum water working pressure of 150 psi. Check valves shall have a cast iron body and the ends shall be flanged, Class 125 in accordance with ANSI B16.1. The disc shall be manufactured of ductile iron, ASTM B-584, C83600. The seat ring and disc ring shall be manufactured of bronze, ASTM B-271, C92200, and must be of the design that permits replaceability in the field without need for special tools or machining. The pivot pin(s) in the body and the bushings in the disc lugs shall be stainless steel, but of different hardness to prevent galling and must conform to ASTM specifications A-582 T303 and A-269 T304, respectively. Shafts shall also be manufactured of stainless steel.

2. The flow area, through the valve body inlet and outlet, shall be equal to the pipe size, and gradually increased to an area forty percent (40%) greater than the pipe size through the valve seat. Inspection ports shall be provided upstream and downstream of the valve disc.

3. Check valves shall be supplied with an outside indicator that visually shows the disc position at all times. An electrical signal switch shall be provided with each valve which can be mounted on the indicator cover to give a remote signal indicating whether the valve is opened or closed.

4. The check valves shall be oil cushioned with a bottom-mounted dash such that it opens smoothly on pump start-up and closes at a controlled rate of speed following pump shut-down. The cushioning device shall control the valve closure by way of the interchange of oil to and from the oil reservoir. The use of an air or gas pressurized oil reservoir shall not be permitted. On start-up of the pump, the check valve disc shall open in response to the flow and then afford the minimum resistance to the flow. Upon pump shut-down, the valves shall initiate with an adjustable closing speed.

5. Check valves shall absolutely prevent the return of water back through the valve when the inlet pressure decreases below the downstream pressure. The check valve shall be constructed such that the disc and body seat ring may be easily removed and replaced without removing the valve from the line.

6. Each valve shall be hydrostatically tested at the factory, at a test pressure of 300 psi.

7. All check valves provided shall have an external valve position indicator to indicate whether the valve is opened, closed, or partially closed.

8. Interior Valve Coating:

    a. Prior to shipment from the factory, the interior ferrous surfaces of the valve, except for finished, non-ferrous or bearing surfaces, shall be coated with a fusion bonded or thermosetting epoxy coating in accordance with AWWA C- 550, latest revision.

    b. The coating shall be holiday-free, NSF approved, with a minimum thickness of sixteen (16) mils. Surfaces shall be clean, dry and free from rust and grease before coating.

9. Exterior Valve Coating:

    a. All exterior surfaces of the check valves shall be clean, dry and free from rust and grease before coating. Exterior ferrous parts of all valves shall be shop primed at the factory with one (1) coat, a minimum dry film thickness of four (4) miles, of a lead and chromate-free primer with rust inhibitive pigments and synthetic resins. The primer shall be suitable for the finish paint specified.

    b. Following installation, above ground valves, and those in vaults shall be finish painted in accordance with Section 09900, “Painting”.

B. Swing Check Valves Three inches and Larger

1. Swing check valves three (3) inches and larger shall be a cast iron body valve with bronze seat ring and bronze clapper or cast iron clapper with a bronze disc ring and of the “non-shock” type. Swing check valves shall be designed and manufactured in accordance with AWWA C-508, and shall be suitable for use on the appropriate line type (water, wastewater, reclaimed water, etc.).

2. Check valves ends shall be flanged, Class 125 in accordance with ANSI B16.1.

3. Swing check valves shall be completely bronze fitted with a renewable bronze seat ring and a rubber faced disc.

4. All bronze clapper or internal parts shall be capable of being removed from

the valve by removing the cover. Valves shall incorporate an external lever and weight unless otherwise indicated on the Contract Drawings. Valves shall be modified for installation in a vertical line with the flow up.

5. All check valves provided shall have an external valve position indicator to indicate whether the valve is opened, closed, or partially closed.

C. Globe Style Silent Check Valves - Raw Water Service

1. Globe style silent check valves shall be designed for a minimum of 150 psi working pressure and shall have a Type 60-45-10 ductile iron body with ANSI CL-150 flanged end connections. The flow area through the body shall be equal to or greater than the cross-sectional area of the pipe.

2. The valve plug and seat shall be manufactured of ASTM B-584 bronze with a BUNA-N resilient seat option. The valve plug must be centered guided at both ends with a through integral shaft and spring loaded for guaranteed silent shut-off operation. The seat and plug shall be hand replaceable in the field for ease of maintenance.

3. The spring shall be helical or conical and manufactured of Type 316 stainless steel.

4. All interior ferrous surfaces, except for finished or bearings surfaces, shall be coated with three coats, fifteen (15) mils DFT Tnemec Series 20 Interior Lining. Interior coating shall be suitable for preventing corrosion to the body from the brackish water containing up to 2,600 ppm TDS, 1200 ppm chloride and 4 ppm hydrogen sulfide flowing through the valve. The exterior of the valve shall be factory primed with a prime compatible with the finish coating specified in Section 09900, “Painting”.

D. Diaphragm Check Valves for Anti-Scalant, Sodium Hydroxide, Hydrofluosilicic Acid, Phosphate Inhibitor and Chlorine Solution

1. The diaphragm check valves shall be constructed on Type I, Grade 1 PVC with Viton diaphragms.

2. The diaphragm check valve shall utilize a normally closed design which is entirely automatic in action and shall be provided with double true unions.

3. The check valve must operate effectively in any position it is installed in.

4. The diaphragm check valve shall be designed for a minimum water working pressure of 150 psi.

E. Diaphragm Check Valves Used in Low Pressure Sulfuric Acid Piping Systems

1. The diaphragm check valves shall be constructed with a PVDF housing.

2. The diaphragm material shall be Viton.

3. The check valve must operate effectively in any position it is installed in.

4. The diaphragm check valve shall be designed for a minimum water working pressure of 150 psi.

F. Lined Ball Check Valves Used in High Pressure Sulfuric Acid Piping Systems

1. The following type of check valve shall be used with Teflon lined carbon steel piping for high pressure sulfuric acid piping systems.

2. The valve shall be a Teflon PFA lined ball check valve and shall have a ductile iron body with flanges and shall be capable of being used in either the horizontal or vertical position. The Teflon lining shall line all wetted surfaces and the flanged faces. The ball shall be fabricated of PTFE. The exterior body shall have a factory applied chemically resistant coating that is resistant to sulfuric acid.

3. The check valve must operate effectively in any position it is installed in.

4. The diaphragm check valve shall be designed for a minimum working pressure of 150 psi.

G. Diaphragm Check Valves for Low Pressure Ammonia Gas

1. The diaphragm check valves shall be constructed on Type I, Grade 1 PVC with BUNA-N diaphragms.

2. The diaphragm check valve shall utilize a normally closed design which is entirely automatic in action.

3. The check valve must operate effectively in any position it is installed in.

4. The diaphragm check valve shall be designed for a minimum water working pressure of 150 psi.

H. Tru-union Ball Check Valves for Sodium Hydroxide

1. The diaphragm valves shall be manufactured of Grade I, Type 1 PVC with Viton seats.

2. The ball check valve shall utilize a normally closed design which is entirely automatic in action.

3. The check valve must operate effectively in any position it is installed in and shall be provided with double true unions.

4. The diaphragm check valve shall be designed for a minimum water working pressure of 150 psi.

I. Double-Door Check Valves for Permeate and Concentrate

1. The double-door check valves shall be manufactured of Grade I, Type 1 PVC with Viton seals.

2. The ball check valve shall utilize a normally closed design which is entirely automatic in action. The check valve must operate effectively in any position it is installed in.

3. The diaphragm check valve shall be designed for a minimum water working pressure of 150 psi.

J. Swing Check Valves for Permeate, Cleaning Solution and Scrubber Recirculation Water

1. The swing check valves shall be manufactured of polypropylene conforming to ASTM D-4101 cell classification PP0210B67272 with EPDM seats and seals.

2. The valves shall incorporate a single disc design suitable for either horizontal or vertical installation with equal effectiveness.

3. The valves shall be of the top entry bonnet type design for maintenance purposes. The diaphragm check valve shall be designed for a minimum working pressure of 150 psi.

K. Bronze Angle Hose Valves

1. Angle-type hose valves, less than two (2) inches in size, shall have a brass or bronze body (ASTM B-62 or ASTM B-584, Alloy C83600) with rising or non-rising stem, composition disc, and bronze or malleable iron handwheel.

2. The stem shall be bronze, ASTM B-62, ASTM B-584 (Alloy 83600), or ASTM B-198 (Alloy 87600).

3. The valve shall have a cold water service pressure rating of 150 psi.

4. Provide a cap and chain with the valve.

5. Threads on the valve outlet shall be American National Standard fire hose coupling screw thread.

2.9 Pressure Relief Valves (PRV's)

A. PRV's for Sodium Hypochlorite Use

1. Pressure relief valves shall be of the in-line pattern design and manufactured of Grade 1, Type 1 PVC with Viton seals.

2. The valve shall be provided with threaded end connections.

3. The operator shall be of the “adjusting screw” type.

4. The valve shall be rated for a pressure of 100 psi.

B. PRV’s for Sodium Hydroxide Use

1. Pressure relief valves shall be of the in-line pattern design and manufactured of Grade 1, Type 1 PVC with EPDM seals.

2. The valve shall be provided with threaded end connections.

3. The operator shall be of the “adjusting screw” type.

4. The valve shall be rated for a pressure of 100 psi.

C. PRV’s for Sulfuric Acid Use

1. Pressure relief valves shall be of the angle or in-line pattern design and manufactured of Teflon with a Teflon shaft and Viton seals.

2. The valve shall be provided with threaded end connections.

3. The operator shall be of the “adjusting screw” type.

4. The valve shall be rated for a pressure of 100 psi.

D. PRV’s for Antiscalant, Hydrofluosilicic Acid and Phosphate Inhibitor Use

1. Pressure relief valves shall be of the angle pattern design and manufactured of Grade 1, Type 4 CPVC with Teflon shaft and Viton seals.

2. The valve shall be provided with threaded end connections.

3. The operator shall be of the “adjusting screw” type.

4. The valve shall be rated for a pressure of 100 psi.

2.10 Backpressure Sustaining Valves

A. The backpressure sustaining valve(s) shall throttle to maintain a pre-set pressure on the upstream side of a valve. If upstream pressure drops below the valve setting, the valve will close. Turning clockwise on the sustaining pilot handwheel will increase the setting and turning clockwise will decrease the setting. The backpressure valve shall be of the in-line pattern design and manufactured of

Teflon with Teflon wetted diaphragm, zinc plated steel spring, and HDPE adjusting screw. The valve shall be supplied with all Type 316 stainless steel fasteners.

B. The operator shall be of the “adjusting screw” type.

C. The valve shall be rated for a pressure of 150 psi.

D. The valve shall be provided for use with sulfuric acid.

2.11 Isolation Valves

A. Isolation valves shall be provided for the following services: water, sulfuric acid, anti- scalant, hydrofluosilicic acid, sodium hydroxide, ammonia gas, sodium hypochlorite and phosphate inhibitor.

B. The isolation valves shall be of the ball type. Materials of construction of the valve body shall be compatible with the type of service, as indicated above, and as shown on the Contract Drawings.

C. Valves shall be of the threaded, flanged, socket, plain, union or grooved ends as required by the Contractor.

D. The operator shall be of the “handle” type compatible with the type of service.

E. The valve shall be rated for an operating pressure of 150 psi.

2.12 Solenoid Valves

A. Potable Water Service

1. The solenoid valve shall be normally closed and shall be equipped with a manual override operator. The valve shall be of the general purpose type and shall be fabricated with a body and trim of stainless steel.

2. The operator shall be of the solenoid type rated for 120 V service.

3. The valve shall be rated for an operating pressure of 150 psi.

B. Ammonia Gas

1. The solenoid valve shall be normally closed and shall be equipped with a manual override operator. The valve shall be of the stainless steel body and trim type. The solenoid valve shall be explosion proof, waterproof, and shall met NEMA 7 enclosure requirements.

2. The operator shall be of the solenoid type rated for 120 V service.

3. The valve shall be rated for an operating pressure of 150 psi.

2.13 Pinch Valves

A. Valves are to be of the full cast metal body, mechanical pinch type with flange joint ends on both the body and the sleeve trim. The valve shall have face-to-face dimensions of standard gate valves, in accordance with ANSI B16.10 up to 12” size. The flanges shall be drilled to mate with ANSI B16.1, Class 125 flanges. The valve body halves are to be sealed with an elastomer sheet gasket cut to fit the contour of the valve body. Body shall be epoxy coated for additional corrosion protection.

B. The sleeve trim shall be one piece construction with integral flanges drilled to be retained by the flange bolts. The sleeve trim shall be reinforced with calendared nylon or calendared polyester fabric to match service conditions. The sleeve trim shall be connected to the pinch bar by tabs imbedded in the sleeve trim-reinforcing ply. All internal valve metal parts are to be completely isolated from the process fluid by the sleeve trim.

C. For full port and reduced port sleeves, the port areas shall be 100% of the full pipe area at the valve ends.

D. The steel mechanism shall be double acting with pinching of the sleeve trim occurring equally from two sides. ACME threads shall be used on all valve mechanisms. There shall be no cast parts in the operating mechanism.

E. A torque tube shall be fitted to the body of the valve via a mounting plate. The tube shall extend from the valve to above grade level, providing protection for the operating stem and sealing the opening in the top body half. Valve shall be operated by turning a non- rising stem, contained within the torque tube, and connected to the pinch mechanism. Bevel gear operators shall be provided on all valves over 8" size, and on smaller sizes as specified on the purchase order. Torque tube shall be epoxy coated for additional corrosion protection.

F. The handwheel shall be constructed of welded, tubular steel and be connected to the bevel gear operator by means of a single retaining bolt. The handwheel shall be fitted with a lubrication fitting to allow lubrication of the stem.

G. Valves shall be of the Series 75-B as manufactured by Red Valve Company, or approved equal.

H. Manufacturer’s authorized representative shall be available for customer service during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

2.14 Electric Motor Operated Pinch Valves

A. Valves shall be two (2) inches of the full cast metal body, mechanical pinch type with flange joint ends. The valve length shall be a given in ISA S75.08. The flanges shall be drilled and tapped to mate with ANSI B16.1, Class 125/ ANSI B16.5, Class 150 flanges.

B. The sleeve trim shall be one piece construction with integral flanges drilled to be retained by the flange bolts. The sleeve trim shall be reinforced pure gum rubber. The sleeve trim shall be connected to the pinch bar by tabs imbedded in the sleeve trim reinforcing ply. All internal valve metal parts are to be completely isolated from the process fluid by the sleeve trim. For full port and reduced port sleeves the port areas shall be one hundred percent (100%) of the full pipe area at the valve ends.

C. The solid steel pinch mechanism shall be single acting, closing the sleeve from the top only. The mechanism shall be supported in the valve body. There shall be no cast parts in the operating mechanism. The mechanism shall be connected to the electrically actuated actuator through an ACME threaded stem. The electric motor shall be as specified. The pinch mechanism shall be adjustable for stroke without removing the valve from the line. The valve shall be manufactured in the USA.

D. The electrically actuated control valve actuator shall be an “on/off” actuator. The actuator shall have a bronze operating nut, NEMA 4 enclosure, Class 5 insulation, with two (2) year train limit switches, two (2) torque switches, manual handwheel override, reversing starters, and a transformer. The actuator shall also have three (3) push-button control switches (O/S/C), a selector switch (L/O/R), and a mechanical dial position indicator (MDPI). The actuator shall be manufactured by Limitorque, Rotork, or an approved equal.

E. An electric motor rotates a threaded nut, pushing a threaded stem into the valve body, pinching the sleeve closed. Reversing the direction of the electric motor pulls the stem out of the valve body, opening the sleeve.

2.15 Telescoping Valves

A. “Flared Style”, stainless steel telescoping valves, shall be provided where indicated on the Contract Drawings. The valve tube shall be designed to travel inside a riser pipe.

B. The stainless steel tube, twelve (12) inches in diameter shall be manufactured of Type 304 stainless steel seamless pipe or tube. The tube length shall be of sufficient length to facilitate valve travel and maintain an appropriate insert depth. Valve tubes are to be a minimum 1/8-inch thick and are attached to connecting stems by use of a lifting ball.

C. A stainless steel companion flange and neoprene slip seal gasket shall be provided by the valve manufacturer. The gasket shall have a minimum thickness of ¼-inch. The inside diameter of the gasket is to be 1/8-inch smaller than the outside diameter of thevalve tube to provide a friction seal. The gasket is to be sandwiched between the riser pipe flange and the companion flange. The gasket and companion flange shall include a 125 lb. standard drilling pattern to match the riser pipe.

D. The lift bail shall be of the same material as the tube and be rigidly welded to the tube.

E. Lifts (Non-Rising Stem) shall be of the ball bearing supported handwheel type with dial position indicator, mounted to a fabricated galvanized steel non-rising stem pedestal. The pedestal shall be manufactured with a square, main vertical member and a telescoping type torque tube. The torque tube must incorporate a square thrust pocket at the top to house a square thrust nut, to prevent rotation of the valve tube assembly. The bottom of the torque tube shall be attached to the lifting bail with Type 304 stainless steel anchor bolts and nuts.

F. Handwheels shall be a minimum of twelve (12) inches in diameter and shall include a clear plastic butyrate stem cover with a mylar strip type position indicator, calibrated in ¼-inch increments to illustrate the valve position. The mylar strip, provided by the manufacturer, shall be affixed by the Contractor.

G. Cleaning and shop priming coating shall be provided on all ferrous materials by the manufacturer.

2.16 Air Release Valves

A. Clean Water Air Release Valves

1. Small Valves:

a. Valves ¾-inch and smaller shall be of the simple-lever type with a cast iron body, ASTM A48, Class 35, Type 316 stainless steel trim, and Viton orifice button. Valves shall have a working pressure rating of at least 150 psi.

b. Valves shall be shall be properly sized for the proposed application and of the proper materials of construction for the intended service (water, etc.) and shall be a product manufactured by APCO, Valmatic, or approved equal.

2. Large Valves:

a. Valves one (1) inch or larger shall have a heavy duty compound lever operating mechanism with Type 316 stainless steel pivot pins and Type 316 stainless steel retaining rings.

b. Valves shall be constructed of cast iron, ASTM A48, Class 35 with Type 316 stainless steel trim and float. Valves shall have an adjustable orifice button, constructed of Type 316 stainless steel with viton or Buna-N seating.

c. Provide ½-inch threaded outlet and stainless steel plug for the top cover and body drain. Valves shall have a working pressure rating of at least 300 psi.

d. Valves shall be shall be properly sized for the proposed application and of the proper materials of construction for the intended service (water, etc.) and shall be a product manufactured by APCO, Valmatic, or approved equal.

B. Wastewater and Reclaimed Water Air Release Valves

1. Air release valves for wastewater service shall be of the long stem and body type designed to keep the valve operating mechanism as free from contact with the wastewater as possible.

2. Valves shall have a two (2) inch threaded inlet, with a one (1) inch blow-off connection with a one (1) inch blow-off valve (gate valve), ½-inch back-flushing attachments with a ½-inch outlet. The outlet and back flushing connections shall be quick couplings. The valve shall have a minimum orifice diameter of $^{5}/_{16}$-inch.

3. Valves shall be shall be properly sized for the proposed application and of the proper materials of construction for the intended service (wastewater, reclaimed water, etc.) and shall be a product manufactured by APCO, Valmatic, or approved equal.

4. Valves shall be constructed of cast iron, ASTM A48, Class 35 with Type 316 stainless steel trim, lever pins and float.

5. Valves shall have a working pressure rating of at least 150 psi.

C. Air and Vacuum Wastewater/Reclaimed Water Valves

1. Air and vacuum valves for wastewater service shall be of the long stem and body type designed to keep the valve operating mechanism as free from contact with the wastewater as possible.

2. Valves shall have a two (2) inch threaded inlet, with a one (1) inch blow-off connection with a one (1) inch blow-off valve (gate valve), ½-inch back-flushing attachments with a ½-inch outlet. The outlet and back flushing connections shall be quick couplings. The valve shall have a minimum orifice diameter of one (1) inch. The valves on the discharge piping of pumping stations shall have the orifice sized as required to expel air on pump starting.

3. Valves shall be shall be properly sized for the proposed application and of the proper materials of construction for the intended service (wastewater, reclaimed water, etc.) and shall be a product manufactured by APCO, Valmatic, or approved equal.

4. The valve body shall be constructed of cast iron, ASTM A48, Class 35. The valve and float shall be Type 316 stainless steel. Valves shall have a working pressure rating of at least 150 psi.

D. Valve End Connections

1. Valves smaller than three (3) inches shall have threaded ends. Valves four (4) inches and larger shall have flanged ends.

2. Flanges for Class 150 valves shall comply with ANSI B 16.1, Class 125.

3. Flanges for Class 300 valves shall comply with ANSI B16.1, Class 250.

4. Threaded ends shall comply with ANSI B2.1.

E. All air release and vacuum relief valves shall be isolated from the service line with a Type 316 stainless steel gate valve for valves up to 3-inches, and a flanged body butterfly valve for valves greater than three (3) inches (provide a spacer plate if required to clear the rotation of the butterfly disc).

2.17 Surge Anticipating Control Valve

A. Main Valve

1. The main valve shall be a center guided diaphragm actuated globe valve of either oblique (Y) or angle pattern design. The body and cover shall be ductile iron, A-536, with stainless steel seat. The internal and external surfaces of the valve body shall be fusion bonded coated. End connections shall meet the ANSI, ISO, DIN, JIS, or other internally recognized standards as required.

2. The body shall have a replaceable non-threaded seat ring that is held in place by set screws which tighten into a body groove. This seat should be accessible and serviceable without removing the valve from the pipeline. The seat area shall have a flow opening without stem guides, bearings, or supporting ribs.

B. Actuator

1. The actuator assembly shall be a double chamber design with a separating partition between the lower surface of the diaphragm and the main valve. The entire actuator assembly consisting of a seal disk, valve shaft, bearing, diaphragm assembly, separating partition, and top cover must be removable from the valve as a single unit.

2. The control chamber between the diaphragm and the separation partition shall be capable of being open to or isolated from the valve internal body pressure. The stainless steel valve shaft shall be guided throughout its travel by a bearing in the separating partition. The replaceable resilient seal shall be rectangular in cross section and contained on three and one half sides. A lift shall be provided on the seal disc outside edge to lock the seal in place.

3. The actuator assembly must be capable of accepting a V-port throttling plug by simply bolting the device to the seal disk.

C. Control System

1. The high and low pressure relief pilots shall be direct acting, adjustable, spring loaded diaphragm actuated valves. The high pressure pilot shall have a built-in needle valve to adjust the main valve closing speed.

2. The body and cover of the pilot valves shall be of brass or bronze construction with stainless steel trim and resilient seal. The main valve shall be equipped with either a mechanical or hydraulic flow limiting device.

3. Liquid to the pilots must be filtered and cock valves must be provided to isolate the control loop.

D. Quality Assurance

1. The main valve, pilots, control tubing, filter, and isolation valves shall be factory assembled and tested. 'the valve shall be NSF 61 approved.

2. The valve manufacturer must be completely certified to the ISO 9002 Quality Assurance Standard.

2.18 Reduced Pressure Backflow Preventer (RPBP)

A. Potable Water Service

1. Reduced pressure backflow preventers for potable water service shall meet the requirements of AWWA C-511.

B. Concentrate Service

1. The reduced pressure principle backflow preventor shall consist of two independently operating, spring loaded patented cartridge checks with a hydraulically operated differential pressure relief valve located between and below the cartridge checks, required test cocks and butterfly type at inlet and outlet shut off valves. When normal flow exists, both check valves are open and pressure in the area between the check valves is at least 2 psi lower that the inlet pressure. The differential pressure relief valve is closed during normal flow. If cessation of normal flow occurs, the differential pressure relief valve will automatically open and discharge to maintain a 2 psi pressure lower than the inlet pressure. The differential pressure relief valve is closed during normal flow conditions.

2. If normal flow is interrupted the differential pressure relief valve will automatically open and discharge to maintain the zone at least 2 psi lower than the inlet pressure. This action will prevent a back flow or back siphonage condition. After the required differential is established the differential pressure relief valve closes automatically.

3. The body, check valves, springs and cam-arms shall be composed of Type 316 stainless steel. The cam-checks shall have rubber faced disks and replaceable seats.

4. The relief valve shall be mounted under the body of the check body and shall have an external relief sensing line. The relief valve shall be a balanced rolling

diaphragm with no sliding seals and will be able to be removed from the check body and be replaceable.

5. The RPBP shall be fully serviceable, in-line, without the use of specialized tools and shall include a single top bolted entry for inspection port for easy servicing of checks.

6. The RPBP shall be manufactured by Ames Inc., Model No. 400055 or approved equal.

2.19 Valve Operators

A. General

1. All operators shall be sized to operate the valve at the valve's full-rated pressure. Gear actuator shall be sized for the maximum pressure differential across the valve, equal to the pressure rating of the valve. All gearing shall be enclosed in a high- strength cast iron housing, suitable for running in a lubricant. Housing shall be provided with seals on all shafts to prevent the entry of dirt and water into the actuator. The actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. The actuator shall clearly indicate valve position for above-ground and valve vault installations and an adjustable stop shall be provided to set closing torque. The actuator shall be capable of withstanding an over-torque without damage up to 450 foot-pounds for two (2) inch square nut operators and to 300 foot-pounds for handwheel or chainwheel operators.

2. Valve operators, handwheels or levers shall open by turning counter-clockwise (CCW) and shall be constructed of non-corrosive materials.

3. Four (4) inch and smaller aboveground valves shall be furnished with manual actuators, one-quarter turn to open. The actuator shall be supplied with an AWWA Standard two (2) inch operating nut with a standard valve operating lever.

4. Exposed operators shall be furnished with chainwheel operators, geared operators, extension stems, floor stands, and other elements to permit operation from the normal operating level.

5. All valve stem extensions for buried valves shall be “pinned”.

B. Plug Valves

1. Unless otherwise noted, plug valves installed in valve vaults or buried underground shall have gear actuators with two (2) inch square nut designed for buried and submerged service. The valve shall have seals on all shafts and gaskets on valve and actuator covers to prevent entry of water and dirt. Actuator mounting brackets for buried or submerged service shall be totally enclosed

and shall have gasket seals. All exposed valve nuts, bolts, springs, washers, and the like shall be Type 304 stainless steel.

2. Unless otherwise noted, above-ground plug valves six (6) inches in size and larger shall be furnished with mechanical gear actuators furnished with handwheel, chainwheel, or two (2) inch square nut operators, as shown on the Contract Drawings.

C. Manual Operators

1. Manual operators include handwheel, chainwheel, lever and handle type operators. When the maximum force to operate a valve under full operating head exceeds forty (40) pounds, gear reduction operators shall be provided.

2. Lever Operator:

   a. Levers shall be fabricated of non-corrosive materials. They shall include a set screw and be grease lubricated.

   b. The operator shall be capable of being locked in any position and shall be provided with an adjustable memory stop.

3. Handwheel:

   a. Gate/valve operators shall be selected so that no more than forty (40) pounds effort on the operator will be required to open or close a gate/valve. Gate/valve operators shall be located at a maximum height of forty-two (42) inches above the structure. When the normal yoke elevation is above 42-inches above structure, the geared lift shall be coupled to a ninety degree (90° bevel gear box by means of a floating shaft and lovejoy couplings. This gearbox shall be mounted on the edge of the self-contained yoke. All shafts and couplings shall be Type 304 stainless steel and aligned to acceptable coupling tolerance. All cast iron gearbox housings shall be epoxy coated in accordance with Section 09900, “Painting”, for corrosion protection.

   b. All operators shall be geared and shall have a weatherproof case iron housing or pedestal with a bronze operating nut. An effective gear ratio of at least 2:1 is required.

   c. The operator shall include a position indicator and self-locking feature to prevent the disc or plug from creeping.

   d. Gear operators shall be totally enclosed and lubricated. Operators shall be grease lubricated and provided with grease fittings.

   e. Handwheel operators supplied with floorstands and benchstands shall be self-locking at any position of stem travel. Cranks and handwheels shall be cast iron and hot dip galvanized after fabrication. Cranks shall be no less

than twelve (12) inches long and shall be keyed to the operating nut. Handwheels shall not have a diameter greater than thirty (30) inches.

f. Self-locking gear shall be a one-piece design of gear bronze material (ASTM B 427), accurately machine cut. The sector gear shall be hardened alloy steel (ASTM A-322), grade G41500 or ASTM A-148, Grade 105-85, with thread ground and polished. The reduction gearing shall run in a proper lubricant.

4. Buried Operators:

a. Buried service operators on valves larger than 2½ inches shall have a 2-inch AWWA operating nut. Buried operators on valves 2-inches and smaller shall have cross handle for operation for forked key. All moving parts of the valve and operators shall be enclosed in a housing to prevent contact with the soil.

b. Buried service operators for quarter-turn valves shall be designed to withstand 450 foot-pounds of input torque at the fully open or fully closed positions without damage to the valve or operator and shall be grease packed and gasketed to withstand a submersion in water to 10 psi.

c. Valves shall be installed with “pinned” extension stems, as required, valve boxes, concrete valve pad and valve identification tag.

D. Electric Motor Operated Valve Actuators

1. General:

a. The actuators shall be suitable for use on a nominal 480 volt three-phase 60 Hertz power supply and are to incorporate motor, integral reversing starter, local control facilities, and terminals for remote control and indication connections.

b. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel with either phase sequence of the three-phase power supply connected to the actuator.

c. It shall be possible to carry out the setting of the torque, turns, and configuration of the indication contacts without the necessity to remove any electrical compartment covers.

2. Actuator Sizing:

a. The actuator shall be sized to guarantee valve closure at the specified differential pressure.

b. The safety margin of motor power available for seating and unseating the valve shall be sufficient to ensure torque switch trip at maximum valve

torque with the supply voltage ten percent (10%) below nominal.

c. The operating speed shall be such as to give valve closing and opening at approximately 10 - 12 inches per minute.

3. Ambient Temperature:

a. The actuator shall be capable of functioning in an ambient temperature ranging from -22 ºF (-30ºC) to +158ºF (+70ºC).

4. Motor:

a. The electric motor shall be Class F insulated with a time rating of at least fifteen

b. (15) minutes at 104ºF (40ºC) or twice the valve stroking time, whichever is the longer, at an average load of at least 33% of the maximum valve torque.

c. Electrical and mechanical disconnection of the motor should be possible without draining the lubricant from the actuator gear case. Plugs and sockets are not acceptable as a means of electrical connection for the motor.

5. Motor Protection:

a. Protection shall be provided for the motor as follows:

1) The motor shall be de-energized in the event of stall when attempting to unseat a jammed valve.

2) Motor temperature shall be sensed by a thermostat to protect against overheating.

3) Single phasing protection.

6. Gearing:

a. The actuator gearing shall be totally enclosed in an oil-filled gear case suitable for operation at any angle. All main drive gearing must be of metal construction. Where the actuator operates gate valves or large diameter ball or plug valves, the drive shall incorporate a lost-motion hammerblow feature. For rising spindle valves, the output shaft shall be hollow to accept a rising stem and incorporate thrust bearings of the ball or roller type at the base of the actuator, and the design should be such as to permit the gear case to be opened for inspection or disassembled without releasing the stem thrust or taking the valve out of service.

b. Standard SAE80EP gear oil shall be used to lubricate the gear case. Special or exotic lubricants shall not be used as they may be difficult to source in remote locations.

7. Hand Operation:

   a. A handwheel (non-corrosive material) shall be provided for emergency operation engaged when the motor is declutched by a lever or similar means; the drive being restored to power automatically by starting the motor.

   b. The hand/auto selection lever should be padlockable in both the "Hand" and "Auto" positions. It should be possible to select “Hand” operation while the actuator is running or start the actuator motor while the “Hand/Auto” selection lever is locked in "Hand" without damage to the drive train.

   c. The handwheel drive must be mechanically independent of the motor drive, and any gearing should be such as to permit emergency manual operation in a reasonable time.

   d. Clockwise operation of the handwheel shall give closing movement of the valve.

8. Drive Bushing:

   a. The actuator shall be furnished with a drive bushing easily detachable for machining to suit the valve stem or gearbox input shaft. Normally the drive bushing shall be positioned in a detachable base of the actuator.

   b. Thrust bearings, when housed in a separate thrust base, should be of the “sealed for life” type.

9. Torque and Turns Limitations:

   a. Torque and turns limitation to be adjustable as follows:

      1) Position setting range: 2.5 to 100,000 turns, with resolution to 7.5° of actuator output.

      2) Torque setting: 40% to 100% rated torque.

      3) Torque sensing must be affected directly electrically or electronically. Extrapolating torque from mechanically measured motor speed is not acceptable due to response time. Torque measurement shall be independent of variations in frequency, voltage or temperature.

      4) "Latching" shall be provided for the torque sensing system to inhibit torque off during unseating or during starting in mid-travel against high inertia loads.

b. The electric circuit diagram of the actuator should not vary with valve type remaining identical regardless of whether the valve is to open or close on torque or position limit. An inexpensive setting tool is required for non-intrusive calibration and interrogation of the actuator. This setting tool will provide speedy interrogation capabilities as well as security in a non-intrusive intrinsically safe watertight casing.

10. Remote Valve Position/Actuator Status Indication:

a. In the event of a (main) power (supply) loss or failure, the position contacts must continue to be able to supply remote position feedback and maintain interlock capabilities. If batteries are required to maintain contact functionality the actuator vendor shall provide a supply sufficient for thirty (30) continuous days of unpowered operation with one (1) complete valve cycle every hour.

b. A backup power source must be provided in the actuator to ensure correct remote indication should the actuator be moved manually when the power supply is interrupted.

c. The position of the actuator and valve must be updated contemporaneously, even when the power supply is not present.

d. Four (4) contacts shall be provided which can be selected to indicate any position of the valve with each contact externally selectable as normally open or normally closed. The contacts shall be rated at 5A, 250V AC, 30V DC.

e. As an alternative to providing valve position, any of the four (4) above contacts shall be selectable to signal one of the following:

1) Valve Opening or Closing

2) Valve Moving (Continuous or Pulsing)

3) Local Stop Selected

4) Local Selected

5) Remote Selected

6) Open or Close Interlock Active

7) ESD Active

8) Motor Tripped on Torque in Mid-Travel

9) Motor Tripped on Torque Going Open

10) Motor Tripped on Torque Going Closed

11) Pre-Set Torque Exceeded

12) Valve Jammed

13) Actuator Being Operated by Handwheel

14) Lost Main Power Phase

15) Customer 24V DC or 120V AC Supply Lost

16) Battery Low

17) Internal Failure Detected

18) Thermostat Tripped

f. Provision shall be made in the design for the addition of a contact less transmitter to give a 4-20 mA analog signal corresponding to valve travel for remote indication when required.

11. Local Position Indication:

a. The actuator must provide a local display of the position of the valve, even when the power supply is not present. The display shall be able to be rotated in 90° increments so as to provide easy viewing regardless of mounting position.

b. The actuator shall include a digital position indicator with a display from fully open to fully closed in 1% increments. Red, green, and yellow lights corresponding to Open, Closed, and Intermediate positions shall be included on the actuator. The digital display shall be maintained even when the power to the actuator is isolated.

c. The local display should be large enough to be viewed from a distance of six feet (6') when the actuator is powered up.

12. Integral Starter and Transformer:

a. The reversing starter, control transformer, and local controls shall be integral with the valve actuator, suitably housed to prevent breathing and condensation buildup. For ON/OFF service, this starter shall be an electromechanical type suitable for 60 starts per hour and of a rating appropriate to the motor size. For modulating Denitrification Filter Effluent valves, the starter shall be suitable for up to a maximum of 1,200 starts per hour. The controls supply transformer shall be fed from two of the incoming

three phases. It shall have the necessary tapings and be adequately rated to provide power for the following functions:

1) 120V AC energization of the contactor coils

2) 24V DC output where required for remote controls

3) Supply for all the internal electrical circuits

4) The primary and secondary windings shall be protected by easily replaceable fuses.

13. Integral Push Buttons and Selector:

a. Integral to the actuator shall be local controls for Open, Close, and Stop, and a local/remote selector Switch, padlockable in any one of the following three positions:

1) Local Control Only

2) Off (No Electrical Operation)

3) Remote Control plus Local Stop Only

b. It shall be possible to select maintained or non-maintained local control.

c. The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator.

14. Control Facilities:

a. The necessary wiring and terminals shall be provided in the actuator for the following control functions described herein.

b. Removable links for substitution by external interlocks to inhibit valve opening and/or closing.

c. Connections for external remote controls fed from an internal 24V DC supply and/or from an external supply of (min. 12V, max. 120V) to be suitable for any one or more of the following methods of control:

1) Open, Close, and Stop.

2) Open and Close.

3) Overriding Emergency, Shutdown to Close (or Open) Valve from a "Make" Contact.

4) Two-Wire Control, Energize to Close (or Open), De-Energize to Open (or Close).

d. Selection of maintained or push-to-run control for modes (1) and (2) above shall be provided and it shall be possible to reverse valve travel without the necessity of stopping the actuator. The starter contactors shall be protected from excessive current surges during travel reversal by an automatic time delay on energization of approximately 300 ms.

e. Provision shall be made for connectivity with field bus control systems via a plug-in card. The following interfaces shall be available:

1) Modbus

2) Approved equal.

f. The internal circuits associated with the remote control and monitoring functions are to be designed to withstand simulated lightning impulses of up to 2.0 kV.

15. Monitoring and Diagnostics Facilities:

a. Facilities shall be provided for monitoring actuator operation and availability as defined herein.

b. Monitor (availability) relay, having one change-over contact, the relay being energized from the control transformer only when the Local/Off/Remote selector is in the "Remote" position to indicate that the actuator is available for remote (Operations Room) operation.

c. Where required, it shall be possible to provide indication of thermostat trip and "Remote" selected as discreet signals.

d. A non-intrusive hand-held computer must be available, capable of duplex communication for uploading and downloading all variables for the actuator as well as performing detailed diagnostics.

e. Actuators shall include a diagnostic module, which will store and enable download of historical actuator data to permit analysis of changes in actuator or valve performance. A software tool shall be provided to allow configuration and diagnostic information to be reviewed and analyzed and reconfigured.

f. Diagnostic status screens must be provided to show multiple functions simultaneously so troubleshooting can be affected rapidly and efficiently. All diagnostic information should be contained on no more than eight (8) screens so multiple functions can be checked simultaneously.

g. Provision shall be made to display valve torque demand as a percent of rated actuator torque and position simultaneously, so as to facilitate valve troubleshooting and diagnostics.

16. Wiring and Terminals:

a. Internal wiring shall be of tropical grade PVC insulated stranded cable of appropriate size for the control and three phase power. Each wire shall be clearly identified at each end.

b. The terminals shall be embedded in a terminal block of high tracking resistance compound.

c. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal.

d. The terminal compartment of the actuator shall be provided with a minimum of three (3) threaded cable entries. When required, a forth cable entry shall be provided.

e. All wiring supplied as part of the actuator to be contained within the main enclosure for physical and environmental protection. External conduit connections between components are not acceptable.

f. Control logic circuit boards mid relay boards must be mounted on plastic mounts to comply with double insulated standards. No more than a single primary size fuse shall be provided to minimize the need to remove single covers for replacement.

g. A durable terminal identification card showing plan of terminals shall be provided attached to the inside of the terminal box cover indicating:

1) Serial Number.

2) External Voltage Values.

3) Wiring Diagram Number.

4) Terminal Layout.

(a) This must be suitable for the contractor to inscribe cable core identification beside terminal numbers.

17. Enclosure:

a. Actuators shall be 'O' ring sealed, watertight to NEMA 6, and shall at the same time have an inner watertight and dustproof "O" ring seal between the terminal compartment and the internal electrical elements of the actuator

fully protecting the motor and all other internal electrical elements of the actuator from ingress of moisture and dust when the terminal cover is removed on site for cabling.

b. The enclosure must allow for temporary site storage without the need for electrical supply connection.

c. All external fasteners should be of Type 304 stainless steel.

d. Actuators for explosion hazardous applications shall in addition be certified flameproof for Zones 1 and 2 (Divisions 1 and 2) Group gases.

18. Startup Kit:

a. Each actuator shall be supplied with a startup kit comprising installation instruction, electrical wiring diagram, and sufficient spare cover screws and seals to make good any site losses during the commissioning period.

19. Performance Test Certificate:

a. Each actuator must be performance tested and individual test certificates shall be supplied free-of-charge. The test equipment should simulate a typical valve load and the following parameters should be recorded:

1) Current at maximum torque setting.

2) Torque at maximum torque setting.

3) Flash Test Voltage.

4) Actuator Output Speed or Operating Time.

b. In addition, the test certificate should record details of specification, such as gear ratios for both manual and automatic drive, closing direction, and wiring diagram code number.

20. Experience:

a. All technologies and devices used in the actuator must have a minimum of five (5) years' of commercial operating experience for that specific manufacturer, including torque and position sensing, lubrication, and electrical compartment design.

b. Electric motor valve actuators shall be as manufactured by Auma Actuators, or approved equal.

2.20 Valve Boxes

A. Furnish, assemble, and place a valve box over the operating nut for each buried valve. The valve box shall be designed so as to prevent the transmission of surface loads directly to the valve or piping.

B. Valve boxes shall be of the adjustable slide-type of suitable length with an interior diameter of not less than five (5) inches. The valve boxes shall be manufactured of cast iron and shall be of the two piece design including a bottom section and top section with cover. The cast iron cover shall be cast with the applicable service, "WATER," "WASTEWATER," "REUSE," etc., markings. The top section shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade.

C. The castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM A48, Class 30B for Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections, and other harmful defects. The seating surfaces of both the cover and the top section shall be machined so that the cover will not rock after it has been seated.

D. The valve boxes shall be coated inside and outside with an asphaltic coating prior to machining, so that the machined seating surfaces will be free of any coating. Cast iron valve box assemblies shall be Clow Corp. No. F-2452, Tyler Corp. Series 6855 or 6865 or an approved equal.

E. Valve extension stems shall be provided for all buried valves when the operating nut is deeper than three (3) feet below finished grade. The stems shall be “pinned” and shall bring the 2-inch square nut to approximately six (6) inches from the finished valve pad elevation.

2.21 Tie Rods

A. When prior approval is obtained from the Engineer, ductile iron pipe, fittings, and valves may be restrained using a “tie bolt joint restraint”.

B. Joint restraint materials for this method of restraint shall be the Super-Star SST Series Joint Restraint System as manufactured by Star National Products, a Division of Star Industries, Inc. Columbus, Ohio, or an approved equal.

C. All bolts, nuts, washers, tie rods, and other fasteners for the joint restraint system shall be manufactured of CORTEN high strength, low alloy, corrosion-resistant steel in conformance with ASTM A242, or EOR approved equal. Tie bolts shall be manufactured of heat treated CORTEN steel, or EOR approved equal. Tie rods and all fasteners for the system shall be galvanized in conformance with the requirements of ASTM A123. Tie rods shall have a minimum diameter of ¾-inch. The number of tie rods required per joint shall be as recommended by the manufacturer.

D. Prior to backfilling after installation, all parts of the joint restraint system shall be coated with coal tar epoxy equal to Kop-Coat Bitumastic No. 300-M, for a minimum dry film thickness of twenty (20) mils.

2.22 Valve Identification

A. Aboveground Valve Identification

1. A coded and numbered tag attached with a stainless steel chain and/or stainless steel “S” hooks shall be provided on all valves.

2. Tag Types:

   a. Tags for valves on pipe shall be stainless steel, or anodized aluminum, 19 gauge thick.

   b. Colors for aluminum tags shall, where possible, match the color code of the pipe line on which it is installed.

   c. Square tags shall be used to indicate “normally closed” valves and round tags shall indicate “normally open” valves.

3. Coding:

   a. In addition to the color coding, each tag shall be stamped or engraved with “wording” or abbreviations to indicate the information presented in Article 2.1(G)(1)(a-g) of Specification Section 09905, “Piping, Valve and Equipment Identification System”.

   b. Above ground valve tags shall be furnished with stainless steel (Type 316) wire for attachment thereof. The tag shall not be attached to the handwheel or crank operators or any part of the valve which would inhibit operation of the valve.

   c. Valve service shall either be as listed in Table 09905-1 (Section 09905), or by equipment abbreviation if associated with a particular piece of equipment. Valve numbering shall be as approved by the Engineer and/or Owner.

B. Belowground Valve Identification

1. Buried valves shall have valve boxes protected by a concrete pad as identified on the Contract Drawings. The concrete pad for the valve box cover shall have a 3- inch diameter, 19 gauge thick, bronze disc embedded in the surface as shown on the Contract Drawings. The bronze disc shall have the following information neatly stamped on it:

   a. Valve Service: See Table 09905-1 for the abbreviations to be used

b. Valve Identification No.: To be provided by the Engineer and Owner

c. Size of valve, inches

d. Type of valve

1) GV: Gate Valve

2) BfV: Butterfly Valve

3) PV: Plug Valve

4) Other valve abbreviations shall be provided by the Engineer.

e. Number of turns to fully open the valve

f. Direction to open the valve

g. Year of Installation

2. The information contained in the valve schedules shall be coded on the tags in a system.

C. The information contained in the valve schedules shall be coded on the tags in a system provided by the Owner.

D. Above ground valve tags shall be furnished with stainless steel chain and/or stainless steel “S” hooks (Type 316) for attachment thereof. The tag shall not be attached to the handwheel or crank operators or any part of the valve which would inhibit operation of the valve.

2.23 Expansion Joints

A. Water Service

1. Expansion joints shall be manufactured of molded EPDM with a single wide arch. Expansion joints shall be suitable for buried service or above ground service. Flanges shall be drilled to ANSI 125 lb.

2. Working pressures are as follows:

Size (inches)	Pressure (psi)
2 - 12	150
14	130
16 - 20	110
24 - 30	100
36	90

3. The maximum temperature shall be 250°F.

4. Expansion joints shall be Model 100 HT/711 as manufactured by Metraflex or approved equal.

5. Expansion joints shall be furnished with 304 stainless steel split, bevelled retaining rings and control rod assemblies to limit over expansion or compression. A minimum of two control units shall be furnished with each expansion joint and shall be suitable for working pressures as specified above.

B. Chemical Solution Service

1. Expansion joints shall be manufactured of molded elastomer with a single wide arch, regular or reducing style as shown in the drawings. Expansion joints shall be suitable for above ground service with PVC piping.

2. Elastomers shall be suitable for the proposed chemical service as follows:

Solution Type	Cover / Tube Material
Cleaning Solution	EPDM
Scrubber Recirculation Solution	PTFE

3. Flanges shall be drilled to ANSI 125#. Working pressures are as follows:

Size (inches)	Pressure (psi)
12-Feb	150

4. The maximum temperature shall be 250°F.

5. Expansion joints shall be furnished with 316 stainless steel split, bevelled retaining rings and control rod assemblies to limit over expansion or compression. A minimum of two control units shall be furnished with each expansion joint and shall be suitable for working pressures as specified above.

C. Wastewater Service

1. Expansion joints shall be manufactured of molded chlorobutyl and polyester with a filled single such. Expansion joints shall be suitable for buried service or above ground service. Flanges shall be drilled to ANSI 125 lb.

2. Working pressures are as follows:

Size (inches)	Pressure (psi)
2 - 12	150
14	130
16 - 20	110
24 - 30	100
36	90

3. The maximum temperature shall be 250°F.

4. Expansion joints shall be furnished with 304 stainless steel split, bevelled retaining rings and control rod assemblies to limit over expansion or compression. A minimum of two control units shall be furnished with each expansion joint and shall be suitable for working pressures as specified above.

2.24 Sediment Strainers

A. Sediment strainers shall be Y-type manufactured of transparent Type 1, Grade 1 PVC with threaded or solvent welded socket ends.

B. The screen for the strainers shall be 20 mesh, Type 316 stainless steel. The screen shall be easily removed for cleaning or replacement from the filter body without removing the body from the pipeline. The bonnet seal shall be EPDM "O" rings.

C. The sediment strainers shall have a pressure rating as follows:

Strainer Size	Water Non-Shock Pressure Rating
½-inch to 1-inch	150 psi at 70° F
1½-inch to 2-inch	90 psi at 70° F
3-inch to 4-inch	60 psi at 70° F

2.25 Unions

A. Unions on ferrous pipe 2 inches in diameter and smaller shall be 150 pounds malleable iron, zinc-coated.

B. Unions on water piping 2½ inches in diameter and larger shall be of the flange pattern, 125-pound class, zinc-coated.

C. Gaskets for flanged unions shall be of the best quality fiber, plastic, or leather.

D. Unions shall not be concealed in walls, ceilings, or partitions.

2.26 Pressure Gauge Assemblies

A. Pressure gauges shall have the following design features

1. Silicone oil filled (3000 centistoke fluid with an ethylene polymer blowout disc).

2. Stem mounted pressure gauge with a 4-inch or 4.5-inch aluminum dial with black numerals on a white background (for pump service).

3. Stem mounted pressure gauge with a two and one-half (2½) inch aluminum dial with black numerals on a white background (for all other services).

4. Type 316 stainless steel bourdon tube and internal movement.

5. 330 series stainless steel case and ring.

6. Safety glass lens.

7. Threaded lens retaining ring.

8. Adjustable pointer with over-pressure stop and zero pointer stop.

9. Either friction or gear adjustable.

10. Blowout protection.

11. One-half (½) inch, Type 316 stainless steel stem mounting.

12. ±1.0 percent accuracy based on full scale.

13. No stop pins shall be permitted on the dial face.

14. Internal stop pins shall be required to prevent the sector gear from becoming disengaged from the geared needle post as a result of over or under pressure range.

B. Provide Type 316 stainless steel pressure snubbers on all gauges not protected by diaphragm seals. Provide a supply of replacement fill liquid for all gauges supplied for the entire Project. Pressure gauges shall be as manufactured by U. S. Gauge, Ashcroft, Marshalltown, Marsh, or approved equal.

C. Pressure Gauge Service and Ranges

1. Pressure gauges shall be furnished for the following services with the indicated ranges noted. Diaphragm seals shall be furnished for gauges as indicated. This table is for the Contractor's convenience only, and may not depict all systems or all services that require gauges.

Service	No. Required	Range	Diaphragm Seal
RAS and WAS Pump Discharge	9	0 - 100 psi	Yes
IMLR Pump Discharge	4	0 - 5	Yes

* Verify with chemical equipment manufacturer

2. Pressure gauges not identified in the table above shall be provided on the individual pieces of equipment specified in Division 11, “Equipment” and shall meet the pressure gauge requirements specified herein.

D. Diaphragm Seals (Pipe sizes 12-inch and smaller)

1. Pressure gauges shall be furnished with diaphragm protection seals which shall be joined to the pressure gauges and filled at the manufacturer's factory. The seals shall be of the removable design such that the bottom member can be removed for cleaning without disturbing the diaphragm. The diaphragm shall be Type 316 stainless steel. The top and bottom members of the seal shall be Type 316 stainless steel.

2. Connections for both the gauge and the bottom connection shall be ½-inch female NPT threaded connections. The bottom member shall have a ¼-inch plugged flushing connection with a Type 316 stainless steel plug.

3. Liquid filling for the diaphragm seals shall be silicone oil. Provide a supply of replacement fill liquid for all diaphragm seals supplied for the entire Project. Diaphragm protection seals shall be supplied by the manufacturer of the gauge.

E. Each pressure gauge assembly shall be furnished with an isolation ball valve. The valve body, stem, and all other parts of valves shall be manufactured of Type 316 stainless steel. The valve packing shall be high-density TFE. Valve connections shall be ½-inch female NPT threaded connections. Ball valves for pressure gauge assembly isolation shall be 45 Series as manufactured by the Whitey Company, or an equal approved by the Engineer.

2.27 Floor Box and Stem

A. Plain type, for support of non-rising type stem.

B. Complete with stem, operating nut, and stem guide brackets.

C. Stem Guide: Space such that stem L/R ratio does not exceed 200.

D. Anchor Bolts: Type 304 stainless steel.

E. Manufacturers and Products

1. Neenah Foundry: R 7506.

2. Clow: F 5690

3. EOR approved equal

2.28 Emergency Shower/Eye Wash (ES/EW)

A. Furnish and install a combination emergency shower and an eye wash unit where shown on the Contract Drawings.

B. The emergency shower shall have a ten (10) inch stainless steel shower head, eye wash bowl, stay open stainless steel ball valves, a rigid stainless steel pull rod for control of the shower and hand and foot control for the eye wash, and a stainless steel standard to support the ball valve and the shower head. The

emergency shower shall be furnished complete with automatic flow control devices as required to limit water flow to 20 gpm.

C. The emergency eye wash shall have an eleven (11) inch stainless steel receptor bowl, anti-surge eyewash heads including a stainless steel dust cover that protects the heads and automatically releases with water pressure, stainless steel wall mounting bracket and a stainless steel trap. The emergency eye wash shall be furnished complete with automatic flow control devices as required to limit water flow to 3 gpm.

D. Provide the combination emergency shower and an eye wash unit with a bleed valve to limit temperature in the emergency fixture to 100°F. The bleed valve shall be Haws Model SP17A or equal.

E. All exposed emergency shower piping shall be insulated with ½-inch thick closed cell tubing insulating per ASTM C534, Type 1. Paint insulation with two (2) coats of semigloss water base paint, specifically recommended for weather protection, Rubatex R-180FS Insulation, Rubatex 374 Coating, or equal. Install as shown on the Contract Drawings.

F. Provide a 1¼-inch supply inlet, and 1¼-inch waste tee.

G. The combination emergency shower and an eye wash unit shall be Haws Model 8330, or approved equal.

H. Emergency Water Alarm (EWA)

1. Emergency water alarm units and components shall be furnished and installed in conjunction with all emergency shower and eyewash units and fixtures. The emergency water alarm unit shall have brass double pole, double throw flow switch, junction box, UL Listed and CSA approved flashing amber light, audible alarm with a minimum 90 db sound output, all wiring and mounting brackets. The emergency water alarm unit shall be Haws Model 9001 DPDT or approved equal.

2. Wiring between flow switches and emergency water alarm units will be done under Division 16 including furnishing and installing a relay and reset button for each unit. The alarm condition shall be monitored by the SCADA system.

3. Electrical characteristics for this unit are 110 volts, single phase, 60 Hz.

4. Control valves adjacent to flow alarm switches shall be fitted gated valves with bronze lock shields.

5. Installation of flow switches in the piping system shall be in accordance with the manufacturer's recommendations.

2.29 Spare Parts

A. Special tools, if required for normal operation and maintenance, shall be supplied with the equipment.

2.30 Quality Control

A. The Contractor shall follow the Manufacturer's and Supplier's recommended product quality control specifics as required for the Project.

2.31 Hose Bibb

A. Provide the number, type and materials as shown on the Contract Drawings.

B. Hose racks shall be fabricated from Type 304 stainless steel.

2.32 Washdown Hose

A. Hoses shall be fifty (50) feet long, 1-inch diameter abrasion and weather resistant and "kink-proof", industrial grade hose with a ¼-turn industrial grade stainless steel ball valve, with a 1-inch stainless steel male x female (NPT) QF series quick connect coupling on the supply end.

B. An industrial grade stainless steel spray nozzle shall be provided on each hose.

C. All components shall be manufactured by Amazon Hose & Rubber Company or approved equal.

2.33 Miscellaneous Items

A. Other items necessary for the complete installation and not specified herein shall conform to the details and notes shown on the Contract Drawings.

B. All minor items implied, usually included, or required for the construction of a complete operating system shall be installed whether shown on the Contract Drawings or not.

3. EXECUTION

3.1 Inspection

A. All valves and other material shall be subject to inspection and approval by the Engineer after delivery, and no broken, cracked, imperfectly coated, or otherwise damaged or unsatisfactory material shall be used.

B. When a defect or crack is discovered, the damaged item shall not be installed and shall be replaced.

3.2 Preparation

A. All exterior surfaces of iron body valves shall be clean, dry and free from rust and grease before coating.

B. For valves installed underground or in valve vaults, all exterior ferrous parts or valve and actuator shall be coated at the factory with a thermally bonded epoxy coating in accordance with AWWA C-550, latest revision, or with coal tar epoxy (Engineer approval required). Coal tar epoxy shall be applied in two (2) 8-mil dry film thickness coats for a minimum total finish dry film thickness of sixteen (16) mils. Prior to backfilling, all uncoated nuts, bolts, glands, rods and other part of joints shall be coated in the field with coal tar epoxy. The coal tar epoxy shall be Carboline Bitumastic No. 300-M. Amercoat No. 78, or approved equal.

C. For above-ground service, the exterior ferrous parts of all valves shall be coated as follows:

1. Prior to shipment from the factory, valves shall be coated with a thermally bonded epoxy coating in accordance with AWWA C-550, latest revision, or shall be shop painted with one (1) coat, 1.5 mils dry film thickness, of a combination lead and chromate primer with rust-inhibitive pigments and synthetic resins (Engineer approved method).

2. Following installation in the field, valves shall be painted with one (1) coat, 1.5 mils dry film thickness, of a combination lead and chromate primer with rust-inhibitive pigments and synthetic resins. Valves shall be finish painted with two (2) coats, 1.5 mils dry film thickness each coat, of a medium to long oil alkyd resin coating. Field applied coatings shall be as manufactured by the Carboline or an equal approved by the Engineer. The color of the finish coats shall be in accordance with the piping color code in the painting schedule.

3.3 Installation

A. Cover for buried valves shall not be less than that indicated on the Contract Drawings. Pipe elevations shall be maintained as indicated on the Drawings. Maintain a minimum pipe cover of thirty-six (36) inches, unless otherwise approved by the Engineer.

B. Valves of the size and type shown on the Contract Drawings shall be set plumb and installed at the locations indicated on the Contract Drawings. Valves shall be installed in accordance with manufacturer's installation instructions and with the details shown on the Contract Drawing and shall be rigidly supported.

C. Valves shall be installed such that they are supported properly in their respective positions, free from distortion and strain. Valves shall be installed such that their weight is not borne by pumps and equipment that are not designed to support the weight of the valve.

D. Valves shall be carefully inspected during installation; they shall be opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Check and adjust all valves for smooth operation.

E. Install valves with the operating stem in either horizontal or vertical position.

F. Allow sufficient clearance around the valve operator for proper operation.

G. Clean iron flanges by wire brushing before installing flanged valves. Clean carbon steel flange bolts and nuts by wire brushing, lubricate threads with oil or graphite, and tighten nuts uniformly and progressively. Clean threaded joints by wire brushing or swabbing. Apply teflon joint compound or teflon tape to pipe threads before installing threaded valves. All joints shall be watertight.

H. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Contract Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.

I. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe sections in Division 15, “Mechanical”.

J. Flanged joints shall be made with Type 304 stainless steel bolts, nuts and washers. Mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe. All buried bolts and nuts shall be heavily coated with two (2) coats of bituminous paint comparable to Inertol No. 66 Special Heavy, or approved equal.

K. Pressure gauges shall not be installed until after the substantial completion date unless otherwise requested by the Owner.

L. For buried valves, a valve box shall be centered accurately over the operating nut and the entire assembly shall be plumb. The tops of valve boxes shall be adjusted to the proper elevation as specified below and as shown on the Contract Drawings.

1. In paved areas, the tops of valve box covers shall be flush with the pavement. Following paving operations, a twenty-four (24) inch square shall be neatly cut in the pavement around the box and the paving removed. The top of the box shall then be adjusted to the proper elevation and a twenty-four (24) inch square by six (6) inch thick concrete pad poured around the box cover. Concrete pads in traffic areas shall be reinforced with No. 4 reinforcement bars as shown on the Contract Drawings. Concrete for the pad shall be 3,000 psi compressive strength at 28 days.

2. In unpaved areas, tops of valve box covers shall be set one (1) inch above finished grade. After the top of the box is set to the proper elevation, a twenty-four (24) inch square by six (6) inch thick concrete pad shall be poured around the box cover. Concrete for the pad shall be 3,000 psi compressive strength at 28 days.

3. The concrete pad for the valve box cover shall have a three (3) inch diameter, identification disc embedded in the concrete surface as shown on the Contract Drawings. The bronze identification disc shall be as specified in Section 09905, “Piping, Valve and Equipment Identification System” and shall have the information as shown on the Contract Drawings neatly stamped on it.

M. Valve Orientation

1. Install operating stem vertical when the valve is installed in horizontal runs of pipe having centerline elevations 4.5 ft or less above finished floor, unless otherwise shown.

2. Install operating stem horizontal in horizontal runs of pipe having centerline elevations between 4.5 feet and 6.75 feet above finish floor, unless otherwise shown.

3. If no plug valve seat position is shown, locate as follows:

   a. Horizontal Flow: The flow shall produce an "unseating" pressure, and the plug shall open into the top half of valve.

   b. Vertical Flow: Install seat in the highest portion of the valve.

N. Install a line size ball valve and union upstream of each solenoid valve, in-line flow switch, or the in-line electrical device, excluding magnetic flowmeters, for isolation during maintenance.

O. Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and ceilings for valve access.

P. Floor Box and Stem

Q. Steel extension stem length shall locate operating nut in floor box.

R. All valves and appurtenances shall be tested hydrostatically for a minimum of two (2) hours, concurrently with the pipeline in which they are installed at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. Protect or isolate any parts of valves, operators, or control and instrumentation systems whose pressure rating is less than the pressure used for the pressure test(s). If valve joints leak during pressure testing, loosen or remove the nuts and bolts, reseat or replace the gasket, reinstall or retighten the bolts and nuts, and hydrostatically retest the joints.

S. Following installation, all above-ground valves shall be painted in accordance with the painting system specified in Section 09900, “Painting”. Following installation of buried valves or valves installed in valve vaults, repair any scratches, marks and other types of surface damage, etc., with a coating equal to the original coating supplied by the manufacturer.

3.4 Installation of Air Release and Air and Vacuum Valves

A. Piping, fittings, and the air release and air and vacuum valves shall be installed as shown on the Contract Drawings.

B. Air Release/Air and Vacuum valves shall be installed on the discharge side of all “non-submersible” type pumping stations.

C. The air release valve assemblies shall be installed so that they are properly supported and such that they will function properly and freely and no parts shall be strained.

D. Air release valve testing shall be performed during the testing of pipeline which air release is attached.

3.5 Installation of Tie Rods

A. Tie rods shall be installed in strict accordance with the manufacturer's written installation requirements.

B. Unless otherwise indicated on the Contract Drawings, the size and number of tie rods for a joint or installation shall be as recommended by the manufacturer's design chart for a working pressure of 150 psi.

C. Following installation and prior to backfilling, all parts of the buried tie rod joint restraint system, including tie rods, tie bolts, nuts, washers, and other fasteners, shall be coated with two (2) coats, ten (10) mils DFT per coat, of coal tar epoxy equal to Koppers Bitumastic No. 300-M.

3.6 Inspection and Hydrostatic Pressure and Leakage Testing

A. Completed pipe shall be subjected to hydrostatic pressure test for 2 hours at full working pressure. All leaks shall be repaired and lines retested as approved by the Engineer. Prior to testing, the gravity pipelines shall be supported in an approved manner to prevent movement during tests.

B. Hydrostatic pressure and leakage testing shall be performed in accordance with Section 15044, “Pressure Testing of Piping”.

END OF SECTION

DRAFT DOCUMENT FOR COMMISSION REVIEW

APPENDIX A

PERMITS

DRAFT DOCUMENT FOR COMMISSION REVIEW

FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Ron DeSantis
Governor

Jay Collins
Lt. Governor

Alexis A. Lambert
Secretary

NOTICE OF ACCEPTANCE TO USE A GENERAL PERMIT

For:
Construction of Water Main Extensions for PWSs

11/24/2025

Permittee:
Timothy WelchUtilities DirectorCity of Pembroke Pines8300 South Palm Drive, Hollywood FL 33025Sent by E-mail: twelch@ppines.com

Permit Number:	0125162-357
Issue Date:	11/24/2025
Expiration Date:	11/23/2030
County:	BROWARD
Project Name:	Human Services Campus Utility
Water Supplier Name:	PEMBROKE PINES, CITY OF
Water Supplier ID:	4061083

Dear Amanda Martin:

On 11/21/2025, the Department received your Notice of Intent to Use the General Permit for Construction of Water Main Extensions for PWSs, under the provisions of Rules 62-4.530 and 62-555.405, Florida Administrative Code (F.A.C.). The Department does not object to the use of a General Permit for the activity described. Your general permit number is listed above; please refer to this number in all correspondence or inquiries regarding this permit. The activity covered under this general permit must conform to the description contained in your notice and any supplemental information. Any deviation will subject the Permittee to enforcement action and possible penalties.

Proposed Project Description and its Purpose: This project consists of replacing existing potable water infrastructure within the Human Services campus. Construction includes 275 LF of 2" PE poly blue water line, 300 LF of 4" C900 PVC, 700 LF of 6" C900 PVC, 3,700 LF of 8" C900 PVC WM, (2) 4" Gate (10) 6" Gate Valves, (18) 8" Gate Valves, (2) 8" x 4" Tapping Sleeve, (1) 8" x 6" Tapping Sleeve, and (6) 8" x 8" Tapping Sleeve, (3) 12" x 8" Tapping Sleeve. All existing potable water services are to be reconnected to the proposed water mains. Approximately 28 sampling points are included under this project.

Project Location: Project begins on Pembroke Rd and Poinciana Dr intersection and heads north through multiple roads and streets such as: Poinciana Dr, S Palm Dr, Hisbiscus Dr, Florida Dr, W Cypress DR., Pine Dr and other streets within the Human Services Campus.

Permit Remarks: This project application has been approved for General Permit

Any activities performed under this general permit are subject to the general conditions required in Rule 62-4.540, F.A.C. and the general conditions applicable to this general permit in Rule 62-555.405, F.A.C.; copies of which are provided as attachments to this document. You should become familiar with the General Conditions and any sampling and/or reporting requirements for which you may be responsible. This General Permit does not relieve you, the permittee, from the responsibility for obtaining any other permits required by the Department or any federal, state or local agency.

Upon completion of construction of the project and before placing into operation for any purpose other than testing for leakage, disinfection or testing equipment operations, you are required to obtain a clearance from the Department per the attached requirements.

Copies of satisfactory bacteriological analysis taken within sixty (60) days of completion of construction shall be submitted to the Department. Samples shall be taken from locations within the distribution system or water main extension to be cleared, in accordance with Rules 62-555.315(6), 62-555.330, and 62-555.340, F.A.C. and American Water Works Association (AWWA) Standard C 651-92, as follows:

Description of Sampling Points: 28 sampling points

Each location shall be sampled on two consecutive days, with sample points, chlorine residual readings, and presence or absence of total coliform clearly indicated on the report. A sketch or description of all bacteriological sampling locations must also be provided.

CLEARANCE REQUIREMENTS

To review clearance requirements and submit clearance documentation, please visit the ESSA electronic portal at: https://prodenv.dep.state.fl.us/DepEssa/coreenginestart?name=dwrm_pwc&Create=new.

If you have any questions or comments regarding coverage under the General Permit, please contact Sebastian Rodriguez by e-mail at Sebastian.Rodriguez@FloridaDEP.gov.

NOTICE OF RIGHTS

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, F.S., before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the hearing process may result in a modification of the agency action or even denial of the application.

Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rules 28-106.201 and 28-106.301, F.A.C., a petition for an administrative hearing must contain the following information:

a. The name and address of each agency affected and each agency's file or identification number, if known;

b. The name, address, and telephone number of the petitioner; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests are or will be affected by the agency determination;
c. A statement of when and how the petitioner received notice of the agency decision;
d. A statement of all disputed issues of material fact. If there are none, the petition must so indicate;
e. A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;
f. A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and
g. A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@FloridaDEP.gov. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

Time Period for Filing a Petition

In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing by the applicant and persons entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of receipt of this written notice. Petitions filed by any persons other than the applicant, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of receipt of the written notice, whichever occurs first. The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

Extension of Time

Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may, for good cause shown, grant the request for an extension of time. Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@FloridaDEP.gov, before the deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

Mediation

Mediation is not available in this proceeding.

FLAWAC Review

The applicant, or any party within the meaning of Section 373.114(1)(a) or 373.4275, F.S., may also seek appellate review of this order before the Land and Water Adjudicatory Commission under Section 373.114(1) or 373.4275, F.S. Requests for review before the Land and Water Adjudicatory Commission must be filed with the Secretary of the Commission and served on the Department within 20 days from the date when this order is filed with the Clerk of the Department.

Judicial Review

Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Florida Rules of Appellate Procedure 9.110 and 9.190 with the Clerk of the Department in the Office of General Counsel (Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000) and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice must be filed within 30 days from the date this action is filed with the Clerk of the Department.

EXECUTION AND CLERKING
Executed in Tallahassee, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Enclosures:
All supporting documentation provided by the applicant can be found here:
https://prodenv.dep.state.fl.us/DepNexus/public/electronic-documents/0125162-357/permit
This link will not be available immediately. These documents will be available no later than 3 days from the date of issuance of this permit.

Attachments:

1. General Conditions for All General Permits, Rule 62-4.540, F.A.C., effective date 8/31/1988
2. Requirements for this General Permit, Construction of Water Main Extensions for Public Water Systems, Rule 62-555.405, F.A.C., effective date 8/28/2003
3. Certification of Construction Completion and Clearance for Public Water System Components, Rule 62-555.345, F.A.C., effective date 8/28/2003
4. Certification of Construction Completion and Request for Clearance to Place Permitted PWS Components into Operation, Form 62-555.900(9), F.A.C., effective date 8/28/2003
5. Drinking Water Microbial Sample Collection & Laboratory Reporting format, Form 62-550.730 Reporting Format effective 01/1995, Revised 02/2010

CERTIFICATE OF SERVICE
Enterprise Self-Service Authorization System (ESSA) hereby certifies that this document and all attachments were sent on the filing date below to the following listed persons:

Amanda Martin
Timothy Welch
Sebastian Rodriguez

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to Section 120.52, F. S.

ESSA
Clerk

11/24/2025
Date

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APPENDIX B

GEOTECHNICAL REPORT
PERFORMED BY UES
MAY 7, 2025

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Florida's Leading Engineering Source

Geotechnical Exploration Report

Pembroke Human Services Campus

Pembroke Pines, FL

May 7, 2025
UES Project No:.0630.2500002.0000

Prepared for: CPH Consulting, LLC

OFFICES THROUGHOUT FLORIDA
8050 NW 77th Court • Medley, Florida 33166 • (305) 249-8434 • (305) 945-1911 (fax) • www.teamUES.com

Materials Testing
Geotechnical Engineering
Environmental
Building Sciences & Safety
Inspections & Code Compliance
Virtual Design Consulting

May 7, 2025

Ms. Amanda Martin
CPH Consulting, LLC
500 W. Fulton Street
Sanford, FL 32771
Phone: 407-322-6841
Email: amartin@cphcorp.com

RE: Geotechnical Exploration
Pembroke Human Services Campus
Poinciana Dr, Pembroke Pines, FL 33025
UES Project No.: 0630.2500002.0000

Dear Ms. Martin,

In accordance with your authorization, **GFA International, Inc. d/b/a Universal Engineering Sciences (UES)** has completed the subsurface exploration for the above-referenced project in accordance with the signed geotechnical service agreement for this project, revised March 11, 2025. The scope of UES's services was planned in conjunction with and authorized by you.

The purpose of UES's subsurface exploration was to classify the nature of the subsurface soils and general geomorphic conditions and to evaluate their impact upon the proposed construction. A determination of sinkhole potential at the site was outside the scope of this investigation. If a determination is requested, UES can propose and perform this service utilizing the appropriate geophysical methods. This report contains the results and UES's engineering interpretation of subsurface conditions of the site with respect to the project characteristics as described to UES, including recommendations for drainage and roadway improvements, hydro-geological concerns, and site preparation procedures.

EXECUTIVE SUMMARY

The subject project is located along Poinciana Drive in Pembroke Pines, Florida. It is UES's understanding that this project is to consist of the installation of water and sewer lines to approximately 3 to 5 feet deep at the above-mentioned address located in Pembroke Pines, FL. UES was provided with an aerial map of the requested drilling locations. At the time of exploration, UES was not provided with the invert depth of the proposed pipe. The site is currently an existing roadway.

If conditions vary from those indicated above, UES should be requested to review the data to see if the recommendations contained herein are still valid.

The subsurface conditions at the tested locations consisted of asphalt atop loose to dense, fine to medium grained silty sand with limestone fragments from the ground surface to approximately 2 feet below ground surface (BGS), underlain by very loose to dense with varying amounts of limestone fragments to the termination depth of the borings at approximately 10 feet BGS. The standard penetration test yielded N-values ranging from 2 to 38 blows per foot.

At the time of testing (April 2025), groundwater was encountered in the test borings at an approximate depth of 6’ BGS.

Engineering evaluation and recommendations can be found in this report for the proposed roadway and drainage improvements.

UES appreciates the opportunity to be of service to you on this project and looks forward to a continued association with **CPH Consulting, LLC.** Please contact the undersigned if you have any questions or comments or if UES may further assist you as your plans proceed.

Respectfully Submitted,
UES
Registry No. 4930



Caleb Castillo
Staff Engineer

Carlos A. Mercado, P.E.
Professional Engineer # 71707
State of Florida

This item has been digitally signed and sealed by [Carlos A. Mercado] on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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1.0 INTRODUCTION

1.1 Project Description

The subject project is located along Poinciana Drive in Pembroke Pines, Florida, as shown in **Figure 1**. It is UES's understanding that this project is to consist of the installation of water and sewer lines to approximately 3 to 5 feet deep at the above-mentioned address located in Pembroke Pines, FL. UES was provided with an aerial map of the requested drilling locations. At the time of exploration, UES was not provided with the invert depth of the proposed pipe. The site is currently an existing roadway.

The recommendations provided in this report are based upon the information noted above. If project information differs significantly, please inform UES so that UES may review and revise the recommendations, if necessary, with respect to any modifications.

1.2 Purpose

The primary purpose of the geotechnical exploration was to evaluate the general type and condition of the subsurface soil materials underlying the project site, to provide professional opinions with respect to site preparation, and recommendations for drainage and roadway improvements.

1.3 Scope of Services

The primary objectives of the geotechnical exploration were to collect subsurface data at the proposed project site, summarize test results, and discuss any apparent site conditions that may have geotechnical significance for the proposed construction. The following are provided within this report:

1. Soil boring logs depicting the subsurface soil conditions encountered during the field exploration.

2. A review of each soil sample obtained during the field exploration by the geotechnical engineer.

3. Analysis of the existing soil conditions found during the exploration with respect to the proposed roadway and drainage improvements.

4. Evaluation and recommendations with respect to the proposed drainage improvements.

5. Provide soil criteria and site preparation procedures for construction of replacing the drainage system.



LEGEND:
SITE

FIGURE 1 – SITE LOCATION PLAN

PEMBROKE HUMAN SERVICES CAMPUS
PEMBROKE PINES, FL
UES PROJECT NO.: 0630.2500002.0000

2.0 OBSERVATIONS

2.1 Site Observation and Historical Data

The subject project is located along Poinciana Drive in Pembroke Pines, Florida. The site is currently an existing roadway. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. UES would be pleased to perform these services if required.

UES reviewed historical data from 1952 to 2022. The site consisted of an undeveloped parcel of land with light to moderate vegetation until the development of the existing paved roadways by 1957. The site has remained unchanged since then.

2.2 Laboratory Testing and Procedures

Soil samples recovered from UES's field exploration were returned to the laboratory. A geotechnical engineer visually examined and reviewed the field descriptions of the recovered soils in general accordance with ASTM D-2488. Samples were visually examined to accurately evaluate the subsurface soil properties and site geomorphic conditions. The following test was performed to aid in classifying the soils and to help evaluate the general engineering characteristics of the site soils secured: passing No.200 sieve (ASTM D-1140) Table 1 below presents the summary of laboratory test results of the soil sample tested.

Boring	Sample Depth (feet)	Passing No. 200 Sieve (%)
B03	0-2	35.2

Representative samples of the soils encountered during the field exploration will be held in the laboratory for your inspection for 30 days unless UES is notified otherwise.

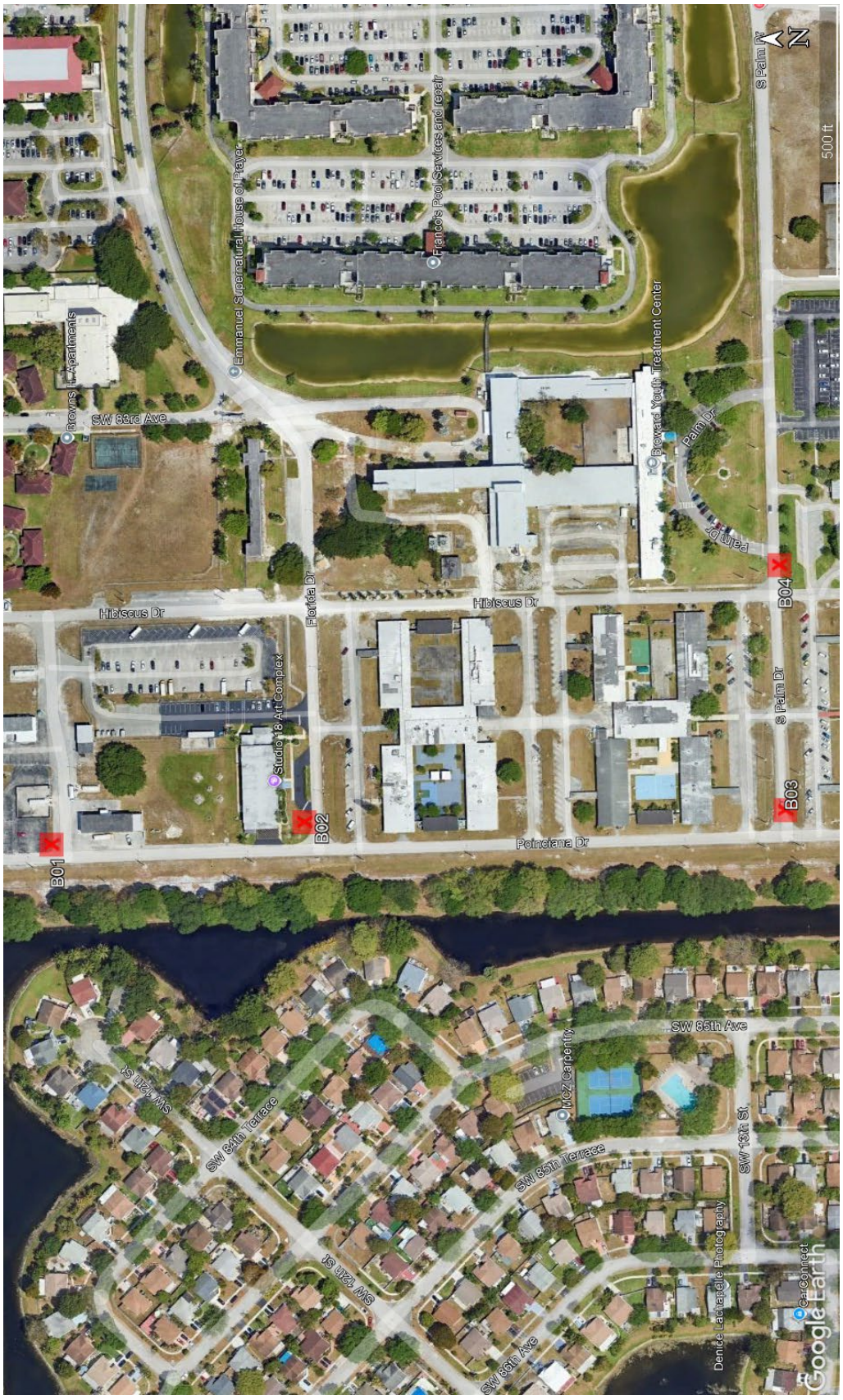
2.3 Field Exploration

For purposes of this study, the following was performed:

- Four (4) standard penetration test (SPT) borings (ASTM D-1586) to a depth of approximately 10 feet below existing grade.

Figure 2 shows the approximate test locations performed at the site.

The SPT boring method was used as the investigative tool within the borings. Penetration tests were performed in substantial accordance with ASTM Procedure D-1586, "Penetration Test and Split-Barrel Sampling of Soils".



Legend: SPT Boring

FIGURE 2 – TEST LOCATION PLAN

NOTE: BORING LOCATIONS WERE LOCATED USING A MEASURING TAPE AND EXISTING LANDMARKS AS REFERENCE POINTS. IN ADDITION, THE LATITUDE, LONGITUDE, AND ELEVATION NOTED ON THE BORING LOGS WERE TAKEN FROM GOOGLE EARTH. THEREFORE, LOCATIONS SHOWN ON THE PLAN ARE APPROXIMATE.

This test procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound automatic hammer falling 30 inches. The number of blows per foot for the second and third 6-inch increments is an indication of soil strength. The SPT borings were performed using a CME-45, a truck-mounted drill rig equipped with an automatic hammer. The soil samples recovered from the soil borings were classified and stratified by a geotechnical engineer. Following completion of the field services, all boreholes were backfilled with excavated soil/rock, and the site generally cleaned, as required.

The results of the classification and stratification are encountered during UES's exploration are presented in **Appendix A** "Record of Test Boring". It should be noted that soil conditions might vary between what is depicted on the attached log and other areas of the site. The soil boring data reflect information from a specific test location only. Site specific survey staking for the test location was not provided for UES's field exploration. The boring location was determined in the field by a project engineer by measuring distances and estimating right angles from existing site features. The latitude, longitude, and elevation noted in UES's boring logs were taken from Google Earth. Google Earth uses WGS-84 or Local Mean Sea Level (MSL) as datum. It should be noted that elevations may not always be correct if fill is added or site grades change to a site after Google captures the image. The boring location and elevations noted should, therefore, be considered approximate. The boring depths were confined to the zone of soil likely to be stressed by the proposed construction.

The boring log depicts the observed soils in graphic detail. The Standard Penetration Test boring indicates the penetration resistance, or N-values logged during the drilling and sampling activities. Please refer to **Appendix B** "Notes Related to the Test Borings" for further clarification of UES's field exploration. The classifications and descriptions shown on the log are generally based upon visual characterizations of the recovered soil samples. All soil samples reviewed have been depicted and classified in accordance with the Unified Soil Classification System symbols (i.e. SP, SP-SM, SC, etc.). See in **Appendix C** "Discussion of Soil Groups", for a detailed description of various soil groups.

3.0 SUBSURFACE CONDITIONS

The subsurface conditions at the tested locations consisted of asphalt atop, loose to dense, fine to medium grained silty sand with limestone fragments from the ground surface to approximately 2 feet below ground surface (BGS), underlain by very loose to dense with varying amounts of limestone fragments to the termination depth of the borings at approximately 10 feet BGS. The standard penetration test yielded N-values ranging from 2 to 38 blows per foot.

For a more precise description of the conditions encountered within the soil test borings, refer to the "Record of Test Boring" logs included in **Appendix A.**

3.1 Groundwater Considerations

On the date of UES's field exploration (April 2025), groundwater was encountered at an approximate depth of 6' BGS during drilling operations.

The groundwater table will fluctuate seasonally depending upon local rainfall and other local influences. Higher temporary water levels may be possible at this site after extended periods of rain. This is based upon the existing static groundwater levels at the time of the exploration and anticipating groundwater table rise through the type of soils encountered during the exploration.

No additional investigation was conducted in relation to any existing well field in the vicinity. Well fields can influence water table levels and cause significant fluctuations. If a more comprehensive water table analysis is necessary, UES recommends contacting a registered professional specialized in hydrogeology.

4.0 ENGINEERING EVALUATION AND RECOMMENDATIONS

4.1 Site Preparation Recommendations

The in-situ bedding soils should be compacted fill to provide adequate support for the proposed drainage improvements. A more detailed description of this work is as follows:

1. Utility runs installed below the groundwater table should be dewatered, if necessary, to allow excavation, inspection, and backfill in the dry.

2. In-situ bedding soils should be compacted to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557) to a depth of 12 inches below the bedding level. Compaction in confined areas should be accomplished using equipment such as jumping jacks and ‘walk-behind’ vibratory plates and rollers.

3. Utility backfill may consist of excavated, non-organic materials that include rock fragments no larger than 3 inches in diameter. Offsite fill material (if required) should consist of clean granular soils with less than 10 percent soil fines. Place fill in uniform 6-inch thick (loose) lifts and compact each lift to a minimum density of 95 percent of the Modified Proctor maximum dry density (ASTM D1557).

4. In paved areas, the pavement subgrade should be re-established using approved materials and specified compactive effort.

Using vibratory compaction equipment can disturb adjacent structures. If vibration related disturbance to nearby structures may be of concern, vibration levels should be monitored during compaction operations. A representative from this office can monitor the vibration disturbance of adjacent structures; and a proposal for these services can be provided upon your request.

4.2 Drainage Improvements

Excavation, bedding, placement, and backfilling for underground utilities should be performed in accordance with the applicable sections of the FDOT Standard Specifications

for Road and Bridge Construction, latest edition. Density tests should be performed to verify the requirements of the FDOT Specifications have been met.

If fill is to be brought in to be used as backfill (if needed), it should be inorganic (classified as SP/SW) containing not more than 5 percent (by weight) fibrous organic materials. Fill materials with silt-size soil fines in excess of 10% should not be used. This includes cyclone sand material. Place fill and compact each lift to a minimum density of 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) with a tamper. Dewatering techniques may be necessary. In the case groundwater cannot be brought down, UES suggests the use of a “self” compacting material such as coarse aggregate (i.e. FDOT No. 57 stone) for backfill material placed below the groundwater table. A filter fabric (geotextile) should be used between the 57 stone and newly placed fill to avoid migration of the soils into the 57 stone.

“Self” compacting material placed below the groundwater should consist of inorganic, non-plastic material, free of any man-made debris, limerock with a three (3) inch maximum particle size with ASTM classification (USCS) of GP, GW or FDOT 57 Stone with less than 5% material finer than the No. 200 Sieve and a maximum particle size of 3 inches. The No. 57 stone should not be placed more than one foot above the groundwater. A filter fabric (geotextile) should be used between the 57 stone and newly placed fill to avoid migration of the soils into the 57 stone.

4.3 Temporary Groundwater Control

Many roadway areas have prematurely deteriorated due to intrusion of the wet seasonal high groundwater table or surface runoff mitigation. If site preparation work is performed during the rainy season (May through October), special care should be taken to maintain positive drainage from the paved areas to drains or ditches around the site. Unexpected wet periods can also occur in Florida during the “dry” season. Such events can raise water tables to levels above seasonal highs without the associated high temperatures to evaporate ponded water. Therefore, the Contractor should practice wet weather means and methods for earthwork during the “dry” season as well.

If dewatering is required, UES recommends that the groundwater level be lowered and maintained at a depth of at least 2 feet below bearing levels and excavation bottoms during construction. Dewatering may consist of ditching, well points, or other means. However, groundwater control means and methods are the sole responsibility of the Contractor. Furthermore, UES recommends that the Contractor determine the actual groundwater levels at the time of construction to determine the groundwater impact on the construction procedures. If groundwater is encountered during trenching or foundation installation, the Geotechnical Engineer of Record should be notified so that they can determine whether there is a need for under-slab drainage, perimeter drains, or other recommendations for dewatering.

Sump pumps may be a feasible alternative[1], depending on the actual depth of the groundwater when excavating. When using sump pumps to maintain the excavation free of water, if water is still present at the bottom of the excavation, the exposed subgrade can be over-excavated to 12 inches and replaced with a fill material consisting of inorganic, non-plastic material, free of any man-made debris, limerock with an ASTM classification (USCS) of GP, GW or FDOT 57 stone with less than 5% material finer than the No. 200 sieve and a maximum particle size of 1 inch. The remainder of the excavation may be backfilled with clean granular fill material to at least 98% of the Modified Proctor (ASTM D1557) maximum dry density. A filter fabric (geotextile) should be used between the 57 stone and newly placed fill to avoid migration of the soils into the 57 stone.

4.4 Pipe Bedding and Backfill

Pipe bedding and backfill requirements to one (1) foot above the crown of pipe should be specified by the civil engineer. UES suggests the use of a “self” compacting material such as coarse aggregate (i.e. FDOT No. 57 stone) for backfill material placed below the groundwater table. A filter fabric (geotextile) should be used to avoid migration of the existing soils into the newly placed backfill. “Self” compacting material placed below the groundwater should consist of inorganic, non-plastic material, free of any man-made debris, limerock with a three (3) inch maximum particle size with ASTM classification (USCS) of GP, GW or FDOT 57 Stone with less than 5% material finer than the No. 200 Sieve and a maximum particle size of 3 inches. The No. 57 stone should not be placed more than one foot above the groundwater.

Fill placed in one (1) foot above the crown of the pipe shall consist of select material having no more than 12 percent passing the No. 200 sieve, with a maximum particle size of 3 inches. The trench backfill shall be placed in maximum loose lifts of 12 inches and compacted to at least 95% of the Modified Proctor (ASTM D1557) maximum dry density or as specified by the civil engineer.

5.0 EXCAVATION CONDITIONS

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better ensure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the OSHA guidelines. It is UES's understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the Contractor could be liable for substantial penalties.

1 No pumping tests were performed and no firm estimate of water to be removed, or of soil permeability is available. The contractor may contract these tests to UES if he needs an accurate estimate.

The Contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The Contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the Contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. UES is providing this information solely as a service to UES's client. UES is not assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not implied and should not be inferred.

6.0 BACKFILL

Most of the soils encountered during UES's exploration are *suitable* for reuse as backfill soils. Material required for backfilling should consist of clean sands with no more than 10% passing the U.S. No. 200 sieve. The backfill should be placed in uncompacted lifts of not more than 12 inches in thickness and should be uniformly compacted to the requirements stated in the contract specifications. Heavy compaction equipment should be operated no closer than 3 feet of any installed structure. Compaction adjacent to structures should be performed with small compaction equipment (e.g., jumping-jack or heavy plate tamper). The Contractor should use caution during the backfilling operations to prevent any damage to adjacent structures.

7.0 REPORT LIMITATIONS

This consulting report has been prepared for the exclusive use of the current project owners and other members of the design team for the proposed project. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied.

The evaluation submitted in this report is based in part upon the data collected during a field exploration. However, the nature and extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to reevaluate information and professional opinions as provided in this report. In the event changes are made in the nature, design, or locations of the proposed structure, the evaluation and opinions contained in this report shall not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by UES. Lastly, in accepting this report, the client understands that the data obtained from the soil borings is intended for foundation analysis only and is not to be used for excavating or backfilling pricing estimates.

The analysis and recommendations submitted in this report are based on the data obtained from the tests performed at the location indicated on the attached **Figure 2**. This report does not reflect any variations, which may occur between borings. While the borings are representative of the subsurface conditions at their respective locations and for their vertical reaches, local variations characteristic of the subsurface soils of the region are anticipated and may be encountered. The delineation between soil types shown on the soil logs is

approximate and the description represents UES's interpretation of the subsurface conditions at the designated boring locations on the particular date drilled.

The scope of UES's services did not include an environmental assessment for the presence or absence of hazardous or toxic materials in the soil and groundwater. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of UES's client.

UES should be provided the opportunity to review the final foundation specifications and review foundation design drawings in order to determine whether UES's recommendations have been properly interpreted, communicated, and implemented. If UES is not afforded the opportunity to participate in construction related aspects of foundation installation as recommended in this report or any report addendum, UES will accept no responsibility for the interpretation of UES's recommendations made in this report or on a report addendum for foundation performance.

Any third-party reliance on UES's geotechnical report or parts thereof is strictly prohibited without the expressed written consent of UES. **The SPT methodology (ASTM D-1586) used in performing UES's borings and for determining penetration resistance is specific to the sampling tools utilized and does not reflect the ease or difficulty of advancing other tools, equipment, or materials.**
In addition, an environmental assessment regarding the potential for contaminated soil and/or groundwater on this site has not been performed as part of this study.

The monitoring and inspection of construction procedures and the supervision of the implementation of the recommendations given herein shall be made by UES. Otherwise, the retained firm shall study this report, perform additional tests as they deem necessary, and submit their own recommendations or assume full responsibility for the outlined recommendations in their entirety.

APPENDIX A
Record of Test Borings

DRAFT DOCUMENT FOR COMMISSION REVIEW

UES
8050 NW 77th Ct
Medley Florida 33166
(305) 249-8434

LOG OF BORING B01

CLIENT CPH Consulting, LLC
PROJECT NAME Pembroke Human Services Campus
PROJECT NUMBER 0630.2500002.0000
PROJECT LOCATION Poinciana Drive, Pembroke Pines, FL
DRILLING CONTRACTOR UES
HOLE DEPTH 10 ft
HOLE DIAMETER
DRILLER Chris Bell
DATE STARTED 4/22/25
COMPLETED 4/22/25
DRILL RIG CME 45
GROUND WATER LEVEL: ▽ **AT TIME OF DRILLING** 6.00 ft / Elev 0.00 ft
METHOD SPT
LATITUDE 26.001144
LONGITUDE -80.254273
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
0.0	5.0		1.5" of asphalt atop, dense, gray, fine to medium grained SAND (SP) with LIMESTONE fragments.	1	90	39 26 12 12	38		
2.0			Dense, gray, fine to medium grained SAND (SP).	2	90	9 16 13 11	29		
2.5	2.5		Medium dense, gray, fine to medium grained SAND (SP).	3	90	6 7 5 4	12		
5.0	0.0	▽	Very loose, brown, fine to medium grained SAND (SP) with trace limestone fragments.	4	90	1 1 1 4	2		
7.5	-2.5		Loose, light gray, fine to medium grained SAND (SP) with LIMESTONE fragments.	5	90	2 3 3 4	6		
10.0									

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 10.0 feet.

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DRAFT DOCUMENT FOR COMMISSION REVIEW

UES
8050 NW 77th Ct
Medley Florida 33166
(305) 249-8434

LOG OF BORING B02

CLIENT CPH Consulting, LLC
PROJECT NAME Pembroke Human Services Campus
PROJECT NUMBER 0630.2500002.0000
PROJECT LOCATION Poinciana Drive, Pembroke Pines, FL
DRILLING CONTRACTOR UES
HOLE DEPTH 10 ft
HOLE DIAMETER
DRILLER Chris Bell
DATE STARTED 4/22/25
COMPLETED 4/22/25
DRILL RIG CME 45
GROUND WATER LEVEL: ▽ **AT TIME OF DRILLING** 6.00 ft / Elev 0.00 ft
METHOD SPT
LATITUDE 25.999872
LONGITUDE -80.254148
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
0.0	5.0		Loose, gray, fine to medium grained SAND (SP) with trace limestone fragments.	1	90	1 2 3 3	5		
2.0			Loose, light gray, fine to medium grained SAND (SP).	2	90	3 4 4 4	8		
4.0	2.5		Very loose, gray-brown, fine to medium grained SAND (SP).	3	90	2 2 2 1	4		
6.0 ▽	0.0		Very loose, gray, fine to medium grained SAND (SP).	4	90	1 1 1 1	2		
10.0	-2.5			5	90	1 1 1 2	2		

SPT N VALUE ▲ (20 40 60 80)
PL MC LL (20 40 60 80)
☐ FINES CONTENT (%) ☐ (20 40 60 80)

Bottom of borehole at 10.0 feet.

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DRAFT DOCUMENT FOR COMMISSION REVIEW

UES
8050 NW 77th Ct
Medley Florida 33166
(305) 249-8434

LOG OF BORING B03

CLIENT CPH Consulting, LLC
PROJECT NAME Pembroke Human Services Campus
PROJECT NUMBER 0630.2500002.0000
PROJECT LOCATION Poinciana Drive, Pembroke Pines, FL
DRILLING CONTRACTOR UES
HOLE DEPTH 10 ft
HOLE DIAMETER
DRILLER Chris Bell
DATE STARTED 4/22/25
COMPLETED 4/22/25
DRILL RIG CME 45
GROUND WATER LEVEL: ▽ **AT TIME OF DRILLING** 6.00 ft / Elev 0.00 ft
METHOD SPT
LATITUDE 25.997453
LONGITUDE -80.25408
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
0.0	5.0		1.5" of asphalt atop, dense, light tan, SILTY SAND (SM) with LIMESTONE fragments.	1	90	35 18 9 11	27		
2.0	2.5		Medium dense, light gray, fine to medium grained SAND (SP).	2	90	12 10 12 11	22		
4.0	0.0		Loose, brown, fine to medium grained SAND (SP).	3	90	4 3 3 3	6		
6.0 ▽	-2.5		Very loose, gray, fine to medium grained SAND (SP) with some limestone fragments.	4	90	1 1 2 5	3		
10.0			Loose, gray, fine to medium grained SAND (SP) with some limestone fragments.	5	90	2 3 3 3	6		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 10.0 feet.

GFA GEOTECH BH - GFA DATA TEMPLATE.GDT - 5/5/25 09:20 - C:\USERS\CCASTILLO\TEAMUES\UES GEOTECHNICAL SERVICES - SFL - MIAMI - MIAMI\ACTIVE PROJECTS\0630.2500002.0000 - PEMBROKE HUMAN SERVICES CAMPUS\6 - GINT\0630.2500002.0000 -

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UES
8050 NW 77th Ct
Medley Florida 33166
(305) 249-8434

LOG OF BORING B04

CLIENT CPH Consulting, LLC
PROJECT NAME Pembroke Human Services Campus
PROJECT NUMBER 0630.2500002.0000
PROJECT LOCATION Poinciana Drive, Pembroke Pines, FL
DRILLING CONTRACTOR UES
HOLE DEPTH 10 ft
HOLE DIAMETER
DRILLER Chris Bell
DATE STARTED 4/22/25
COMPLETED 4/22/25
DRILL RIG CME 45
GROUND WATER LEVEL: ▽ **AT TIME OF DRILLING** 6.00 ft / Elev 0.00 ft
METHOD SPT
LATITUDE 25.997484
LONGITUDE -80.252709
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
0.0	5.0		1.5" of asphalt atop, dense, dark gray, fine to medium grained SAND (SP) with LIMESTONE fragments.	1	90	25 22 10 8	32		
3.0	2.5		Medium dense, light gray, fine to medium grained SAND (SP).	2	90	6 7 8 9	15		
5.0	0.0		Loose, brown, fine to medium grained SAND (SP).	3	90	3 3 3 2	6		
6.0 ▽			Very loose, gray, fine to medium grained SAND (SP).	4	90	1 1 1 1	2		
7.5	-2.5			5	90	1 1 2 4	3		
10.0									

Bottom of borehole at 10.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

GFA GEOTECH BH - GFA DATA TEMPLATE.GDT - 5/5/25 09:20 - C:\USERS\CCASTILLO\TEAMUES\UES GEOTECHNICAL SERVICES - SFL - MIAMI - MIAMI\ACTIVE PROJECTS\0630.2500002.0000 - PEMBROKE HUMAN SERVICES CAMPUS\6 - GINT\0630.2500002.0000 -

APPENDIX B

Notes Related to Test Borings

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NOTES RELATED TO RECORDS OF TEST BORING AND GENERALIZED SUBSURFACE PROFILE

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.

2. The boring location was identified and located in the field based on measured and estimated distances from existing site features.

3. The borehole was backfilled to site grade following boring completion, patched with asphalt cold patch mix when pavement was encountered.

4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.

5. The Record of Test Boring is subject to the limitations, conclusions, and recommendations presented in the report text.

6. The Standard Penetration Test (SPT) was performed in accordance ASTM Procedure D-1586. SPT testing procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound hammer falling 30 inches.

7. On the Record of Test Boring listed as “Blow Counts”, the N-value is the sum of the SPT hammer blows required to drive the split-tube sampler through the second and third 6-inch increment of the sampling layer, and is an indication of soil strength.

8. Shown on the Record of Test Boring an SPT N-value expressed as 50/2” is descriptive of the fact that 50 hammer blows were required to drive the split-spoon sampler a distance of approximately 2 inches.

9. The soil/rock strata interfaces shown on the Records of Test Boring are approximate and may vary from those in the field. The soil/rock conditions shown on the Records of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.

10. Relative density and consistency for sands/gravels, silts/clays, and limestone are described as follows:

Cohesionless Soils	
SPT (N-Value)	Relative Density
0 – 3	Very Loose
4 – 8	Loose
9 – 24	Medium Dense
25 – 40	Dense
Over 40	Very Dense

Silts and Clays	
SPT (N-Value)	Consistency
0 – 1	Very Soft
2 – 4	Soft
4 – 6	Firm
7 – 12	Stiff
13 – 24	Very Stiff
Over 24	Hard

Limestone	
SPT (N-Value)	Relative Density
0 – 19	Very Soft
20 – 49	Soft
50 – 100	Medium Hard
50 for 3 to 5”	Moderately Hard
50 for 0 to 2”	Hard

11. Definition of descriptive terms of modifiers for silts/clays/shells/gravels are described as follows:

Percentage of Modifier Material	First Qualifier	Second Qualifier
0 – 5	With a Trace of + Silt, Clay, Shell	With a Trace
5 – 12	Slightly + Silty, Clayey, Shelly	With Some
12 – 30	Silty, Clayey, Shelly	With
30 – 50	Very + Silty, Clayey, Shelly	And

12. Descriptive characteristics for organic content percentages are described as follows:

Percentage of Organic Material	Descriptor
0 – 5	With a Trace
5 – 20	With Organics
20 – 75	Highly Organic
75 – 100	Peat

APPENDIX C
Discussion of Soil Groups

DISCUSSION OF SOIL GROUPS

COARSE GRAINED SOILS

GW and SW GROUPS. These groups comprise well-graded gravelly and sandy soils having little or no plastic fines (less than 5 percent passing the No. 200 sieve). The presence of the fines must not noticeably change the strength characteristics of the coarse-grained fraction and must not interface with it's free-draining characteristics.

GP and SP GROUPS. Poorly graded gravels and sands containing little of no plastic fines (less than 5 percent passing the No. 200 sieve) are classed in GP and SP groups. The materials may be called uniform gravels, uniform sands or non-uniform mixtures of very coarse material and very fine sands, with intermediate sizes lacking (sometimes called skip-graded, gap-graded or step-graded). This last group often results from borrow pit excavation in which gravel and sand layers are mixed.

GM and SM GROUPS. In general, the GM and SM groups comprise gravels or sands with fines (more than 12 percent passing the No. 200 sieve) having low or no plasticity. The plasticity index and liquid limit of soils in the group should plot below the "A" line on the plasticity chart. The gradation of the material is not considered significant and both well and poorly graded materials are included.

GC and SC GROUPS. In general, the GC and SC groups comprise gravelly or sandy soils with fines (more than 12 percent passing the No. 200 sieve), which have a fairly high plasticity. The liquid limit and plasticity index should plot above the "A" line on the plasticity chart.

FINE GRAINED SOILS

ML and MH GROUPS. In these groups, the symbol M has been used to designate predominantly silty material. The symbols L and H represent low and high liquid limits, respectively, and an arbitrary dividing line between the two is set at a liquid limit of 50. The soils in the ML and MH groups are sandy silts, clayey silts or inorganic silts with relatively low plasticity. Also included are loess type soils and rock flours.

CL and CH GROUPS. In these groups the symbol C stands for clay, with L and H denoting low or high liquid limits, with the dividing line again set at a liquid limit of 50. The soils are primarily inorganic clays. Low plasticity clays are classified as CL and are usually lean clays, sandy clays or silty clays. The medium and high plasticity clays are classified as CH. These include the fat clays, gumbo clays and some volcanic clays.

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APPENDIX C

LIST OF APPROVED PRODUCTS

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CITY OF PEMBROKE PINES
Engineering Division
Materials Review Checklist
Water and Sewer Construction

Project Name: _____

Engineer of Record: _____

Contractor: _____

Permit #: _____ **Date:** _____

The following materials and specifications have been found to be acceptable by the City of Pembroke Pines Engineering Division. Shop drawings shall not be submitted for approval if the CONTRACTOR uses products on this list. Only one (1) manufacturer per category will be allowed. The Engineer of Record and The City of Pembroke Pines Engineering Division and/or Utilities Department approve any product that is not on the checklist. Three copies of the shop drawing are required for each product seeking approval.

Shop drawings are required for all structures and non-standard items. Materials/products shall be rejected if they do not meet the City of Pembroke Pines minimum design and construction standards.

All materials shall be new and unused and in compliance with the AWWA/ANSI minimum standards. For the purpose of standardization, materials should be of like kind in order to achieve conformity with current existing City water and sewer systems.

Three (3) sets of the Materials Review Checklist and any additional shop drawings shall be stamped and signed by the Contractor and Engineer of Record as prerequisite for submittal to the City of Pembroke Pines for approval.

The CONTRACTOR is required to mark an "X" next to the selected material for each category. The list shall be completed in full. If the materials category does not apply to the required scope of construction for the project, then place an "N/A on that line that is not applicable. For all material categories, mark with an "X", "N/A" or "refer to Attached Alternate."

Approved By:

MATERIALS REVIEW LIST - WATER DISTRIBUTION SYSTEM
All components in contact with drinking water shall meet requirements of NSF 61

PVC WATER PIPE: Class 150 (DR 18), conforming to ANSI/AWWA C900-16 OR C905-97 or Latest revision and shall have push on rubber gasket joints.

_____ J-M Pipe

_____ Diamond

DIP WATER PIPE: Class 350 wall thickness (up to 12”), Class 300 (14”-18”), conforming to ANSI/AWWA C151/a21.51-17, or latest revision, and shall be double cement lined conforming to ANSI/AWWA C104/A21.4-16 or latest revision.

_____American Cast Iron Co.

_____U.S. Pipe

_____McWane/Clow

FITTINGS: ductile iron compact mechanical joint type and shall be class 350 through 24" conforming to ANSI/AWWA C153/A21.53-11, or latest revision, and class 250 in sizes 24" and larger, conforming to ANSI/AWWA C110/A21.10-08, or latest revision, complete with glands, gaskets, bolts and nuts. All fittings shall be cement lined and seal coated with the same as pipe.

_____American Cast Iron Pipe

_____McWane/Union Foundry

_____U.S. Pipe

_____Star Products

FIRE HYDRANTS: minimum 5 1/4" valve opening and shall open against the pressure and closing with the flow. Hydrants shall meet or exceed ANSI/AWWA C502-18 or latest revision and shall comply with Factory Mutual Research Corporation and Underwriters Laboratories UL246 Standard.

_____Mueller

_____American Flow Control

_____McWane/Clow

_____McWane/Kenned

GATE VALVES: gate valves for water (4"-12" in size), Gate valves shall be iron body, fully resilient seat, and bronze mounted non-rising stem, double disc, rated at 200 psi and conforming to ANSI/AWWA C509-15 or latest revision. Exposed valves shall be outside screw and yoke type.

_____American Flow Control

_____Mueller

_____McWane/Clow

BUTTERFLY VALVES AND OPERATORS: butterfly valves for water (16" and up in size) shall conform to ANSI/AWWA C504-15 or latest revision standard for rubber-seated butterfly valves and shall be class 150 A or B.

_____Mueller Company

_____Henry Pratt Company

_____DeZurik

_____McWane/Clow/M&H

_____Keystone

TAPPING VALVE: flange by mechanical iron body, fully resilient seat, bronze mounted non-rising stem, double disc, rated at 200 psi and conforming to ANSI/AWWA C509-15 or latest revision.

_____American Flow Control

_____McWane/Clow

_____Mueller

TAPPING SLEEVES: ductile iron meeting ASTM A536 Grade 65-45-12, mechanical joint.

_____American / Darling

_____McWane/Clow/Tyler

_____Mueller

_____U.S. Pipe

AIR RELEASE VALVE: shall conform to AWWA C512-15 and valve body and cover shall be of cast iron construction, ASTM A126-B. All internal parts shall be of stainless steel, ASTM A240 - Type 304 for the float and ASTM A743/A744 Type 316 for the linkage. The venting orifice shall be 3/16" in diameter with brass seat or that determined by Engineer of Record. The inlet opening shall be a 2" NPT screwed connection. The overall height shall not exceed 13 inches.

_____Val-Matic

_____Apco/DeZurik

_____Golden-Anderson/VAG Group

_____Crispin

RETAININING GLAND: Retainer glands shall conform to ANSI/AWWA C111/A21.11-17 or latest revision. All glands shall be manufactured from ductile iron as listed by Underwriters Laboratories for 250 psi minimum water pressure rating.

_____Ebaa Mega Lug

_____SIGMA

_____Uni-Flange

VALVE BOX: Valve boxes for water mains and sewer force mains shall be adjustable screw type with 5 ¼ inch shaft, 18-to-24-inch extension, Cast Iron ASTM-A48 Class 30 marked “water”.

_____Tyler

_____US Foundry

_____Kennedy Co/Russell Pipe & Foundry

LOCATING TAPE: 3" wide blue tape with a metallized foil core laminated between 2 layers of plastic film with the words "CAUTION WATER LINE BURIED BELOW" printed at 30" intervals along the tape is required to be placed 18" above all PVC mains or as recommended by manufacturer. 3” wide blue tape with the same words “message” is required to be placed 18” above all ductile iron pipe mains.

_____Reef Ind.

_____Presco

_____Best Materials

LOCATING WIRES – WATER / FIRE MAINS:

_____# 6-gauge single strand copper wire (non-insulated)

LOCATING WIRES – WATER SERVICES:

_____#12 gauge single or mult stran coated copper wire.

SERVICE SADDLE: Ductile iron epoxy or nylon coated with double stainless-steel straps. Saddles shall be manufactured in accordance with AWWA C800-14, ANSI/AWWA C111/21.11-17 and body to ASTM a 536 or latest revision. Shall conform to AWWA M23 for PVC pipe installation.

_____Ford

_____Mueller

_____JCM

_____Romac

_____Smith-Blair / Optional 316ss

CORPORATION STOP: Corporation stops shall be manufactured in accordance with AWWA C800-14 of brass no lead alloy in accordance ASTM B584 with threaded ends.

_____Ford

_____Mueller

METER ANGLE STOP: Meter stops shall be the 90-degree lock wing type and shall be manufactured in accordance with AWWA C800-14 of brass no lead alloy in accordance with ASTM B584. Meter stops shall be closed button design and resilient "O" ring sealed against external leakage at the top. Stops shall be equipped with a meter coupling nut on the outlet sides.

_____Ford

_____Mueller

_____McDonald

P.E. SERVICE TUBING: polyethylene (PE) tubing as described in 200 psi ANSI/AWWA C901- 20, or latest revision with a working pressure of 250 psi (DR 9). Pipe joints shall be of the compression type totally confined grip seal and coupling nut. Polyethylene shall be extruded from PE 4710 high molecular weight materials and must conform to ASTM D2737. Continuous Polytube from corporation to meter angle stop. All Poly tubing under paved areas shall be in SCH 80 PVC sleeve twice the diameter of poly tube.

_____Endot EndoPoly

_____Phillips Driscopipe/Ultraline

_____JM Eagle

BLOW-OFF BOX; 10" box for blow-off assembly shall be Cast Iron ASTM-A48 Class 30 marked W"

_____US Foundry USF 7630

MATERIALS REVIEW LIST - SEWER COLLECTION SYSTEM

RIM & COVER; casting material shall conform to specifications ASTM-A48 Class 30, Gray Cast Iron. Heavy duty round manhole, 7" frame depth with raised letters "SANITARY SEWER & CITY OF PEMBROKE PINES".

_____US Foundry – USF420-C

WATER TIGHT INSERT: 304 SS, polyethylene o r A B S watertight manhole insert. The cover body shall be manufactured to the dimensions as shown on the contract drawings to allow easy installation in the manhole frame. The insert shall be provided with a lift strap attached to the cover body.

_____Rain Guard

_____Rowland

PVC SDR 35 FITTINGS: non-pressure polyvinyl chloride pipe conforming to ASTM D3034-16, SDR 35, with push-on rubber gasket joints unless otherwise noted.

_____Harco

_____J-M

_____NAPCO

PVC SDR 35 PIPE: non-pressure polyvinyl chloride pipe conforming to ASTM D3034-16, SDR 35, With push-on rubber gasket joints unless otherwise noted.

_____J-M Pipe

_____NAPCO

_____Diamond

DUCTILE IRON PIPE: Class 350 wall thickness (up to 12"), Class 300 (14"-18"), Class 250 (20" Or greater) shall be lines conforming to DIPRA Corrosion Control recommendations with ceramic quartz epoxy Protecto 401 or approved equal. The pipe shall withstand a working pressure of 350 psi. The joints shall be bell and spigot push on type, mechanical joint or flanged. Flanged pipe shall conform to the physical and chemical requirements as set forth in the Handbook of Ductile Iron Pipe of the Cast Iron Pipe Research Association.

_____American Cast Iron Co.

_____U.S. Pipe

_____McWane/Clow

MANHOLE COATING; Coal Tar Epoxy

_____Targuard Sherwin William

SEWER TRANSMISSION SYSTEM

PUMP STATION: two vertical, close-coupled, motor driven, vacuum primed, non-clog sewage pumps; valves; internal piping; central control panel with circuit breakers; motor starters and automatic pumping level controls; heater, ventilating blower; priming pumps and appurtenances; and all internal wiring.

_____Smith & Loveless (pump station submittal data sheet must be provided with check list.)

EMERGENCY GENERATOR: the generator shall be sized to meet the starting amperage of both pumps simultaneously. The generator shall be trailer mounted with necessary towing equipment including lights and hitch. The generator shall be supplied with the necessary plug and cable for supplying power to the pump station control panel.

_____SUBMITT PROPOSAL

EMERGENCY BYPASS PUMP: The bypass pump shall be a minimum six (6) inch self-priming pump diesel powered, trailer mounted with necessary towing equipment including, lights and hitch. The bypass pump shall be supplied with the necessary hoses and connections to provide bypassing of the pump station. The pump shall be a Thompson Pump Model 6JSCE-DJCST-423-MC, a 6" Sound Attenuated, Compressor-Assisted, High Efficiency Pump.

_____SUBMITT PROPOSAL

PVC C-900 PIPE: Class 150 (DR 18), conforming to ANSI/AWWA C900-16 OR C905-97 or Latest revision and shall have push on rubber gasket joints.

_____ J-M Pipe

_____ Diamond

DUCTILE IRON PIPE: Class 350 wall thickness (up to 12"), Class 300 (14"-18"), conforming to ANSI/AWWA C151/a21.51-17, or latest revision, and shall be double cement lined conforming to ANSI/AWWA C104/A21.4-16 or latest revision. Flanged pipe shall conform to the physical and chemical requirements as set forth in the M41 Manual on Ductile Iron Pipe and Fittings of the AWWA.

_____American Cast Iron Co.

_____U.S. Pipe/Griffin Pipe

_____McWane/Clow

DUCTILE IRON FITTINGS: ductile iron compact mechanical joint type and shall be class 350 through 24" conforming to ANSI/AWWA C153/A21.53-11, or latest revision, and class 250 in sizes 24" and larger, conforming to ANSI/AWWA C110/A21.10-08, or latest revision, complete with glands, gaskets, bolts and nuts. All fittings shall be cement lined and seal coated with the same as pipe.

_____American Cast Iron Pipe

_____McWane/Union Foundry

_____U.S. Pipe

PLUG VALVE: Plug valves shall be semi-steel body, non-lubricated, eccentric type, with resilient faced plugs, and capable of drip-tight shut off at the rated pressure if applied at either port. Valves are to be equipped with actuating nuts, cast iron hand wheels or chain operators, with galvanized steel chains, as appropriate for the installation and type of operator and conform to ANSI/AWWA C517-16 or latest revision.

_____McWane/Clow/Kennedy Valve

_____Dezurik

TAPPING VALVE: flange by mechanical iron body, fully resilient seat, bronze mounted non-rising stem, double disc, rated at 200 psi and conforming to ANSI/AWWA C509-15 or latest revision.

_____American Flow Control

_____McWane/Clow

_____Mueller

TAPPING SLEEVES: ductile iron or stainless-steel wrap around meeting ASTM A536 Grade 65-45-12, mechanical joint.

_____American-Darling

_____McWane/Clow/Tyler

_____Mueller

_____U.S. Pip

RETAINING GLAND: Retainer glands shall conform to ANSI/AWWAC111/A21.11-17 or latest revision. All glands shall be manufactured from ductile iron as listed by Underwriters Laboratories for 250 psi minimum water pressure rating.

_____Ebba Mega Lug

_____SIGMA

_____Uni-Flange

LOCATING TAPE: 3" wide tape for sewage transmission main with a metallized foil core laminated between 2 layers of plastic film. The words "CAUTION FORCE MAIN BURIED BELOW" shall be printed at 30" intervals along the tape. Tape shall be placed 18" above all PVC Force mains or as recommended by manufacturer. Non-metallic tape shall be used above ductile iron pipe force mains:

_____Reef Ind.

_____Presco

_____Best Materials

LOCATING WIRES:

_____# 6-gauge copper wire single strand (non-insulated)

VALVE BOX: Valve boxes for water mains and sewer force mains shall be adjustable screw type with 5 ¼ inch shaft, 18-to-24-inch extension, Cast Iron ASTM-A48 Class 30 marked “water” or “sewer”

_____Tyler

_____US Foundry

_____Kennedy Co/Russell Pipe & Foundry

AIR RELEASE VALVE: shall conform to AWWA C512-15 and valve body and cover shall be of cast iron construction, ASTM A126-B. All internal parts shall be of stainless steel, ASTM A240 - Type 304 for the float and ASTM A743/A744 Type 316 for the linkage. The venting orifice shall be 3/16" in diameter with brass seat or that determined by Engineer of Record. The inlet opening shall be a 2" NPT screwed connection. The overall height shall not exceed 13 inches.

_____Val-Matic

_____Apco/DeZurik

_____Golden-Anderson/VAG Group

_____Crispin

DRAFT DOCUMENT FOR COMMISSION REVIEW



CITY OF PEMBROKE PINES

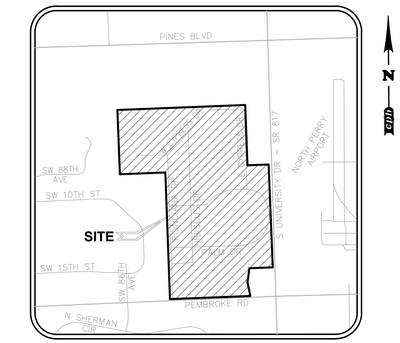
HUMAN SERVICES CAMPUS
UTILITY REHABILITATION

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PEMBROKE PINES, FL 33025

BROWARD COUNTY, FLORIDA



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FL. P.E. NO. 86673

No.	Date	Revision	By

Designed by: K.B.
Drawn by: J.C.
Checked by: A.M.
Approved by: K.B.
Job No.: P19702
Date: 03/03/26

Plans Prepared By:
CPH, Inc.
1992 SW 1st. St.
Miami, FL 33135
Ph: 305.274.4805
Licenses:
Eng. C.O.A. No. 3215
Survey L.B. No. 7143
Arch. Lic. No. AA2600926
Lndscp. Lic. No. LC0000298

CITY COMMISSION

MAYOR	ANGELO CASTILLO
VICE - MAYOR	MICHAEL HERNANDEZ
COMMISSIONER	THOMAS GOOD, JR.
COMMISSIONER	JAY D. SCHWARTZ
COMMISSIONER	MARIA RODRIGUEZ

ABBREVIATIONS

AL. or ALUM.	Aluminum	MATL.	Material
ASPH.	Asphalt	MAX.	Maximum
Ba.V.	Ball Valve	MG	Million Gallons
BLDG.	Building	MGD	Million Gallons Per Day
BM	Bench Mark	NG	Natural Grade
BT	Buried Telephone	NIC	Not in Contract
BTS	Biological Treatment System	NPW	Non-potable Water
B.F.V.	Butterfly Valve	NTS	Not To Scale
CFS	Cubic Feet Per Second	NWL	Normal Water Level
CIP or CI	Cast Iron Pipe	OC	On Center
CONC.	Concrete	OD	Outside Diameter
CONST.	Construction	OH. E.	Overhead Electric
CONT.	Continued	PE	Plain End
CMU	Concrete Masonry Unit	PL.	Plate
C.V.	Check Valve	PP	Power Pole
C.Y.	Cubic Yards	PROP.	Proposed
DIA.	Diameter	PT	Pressure Treated
DIP or DI	Ductile Iron Pipe	P.V.	Plug Valve
DOT	Dept. Of Transportation	PVC	Polyvinyl Chloride
DR. or DW.	Drive Or Driveway	PVMT.	Pavement
EA	Each	PW	Potable Water
ED	Equipment Drain	R	Radius
ESM'T	Easement	RAS	Return Activated Sludge
EF	Each Face	RCP	Reinforced Concrete Pipe
EFF.	Effluent	RED.	Reducer
ELEC.	Electrical	REINF.	Reinforced
ELEV. or EL.	Elevation	REQ'D	Required
EQUIP.	Equipment	Reuse	Reuse Water
EXIST.	Existing	RT.	Right
EXP.	Expansion	RWM	Reclaimed Water Main
EXT.	Extended	R/W	Right-of-way
EW	Each Way	SAN	Sanitary
FD	Floor Drain	S.F.	Square Feet
FDOT	Florida Department of Transportation	SPEC.	Specification
F.E.	Fire Extinguisher	STA.	Station
F.F.	Finish Floor	SQ.	Square
FLEX.	Flexible	SS	Stainless Steel
FLG.	Flanged	STN. STL.	Stainless Steel
FM	Force Main	SWD	Side Water Depth
GALV.	Galvanized	SW (S/W).	Sidewalk
GM	Gas Main	S.Y.	Square Yards
GPM	Gallons Per Minute	T	Telephone Cable
GS	Galvanized Steel	TBM	Temporary Benchmark
GSP	Galvanized Steel Pipe	TOF	Top Of Floor
G.V.	Gate Valve	TRANS.	Transformer
HB	Hose Bibb	TYP.	Typical
HORIZ.	Horizontal	UE	Underground Electric
HP	Horsepower	UG	Underground
HWL	High Water Level	UT	Underground Telephone
ID	Identification	VCP	Vitrified Clay Pipe
I.D.	Inside Diameter	VAC.	Vacuum
INF.	Influent	VERT.	Vertical
I.P.	Iron Pipe	WAS	Waste Activated Sludge
INV.	Invert	W.L.	Water Line
L.F.	Linear Feet	W.F.	Water Fountain
MANF.	Manufacturer	WM	Water Main
MATL.	Material		

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C-1	POTABLE WATER PLAN
C-2	POTABLE WATER PROFILES
C-3 - C-12	POTABLE WATER PLAN & PROFILE
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C-14	DETAILS
C-15	DETAILS

PROJECT AREA

VERTICAL DATUM: NAVD88

THE SIZE OF THESE PLANS MAY HAVE BEEN SLIGHTLY ALTERED BY REPRODUCTION PROCESSES, THIS MUST BE CONSIDERED WHEN SCALING ANY REPRODUCED PLANS FOR THE PURPOSE OF COLLECTING DATA.

BEFORE YOU DIG !
CALL SUNSHINE STATE ONE CALL OF FLORIDA
AT LEAST TWO FULL BUSINESS DAYS BEFORE DIGGING OR DISTURBING EARTH
811
Know what's below. Call before you dig.

COVER

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
G-0

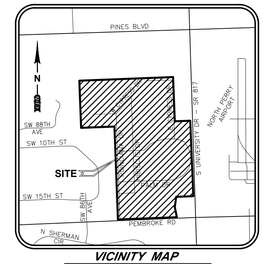
DRAFT DOCUMENT FOR COMMISSION REVIEW

TOPOGRAPHIC SURVEY
FOR
CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS
AT
1627 POINCIANA DRIVE
SECTIONS 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA



Topographic Area:

CERTAIN ROADS AND PROPOSED PATHS LYING WITHIN THE LIMITS OF THE HUMAN SERVICES CAMPUS IN THE CITY OF PEMBROKE PINES, FLORIDA.



VICINITY MAP
NOT TO SCALE

Survey Notes:

1. COPIES OF THIS SURVEY ARE NOT VALID WITHOUT THE ORIGINAL SIGNATURE AND SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.
2. ADDITIONS OR DELETIONS TO SURVEY MAPS OR REPORTS BY OTHER THAN THE SIGNING PARTY OR PARTIES IS PROHIBITED WITHOUT WRITTEN CONSENT OF THE SIGNING PARTY OR PARTIES.
3. THIS SURVEY IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD '88)

   THE SITE BENCHMARKS FOR THIS TOPOGRAPHIC SURVEY ARE DISPLAYED ON THE RESPECTIVE SURVEY FILE. THESE BENCHMARKS ARE BASED ON A CLOSED VERTICAL CONTROL LOOP HAVING AN ACTUAL ERROR OF CLOSURE OF 0.01' WHICH MEETS THE ALLOWABLE CLOSURE OF 0.03'. THIS FIELDWORK WAS PERFORMED USING A TOPCON LEVEL MODEL # DL-502 AND REFERENCES THE FOLLOWING PUBLISHED BENCHMARKS AS ESTABLISHED BY THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD '88) AND ALL VERTICAL INFORMATION INCLUDING SPOT ELEVATIONS, NOTATIONS AND THE CONTOUR LINES DERIVED THEREFROM ARE BASED ON AND MATCHED TO VERTICAL CONTROL BENCHMARKS SUPPLIED BY SPECIFIC PURPOSE SURVEY PREPARED FOR STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION FINANCIAL PROJECT ID #421659-1-52-01 AS FOLLOWS:

   a) PID "AT106" (NAVD '88) ELEVATION = 7.44'

   SITE BENCHMARKS ARE AS SHOWN ON SURVEY SHEETS 3 THROUGH 11.
4. THIS SURVEY IS NOT VALID WITHOUT SURVEY SHEETS 1 THROUGH 11 OF 11.
5. THE LAST DAY FIELD WORK WAS PERFORMED WAS 11/29/23.
6. HAVING CONSULTED THE NATIONAL FLOOD INSURANCE PROGRAM, FLOOD INSURANCE RATE MAP (FIRM) NUMBER 120053, COMMUNITY PANEL NO.(S) 12011C0545H, AND 12011C0710H CITY OF PEMBROKE PINES, EFFECTIVE DATE 8/18/2014, THE SUBJECT PROPERTY APPEARS TO LIE IN ZONE AE, WHICH ARE SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100 YEAR FLOOD WITH BASE FLOOD ELEVATIONS DEPICTED AS 7 FEET (NGVD '29). THIS DETERMINATION WAS BASED ON GEOSPATIAL DATA DOWNLOADED FROM WWW.FEMA.GOV AND THE SHAPE FILE DISPLAYED HEREON WAS REFERENCED TO ABOVE GROUND IMPROVEMENTS. THIS DETERMINATION WAS BASED ON A GRAPHIC INTERPOLATION OF SAID MAP AND NOT ON ACTUAL FIELD MEASUREMENTS.
7. HORIZONTAL WELL-IDENTIFIED FEATURES IN THIS SURVEY AND MAP HAVE BEEN MEASURED TO AN ESTIMATED HORIZONTAL POSITIONAL ACCURACY OF 0.05 (FT). THE EQUIPMENT USED TO VERIFY THE HORIZONTAL CONTROL ON THE SUBJECT SURVEY WAS A TOPCON GPS HIPER VR. THE EQUIPMENT USED TO LOCATE THE FEATURES WAS A LEICA SCANSTATION P40, AND A TOPCON GPS HIPER VR. THIS INFORMATION IS BASED ON (NAD 83(90).
8. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN ABSTRACT OR OPINION OF TITLE.
9. NO UNDERGROUND UTILITIES, FOUNDATIONS OR IMPROVEMENTS, IF ANY, HAVE BEEN LOCATED EXCEPT AS SHOWN.
10. THIS SURVEY DOES NOT IDENTIFY THE LIMITS OR EXTENT OF POTENTIAL JURISDICTIONAL WETLAND BOUNDARIES.
11. FENCES AND WALLS EXISTING ON, OVER OR ADJACENT TO SUBJECT PROPERTY, ARE DISPLAYED HEREON; OWNERSHIP WHETHER SINGULAR OR JOINT WAS NOT DETERMINED BY THIS SURVEY.
12. VERTICAL FEATURE ACCURACY: "ELEVATIONS OF WELL-IDENTIFIED FEATURES CONTAINED IN THIS SURVEY AND MAP HAVE BEEN MEASURED TO AN ESTIMATED VERTICAL POSITIONAL ACCURACY OF 0.05 (FT)."
13. STATE PLANE INFORMATION SHOWN HEREON IS BASED ON THE NORTH AMERICAN DATUM OF 1983 (1990) USING CONTROL POINTS FROM THE DATA SHEETS PUBLISHED BY FLORIDA DEPARTMENT OF TRANSPORTATION AND ARE AS FOLLOWS:

    FLORIDA EAST ZONE

    a) DESIGNATION # FL GPS 70, PID #AD7904 = N 610211.97 FEET, E 914536.33 FEET

    b) DESIGNATION # WALDREP, PID #AJ2431 = N 618466.55 FEET, E 895288.42 FEET

    THE EQUIPMENT USED TO TRANSFER THE STATE PLANE INFORMATION FROM THE ABOVE REFERENCED CONTROL POINTS TO THE SUBJECT SURVEY WAS A TOPCON GPS HIPER V.
14. DIMENSIONS ARE SHOWN RELATIVE TO UNITED STATES STANDARD FEET AND DECIMALS THEREOF, UNLESS THE OBJECT SHOWN IS COMMONLY IDENTIFIED IN INCHES, I.E. TREE DIAMETER, PIPE DIAMETER, ETC. TREES DEPICTED ARE COMMON NAMES AND MEASURED AND LABELED AS DIAMETER AT BREAST HEIGHT IN INCHES.
15. THE UNDERGROUND UTILITIES DEPICTED BY PIPE LINETYPES ARE APPROXIMATE IN NATURE BASED UPON A VISUAL INSPECTION OF THE MANHOLE, GRATE, ETC. OF EACH FACILITY. EXISTING PIPES WERE NOT LAMPED OR REMOTELY VIEWED FOR DIRECTION, OBSTRUCTIONS OR CONNECTIVITY.

Abbreviation Legend:

(A)	– ACTUAL	MBX	– MAILBOX
A/C	– AIR CONDITIONER	MES	– MITERED END SECTION
ACSM	– AMERICAN CONGRESS ON SURVEYING & MAPPING	MH	– MANHOLE
ADA	– AMERICANS WITH DISABILITIES ACT	MLP	– METAL LIGHT POLE
ALTA	– AMERICAN LAND TITLE ASSOCIATION	MPH	– MILES PER HOUR
APPROX	– APPROXIMATE	MPP	– METAL POWER POLE
ARV	– AIR RELEASE VALVE	N/A	– NOT APPLICABLE
AVE	– AVENUE	NAVD	– NORTH AMERICAN VERTICAL DATUM
AVG	– AVERAGE	NAD	– NORTH AMERICAN DATUM
(BB)	– BEARING BASIS	NG	– NATURAL GROUND
BFP	– BACK FLOW PREVENTER	NGS	– NATIONAL GEODETIC SURVEY
BLK	– BLOCK	NGVD	– NATIONAL GEODETIC VERTICAL DATUM
BLDG	– BUILDING	N & D	– NAIL AND DISK
BLVD	– BOULEVARD	NO.	– NUMBER
BM	– BENCH MARK	NR	– NON-RADIAL
BOC	– BACK OF CURB	NSPS	– NATIONAL SOCIETY OF PROFESSIONAL SURVEYORS
BOW	– BACK OF WALK	NT	– NON-TANGENT
BSL	– BUILDING SETBACK LINE	NTS	– NOT TO SCALE
BWF	– BARBED WIRE FENCE	OD	– OUTSIDE DIAMETER
C~X	– DENOTES SHEET NUMBERING FOR ENGINEERING PLANS	ORB	– OFFICIAL RECORDS BOOK
(C)	– CALCULATED	OR	– OFFICIAL RECORDS
C	– CHORD	OUL	– OVERHEAD UTILITY LINES
CATV	– CABLE TELEVISION RISER	OTL	– OVERHEAD TRAFFIC LINES
CB	– CHORD BEARING	(P)	– PLAT
CBS	– CONCRETE BLOCK STRUCTURE	PB	– PLAT BOOK
C.C.R.	– CERTIFIED CORNER RECORD	PC	– POINT OF CURVATURE
C&G	– CURB & GUTTER	PCC	– POINT OF COMPOUND CURVATURE
CI	– CATCH INLET	PCP	– PERMANENT CONTROL POINT
C/L	– CENTERLINE	PFF	– PROPOSED FINISHED FLOOR
CLF	– CHAIN LINK FENCE	PG	– PAGE
CM	– CONCRETE MONUMENT	PGS	– PAGES
CMP	– CORRUGATED METAL PIPE	PI	– POINT OF INTERSECTION
CO	– CLEANOUT	PIV	– POST INDICATOR VALVE
CONC	– CONCRETE	PK	– PARKER KAYLON
COR	– CORNER	POB	– POINT OF BEGINNING
CRPP	– CORRUGATED PLASTIC PIPE	POC	– POINT OF COMMENCEMENT
CUE	– COUNTY UTILITY EASEMENT	POL	– POINT ON LINE
CVS	– CAN'T VERIFY SIZE	PP	– POWER POLE
CVS&T	– CAN'T VERIFY SIZE & TYPE	PRC	– POINT OF REVERSE CURVATURE
CWS	– CROSSWALK SIGNAL	PRM	– PERMANENT REFERENCE MONUMENT
Δ	– DELTA	PSM	– PROFESSIONAL SURVEYOR & MAPPER
(D)	– DESCRIPTION	PT	– POINT OF TANGENCY
DB	– DEED BOOK	PVC	– POLYVINYL CHLORIDE PIPE
DBH	– DIAMETER AT BREAST HEIGHT IN INCHES	PVMT	– PAVEMENT
DE	– DRAINAGE EASEMENT	R41E	– RANGE 41 EAST
DEPT	– DEPARTMENT	R	– RADIUS
DIP	– DUCTILE IRON PIPE	RAD	– RADIAL
DR	– DRIVE	RCP	– REINFORCED CONCRETE PIPE
D/U	– DRAINAGE AND UTILITY EASEMENT	REC	– RECOVERED
(E)	– ENGINEERING PLAN	REV	– REVISION
E&B	– ELECTRIC JUNCTION BOX	RP	– RADIUS POINT
EL	– UNDERGROUND ELECTRICAL LINES	R/W	– RIGHT-OF-WAY
ELEC	– ELECTRIC	RLS	– REGISTERED LAND SURVEYOR
ELEV	– ELEVATION	RP	– RADIUS POINT
ELLIP	– ELLIPTICAL	RWL	– UNDERGROUND RECLAIM WATER LINE
EOI	– END OF INFORMATION	RWM	– RECLAIMED WATER METER
EOP	– EDGE OF PAVEMENT	SE	– SPECIAL EASEMENT
FB	– FIELD BOOK	SEC 16	– SECTION 16
FDC	– FIRE DEPARTMENT CONNECTION	SMH	– SANITARY SEWER MANHOLE
FDOT	– FLORIDA DEPARTMENT OF TRANSPORTATION	(SP)	– STATE PLANE
FF	– FINISH FLOOR	SQ	– SQUARE
FGI	– FLAT GRATE INLET	SQ FT	– SQUARE FEET
FGLP	– FIBERGLASS LIGHT POLE	ST	– STREET
FHYD	– FIRE HYDRANT	STMH	– STORM DRAINAGE MANHOLE
FM	– FORCE MAIN	S/W	– SIDEWALK
FND	– FOUND	TB	– TANGENT BEARING
FP&L	– FLORIDA POWER AND LIGHT	T21S	– TOWNSHIP 21 SOUTH
FS	– FLORIDA STATUTES	TELE	– TELEPHONE
(G)	– GRID (STATE PLANE)	TL	– OVERHEAD TRAFFIC SIGNAL LINES
GL	– UNDERGROUND GAS LINES	TOB	– TOP OF BANK
GOV'T	– GOVERNMENT	TOE	– TOE OF SLOPE
GPR	– GROUND PENETRATING RADAR	TR	– TELEPHONE RISER
GTMH	– GREASE TRAP MANHOLE	TRANS	– TRANSFORMER
HDPE	– HIGH DENSITY POLYETHYLENE PIPE	TSB	– TRAFFIC SIGNAL BOX
HWF	– HOG WIRE FENCE	TSSP	– TRAFFIC SIGNAL SUPPORT POLE
ID	– IDENTIFICATION	TVL	– UNDERGROUND CABLE TV LINES
ICV	– IRRIGATION CONTROL VALVE	(TYP)	– TYPICAL
INFO	– INFORMATION	UE	– UTILITY EASEMENT
INV	– INVERT	UNK	– UNKNOWN
IP	– IRON PIPE	UTL	– UNDERGROUND TELEPHONE LINES
IP&C	– IRON PIPE & CAP	W/	– WITH
IR	– IRON ROD	WF	– WROUGHT IRON FENCE
IR&C	– IRON REBAR & CAP	WL	– UNDERGROUND WATER LINE
IRR	– IRRIGATION	WLP	– WOOD LIGHT POLE
L	– ARC LENGTH	WM	– WATER METER
LB#	– LICENSED BUSINESS NUMBER	WP	– WORK PROGRAM
LP	– LIGHT POLE	WPF	– WOOD POST FENCE
(M)	– MEASURED	WPP	– WOOD POWER POLE
MAG	– MAGNETIC	WV	– WATER VALVE
MB	– MAP BOOK		

Line Legend:
NOT TO SCALE

1	= 1 FOOT CONTOURS
5	= 5 FOOT CONTOURS
	= ADJOINER PROPERTY LINES
x x	= BARBED WIRE FENCE
	= BROKEN LINE
UC	= BURIED CABLE
UCTV	= BURIED CABLE TELEVISION
UE	= BURIED ELECTRIC
UFO	= BURIED FIBER OPTICS
UG	= BURIED GAS
URW	= BURIED RECLAIMED WATER LINE
SAN	= BURIED SANITARY LINES
FM	= BURIED SANITARY SEWER FORCE MAIN LINE
TC	= BURIED TRAFFIC CONTROL
UT	= BURIED TELEPHONE LINE
UW	= BURIED WATER LINES
	= CENTER LINE R/W
	= CHAIN LINK FENCE
	= EASEMENT LINES (EXISTING)
	= EASEMENT LINES (PROPOSED)
EOW	= EDGE OF WATER LINES
	= EXISTING DRAINAGE PIPES
	= EXISTING DRAINAGE PIPES (TERMINUS & ANGLE UNKNOWN)
FW	= FIRE WATER MAIN LINES
HW	= HOT WATER SUPPLY LINES
IRR	= IRRIGATION LINES
OTL	= OVERHEAD TRAFFIC LINES
OHU	= OVERHEAD UTILITY LINES
	= RAILROAD TRACKS
	= RIGHT-OF-WAY LINES
	= SECTION LINES
	= STONE WALL LINES
TOB	= TOP OF BANK LINES
TOE	= TOE OF SLOPE LINES
	= TREE LINES
TRAV	= TRAVERSE LINES
UNK	= UNKNOWN BURIED LINES
	= VINYL FENCE
	= WOOD FENCE
	= WETLAND LINE
OP	= ORANGE PAINT LINE
GP	= GREEN PAINT LINE
RP	= RED PAINT LINE
WP	= WHITE PAINT LINE
PP	= PURPLE PAINT LINE
BP	= BLUE PAINT LINE
YP	= YELLOW PAINT LINE

Symbol Legend:
NOT TO SCALE

ARV	– AIR RELEASE VALVE
	– BORING HOLE LOCATION
	– BRICK PAVERS
CTV	– CABLE TV RISER
	– CENTRAL ANGLE
CO	– CLEAN OUT
	– COMMUNICATION MANHOLE
	– CONCRETE
	– CONCRETE LIGHT POLE
	– CONCRETE LIGHT POLE (DUAL)
	– CONCRETE LIGHT POLE (TRIPLE)
	– CONCRETE LIGHT POLE (QUAD)
	– CONCRETE MITERED END SECTION
	– CONCRETE PAVERS
	– CONCRETE RIP RAP
	– CONCRETE UTILITY POLE
CT	– COUNTY ROAD SYMBOL
	– CROSSWALK SIGNAL POLE
	– DETECTABLE WARNING AREA
	– DUAL SUPPORT SIGN
	– ELECTRICAL MANHOLE
EM	– ELECTRIC METER
EJB	– ELECTRICAL JUNCTION BOX
EO	– ELECTRIC OUTLET
	– ELECTRIC RISER
FOM	– FIBER OPTIC MARKER
FDC	– FIRE DEPARTMENT CONNECTION
	– FIRE HYDRANT
	– FLOOD LIGHT
	– FOUND CONCRETE MONUMENT (AS NOTED)
	– FOUND IRON PIPE (AS NOTED)
	– FOUND IRON REBAR (AS NOTED)
	– FOUND/SET NAIL (AS NOTED)
	– GARBAGE CAN
GAS	– GAS MARKER
	– GAS VALVE
	– GOPHER TORTOISE HOLE
	– GRATE INLET
	– GRAVEL/DIRT
	– GREASE TRAP MANHOLE
	– GROUND LIGHT
	– GUY ANCHOR
	– HANDICAP PARKING SPACE
95	– INTERSTATE SYMBOL
	– IRRIGATION CONTROL VALVE
	– LIGHT POLE
	– LIGHT POLE (DUAL)
	– LIGHT POLE (TRIPLE)
	– LIGHT POLE (QUAD)
	– MAILBOX
MW	– MONITOR WELLS
	– NAIL & DISC (AS NOTED)
2	– PARKING SPACES (2)
PIV	– POST INDICATOR VALVE
PBX	– PULL BOX (AS NOTED)
	– REVISION NUMBER (3)
RWM	– RECLAIMED WATER MARKER
RWM	– RECLAIMED WATER METER
RW	– RECLAIMED WATER RISER
RWV	– RECLAIMED WATER VALVE
	– ROOF DRAIN
S	– SANITARY SEWER MANHOLE
SAN	– SANITARY SEWER MARKER
	– SANITARY SEWER VALVE
	– TITLE OR REPORT ITEM NUMBER
	– SECTION CORNER
	– 4" X 4" CM LB #7143
	– 5/8" IR&C LB #7143
	– SIGN
	– SITE BENCH MARK
D	– STORM SEWER MANHOLE
	– STRIPING (DIRECTIONAL)
	– TELEPHONE CABLE RISER
T	– TELEPHONE MANHOLE
TLM	– TELEPHONE LINE MARKER
TJB	– TELEPHONE JUNCTION BOX
	– TEST HOLE
	– TRAFFIC SIGNAL BOX
	– TRAFFIC SIGNAL SUPPORT POLE
U	– UNKNOWN MANHOLE
UNK	– UNKNOWN UTILITY MARKER
UNK	– UNKNOWN RISER
UNK	– UNKNOWN VALVE
	– UTILITY FLAG (AS NOTED)
	– VENT (AS NOTED)
WM	– WATER METER
H2O	– WATER RISER
WPS	– WATER SERVICE
	– WATER SPIGOT
WS	– WATER SPRINKLER
WV	– WATER VALVE
W	– WELL
	– WETLAND FLAG
	– WOOD UTILITY POLE
WOM	– WATER LINE MARKER
	– WIRE HEIGHTS (SEE CHART)

Sign Legend:
NOT TO SCALE

(R1)	ROW NUMBER SIGN
(B)	BUS STOP SIGN
(DE)	DEAD END SIGN
(DNE)	DO NOT ENTER SIGN (R5-1)
(DT)	DRIVE-THRU PARKING
(HC)	HANDICAP SIGN
(HC)	DUAL HANDICAP SIGN
(FDC)	FIRE DEPARTMENT CONNECTION
(INFO)	INFORMATION SIGN
(KR)	KEEP RIGHT SIGN
(LTO)	LEFT TURN ONLY
(ME)	MEDIAN SIGN
(MO)	MOBILE ORDER PARKING SIGN
(ND)	NO DUMPING SIGN
(NL)	NO LEFT TURN SIGN (R3-2)
(NLI)	NO LITTERING SIGN
(NO)	NO OUTLET SIGN
(FL)	NO PARKING FIRE LANE SIGN
(NOR)	NO RIGHT TURN SIGN (R3-1)
(NTT)	NO THRU TRAFFIC SIGN
(NOT)	NO TRUCKS (R5-2)
(NP)	NO PARKING SIGN
(1W)	ONE WAY SIGN (R6-2)
(PE)	PEDESTRIAN CROSSING SIGN
(PU)	PICKUP PARKING SIGN
(RP)	RESERVED PARKING SIGN
(RTO)	RIGHT TURN ONLY
(SL)	SPEED LIMIT SIGN
(ST)	STOP SIGN (R1-1)
(SS)	STREET SIGN
(TZ)	TOW AWAY ZONE SIGN
(TE)	TRUCK ENTRANCE SIGN
(TX)	TRUCK EXIT SIGN
(U)	UNKNOWN SIGN
(WL)	WEIGHT LIMIT SIGN
(WW)	WRONG WAY SIGN
(Y)	YIELD SIGN

Index of Survey Sheets

1	COVER SHEET
2	KEY SHEET
3–11	TOPOGRAPHIC SURVEY

Surveyor's Certification:

I hereby certify that the attached "Topographic Survey" of the hereon-described property is true and correct to the best of my knowledge, information and belief as surveyed in the field on November 29, 2023. I further certify that this "Topographic Survey" meets the standards of practice set forth in Rule Chapter 5J-17 of the Florida Administrative Code, pursuant to FS 472.027.

THE ELECTRONIC SIGNATURE HEREON IS IN COMPLIANCE WITH THE FLORIDA ADMINISTRATIVE CODE (FAC) 5J-17.062(3) AND THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY PAUL J. KATREK, PSM, 6233 ON 1/19/24 PER 5J-17.062(2)

For the Firm By: _____
Paul J. Katrek
Professional Surveyor and Mapper
Florida Registration No. 6233

No.	Date	Revision	By
4			
3			
2			
1			

No.	Date	Revision	By
4			
3			
2			
1			

cph
Building Better Communities Together
500 West Fulton Street
Sanford, FL 32771
Ph: 407.322.6841
www.cphcorp.com
Date: 11/29/2023
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Plans Prepared By:
CPH, LLC
A Full Service A & E Firm
State of Florida License:
Surveyor No. LB7143

Field Crew:	E. Hatecke
Drawn By:	J. Fleming
Checked By:	J. Watson
Approved By:	P. Katrek
Job No.	P19702

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS
1627 POINCIANA DRIVE
SECTIONS 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

TOPOGRAPHIC SURVEY

Survey Sheet 1
Sheet No.
V0.1

J:\P19702\Survey\P19702\P19702.dwg, 1/19/2024 3:30:01 PM, Fleming, Jalon,

THIS SURVEY IS NOT VALID WITHOUT SURVEY SHEETS 1 THROUGH 11 OF 11.

DRAFT DOCUMENT FOR COMMISSION REVIEW

cph N

30 0 30 60

Scale: 1" = 30'

V1.1 V1.2 V1.3 V1.4 V1.5 V1.6 V1.7 V1.8 V1.9 V1.10

BEGIN: 0+00.00

W PEMBROKE RD

SW 84TH AVE/POINCIANA DR (PRIVATE DRIVE)

TAYLOR RD (PRIVATE DRIVE)

PI = 3+07.02 (SW 84TH AVE)
BEGIN: 46+00.00

END: 58+33.50 (TAYLOR RD)
PI = 7+19.44 (SW 84TH AVE)

MATCHLINE "A" - SEE SURVEY SHEET 4 OF 11

SITE BENCHMARK #552
TOP OF MAG NAIL & DISK WITH "BM" LB #7143
ELEV = 6.68 (NAVD '88)
N:604478.33
E:901177.96

SITE BENCHMARK #560
TOP OF MAG NAIL & DISK WITH "BM" LB #7143
ELEV = 5.20 (NAVD '88)
N:604743.01
E:901572.73

FLAT GRATE INLET
TOP GRATE ELEV = 2.98
WATER ELEV = 1.56
BOTTOM ELEV = 0.04
STRUCTURE FULL OF WATER

PC: 49+62.65
PT: 50+54.48
PI: 50+98.46
PI: 54+14.11

SANITARY SEWER MANHOLE
TOP RIM ELEV = 6.27
NE INV ELEV = 2.41 (8" PVC)
S INV ELEV = 2.52 (8" PVC)

SANITARY SEWER MANHOLE
TOP RIM ELEV = 5.87
W INV ELEV = 1.49 (8" DIP)
N INV ELEV = 1.45 (8" PVC)

8" PVC – 8" DIP (TRANSITION POINT UNKNOWN)

90°14'7"
89°57'12"
90°53'6"

No.	Date	Revision	By	No.	Date	Revision	By
1				4			
2				5			
3				6			
4	12/16/24	ADDT'L TOPO INFORMATION W OF POINCIANA DR & N OF W CYPRESS DR		7			

cph
www.cphcorp.com
Building Better Communities Together
500 West Fulton Street
Sanford, FL 32771
Ph: 407.322.6841

Date: 11/29/2023 © 2025

Plans Prepared By:
CPH, LLC
A Full Service A & E Firm
State of Florida License:
Surveyor No. LB7143

Field Crew:	E. Hatecke
Drawn By:	J. Fleming
Checked By:	J. Watson
Approved By:	P. Katrek
Job No.	P19702

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS
1627 POINCIANA DRIVE
SECTIONS 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

TOPOGRAPHIC SURVEY

Survey Sheet 3
Sheet No. **V1.2**

J:\P19702\Civil\DWG_External_Reference\Survey (3D Scan Swde)\P19702.dwg, 1/27/2025 7:34:03 AM, Amanda Martin,

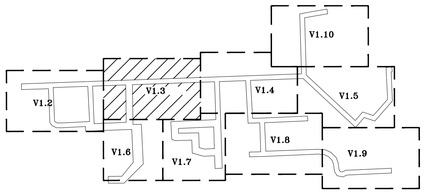
THIS SURVEY IS NOT VALID WITHOUT SURVEY SHEETS 1 THROUGH 11 OF 11.

DRAFT DOCUMENT FOR COMMISSION REVIEW

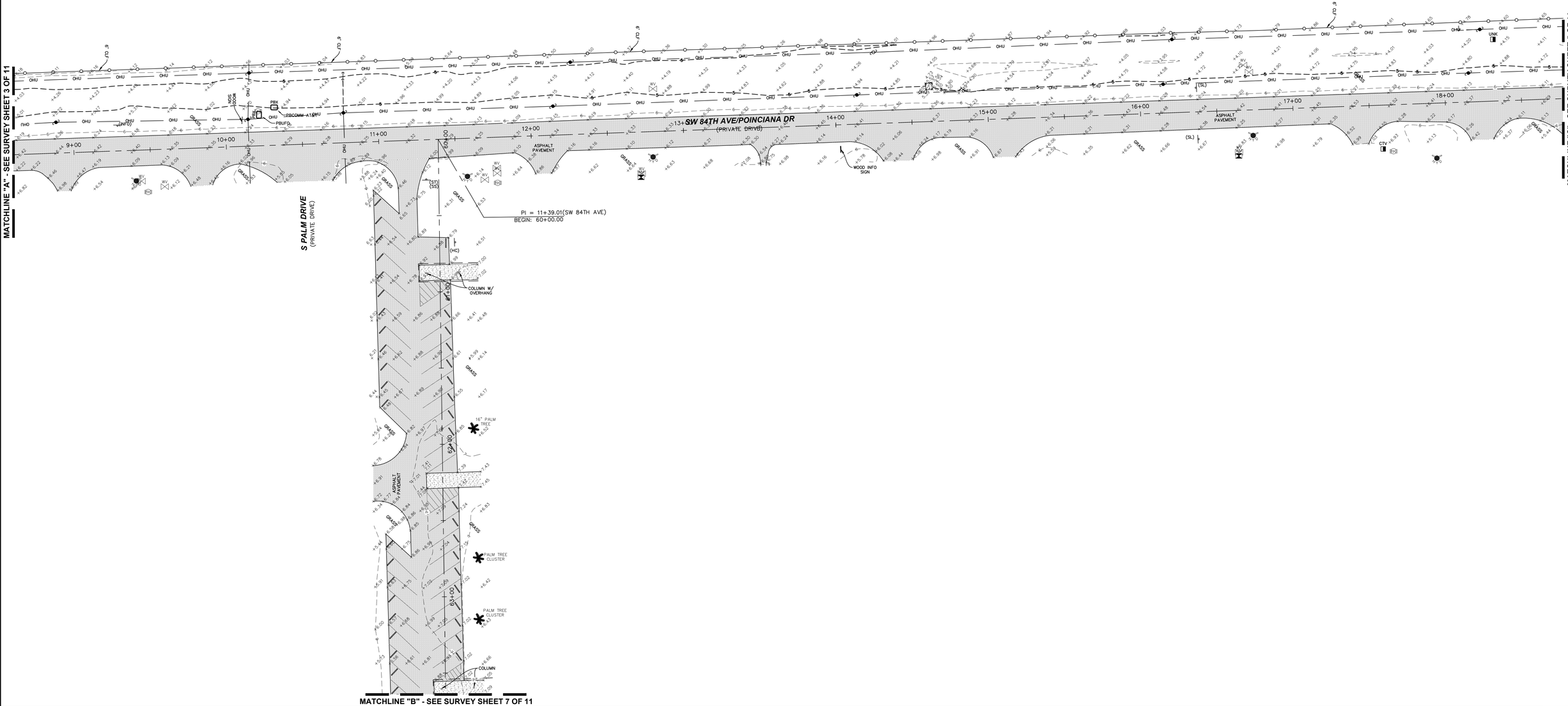
cph N

30 0 30 60

Scale: 1" = 30'



MATCHLINE "A" - SEE SURVEY SHEET 3 OF 11



MATCHLINE "B" - SEE SURVEY SHEET 7 OF 11

MATCHLINE "C" - SEE SURVEY SHEET 5 OF 11

No.	Date	Revision	By
1			
2			
3			
4	12/16/24	ADDT'L TOPO INFORMATION W OF POINCIANA DR & N OF W CYPRESS DR	

No.	Date	Revision	By
5			
6			
7			
8			

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500 West Fulton Street
Sanford, FL 32771
Ph: 407.322.6841
www.cphcorp.com

Date: 11/29/2023

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Plans Prepared By:
CPH, LLC
A Full Service A & E Firm
State of Florida License:
Surveyor No. LB7143

Field Crew:	E. Hatecke
Drawn By:	J. Fleming
Checked By:	J. Watson
Approved By:	P. Katrek
Job No.	P19702

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS
1627 POINCIANA DRIVE
SECTIONS 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

TOPOGRAPHIC SURVEY

Survey Sheet 4
Sheet No.
V1.3

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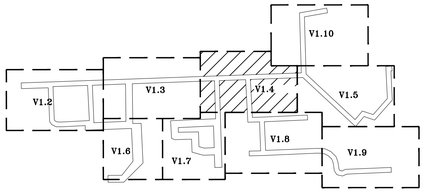
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DRAFT DOCUMENT FOR COMMISSION REVIEW

cph N

30 0 30 60

Scale: 1" = 30'



MATCHLINE "C" - SEE SURVEY SHEET 4 OF 11

MATCHLINE "F" - SEE SURVEY SHEET 6 OF 11

PI = 20+50.27(SW 84TH AVE)
BEGIN: 76+00.00

PI = 23+76.16(SW 84TH AVE)
BEGIN: 98+00.00(PINE DR)

SW 84TH AVE/POINCIANA DR
(PRIVATE DRIVE)

FLAT GRATE INLET
TOP GRATE ELEV = 4.77
WATER ELEV = 1.5± ~
BOTTOM ELEV = -2.6±
STRUCTURE FULL OF WATER

FLAT GRATE INLET
TOP GRATE ELEV = 4.31
WATER ELEV = 1.6±
BOTTOM ELEV = -2.1±
STRUCTURE FULL OF WATER

SITE BENCHMARK #517
TOP OF MAG NAIL & DISK
WITH "BM" LB #7143
ELEV = 6.22 (NAVD '88)
N:606929.92
E:901085.53

SANITARY SEWER MANHOLE
TOP RIM ELEV = 6.57
W INV ELEV = -0.32 (15" CLAY)
N INV ELEV = -0.36 (12" CLAY)
E INV ELEV = 1.23 (6" CLAY)
SE INV ELEV = -0.40 (12" CLAY)

SANITARY SEWER MANHOLE
TOP RIM ELEV = 6.33
NW INV ELEV = 0.57 (12" CLAY)
NE INV ELEV = 0.83 (12" CLAY)
SE INV ELEV = 0.60 (12" CLAY)
SW INV ELEV = 1.58 (6" CLAY)

PINE DR
(PRIVATE DRIVE)

MATCHLINE "D" - SEE SURVEY SHEET 8 OF 11

MATCHLINE "E" - SEE SURVEY SHEET 9 OF 11

No.	Date	Revision	By
1			
2			
3			
4	12/16/24	ADDT'L TOPO INFORMATION W OF POINCIANA DR & N OF W CYPRESS DR	

No.	Date	Revision	By
5			
6			
7			
8			

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HUMAN SERVICES CAMPUS
1627 POINCIANA DRIVE
SECTIONS 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

TOPOGRAPHIC SURVEY

Survey Sheet 5
Sheet No.
V1.4

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MATCHLINE "G" - SEE SURVEY SHEET 11 OF 11

MATCHLINE "F" - SEE SURVEY SHEET 5 OF 11

cph N

30 0 30 60

Scale: 1" = 30'

V1.1 V1.2 V1.3 V1.4 V1.5 V1.6 V1.7 V1.8 V1.9 V1.10

SW 84TH AVE/ POINCIANA DR (PRIVATE DRIVE)

BEGIN: 130+00.00(CYPRESS DR)
PI: 29+62.60(END SW 84TH AVE)
(BEGIN W CYPRESS DR)

SITE BENCHMARK #509
TOP OF MAG NAIL & DISK WITH "BM" LB #7143
ELEV = 6.50 (NAVD '88)
N:607464.53
E:901154.47

SITE BENCHMARK #501
TOP OF MAG NAIL & DISK WITH "BM" LB #7143
ELEV = 5.00 (NAVD '88)
N:608255.73
E:901016.50

SITE BENCHMARK #506
TOP OF MAG NAIL & DISK WITH "BM" LB #7143
ELEV = 6.10 (NAVD '88)
N:607882.89
E:901543.48

ACCESS RD (PRIVATE DRIVE)

CYPRESS DR (PRIVATE DRIVE)

HIBISCUS DR (PRIVATE DRIVE)

PI: 45+20.35

END: 45+58.28

PI: 41+99.23

PI: 38+28.50

PI: 37+00.78

PI: 39+47.24

SANITARY SEWER MANHOLE
TOP RIM ELEV = 6.06
S INV ELEV = 0.01 (12" CLAY)
N INV ELEV = -0.10 (12" CLAY)
NE INV ELEV = 0.85 (6" PVC)

SANITARY SEWER MANHOLE
(NO PIPES VISIBLE)
TOP RIM ELEV = 6.92
TOP OF WASTE = 2.69
BOTTOM ELEV = 0.9±

SANITARY SEWER MANHOLE
TOP RIM ELEV = 6.41
NW INV ELEV = -1.61 (8" PVC)
NE INV ELEV = -2.24 (8" PVC)

SANITARY SEWER MANHOLE
(NO PIPES VISIBLE)
TOP RIM ELEV = 5.77
TOP OF WASTE = 3.06
BOTTOM ELEV = 1.93
(DOESN'T APPEAR IN USE)

SANITARY SEWER MANHOLE
TOP RIM ELEV = 5.02
SE INV ELEV = -0.73 (8" CVT)

SANITARY SEWER MANHOLE
TOP RIM ELEV = 6.45
8" INV ELEV = -3.39 (8" PVC)
SE INV ELEV = -3.54 (8" PVC)

FLAT GRATE INLET
TOP GRATE ELEV = 3.31
WATER ELEV = 1.4±
BOTTOM ELEV = -1.5±
STRUCTURE FULL OF WATER

FLAT GRATE INLET
TOP GRATE ELEV = 3.41
WATER ELEV = 1.4±
BOTTOM ELEV = -0.8±
STRUCTURE FULL OF WATER

FLAT GRATE INLET
TOP GRATE ELEV = 4.78
WATER ELEV = 1.4±
BOTTOM ELEV = -4.8±
STRUCTURE FULL OF WATER

FLAT GRATE INLET
TOP GRATE ELEV = 2.54
WATER ELEV = 1.4±
STRUCTURE FULL OF WATER

INV ELEV=4.67(12"CMP)
INV ELEV=4.99(12"CMP)
INV ELEV=4.14(12"CMP)
12" CMP ELEV = 3.62
12" CMP ELEV = 3.80
12" CMP ELEV = 3.56
12" CORPP ELEV = 2.19

ASPHALT PAVEMENT
GRASS
CONCRETE SIDEWALK
INFO SIGN
CHARTWELLS SIGN
ICV (1)
ICV (4)
GATE
PBX
PBELEC
PBFUFO
PBCATV
WM
BURROWING OWLS NEST
COLUMN
PORCH
FF ELEV=6.33
1 STORY CBS
OVERHANG

8" UNKNOWN TREE
7" UNKNOWN TREE
5" UNKNOWN TREE
12" OAK TREE

No.	Date	Revision	By
1	12/16/24	ADDT'L TOPO INFORMATION W OF POINCIANA DR & N OF W CYPRESS DR	

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Surveyor No. LB7143

Field Crew:	E. Hatecke
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Approved By:	P. Katrek
Job No.	P19702

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS
1627 POINCIANA DRIVE
SECTIONS 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

TOPOGRAPHIC SURVEY

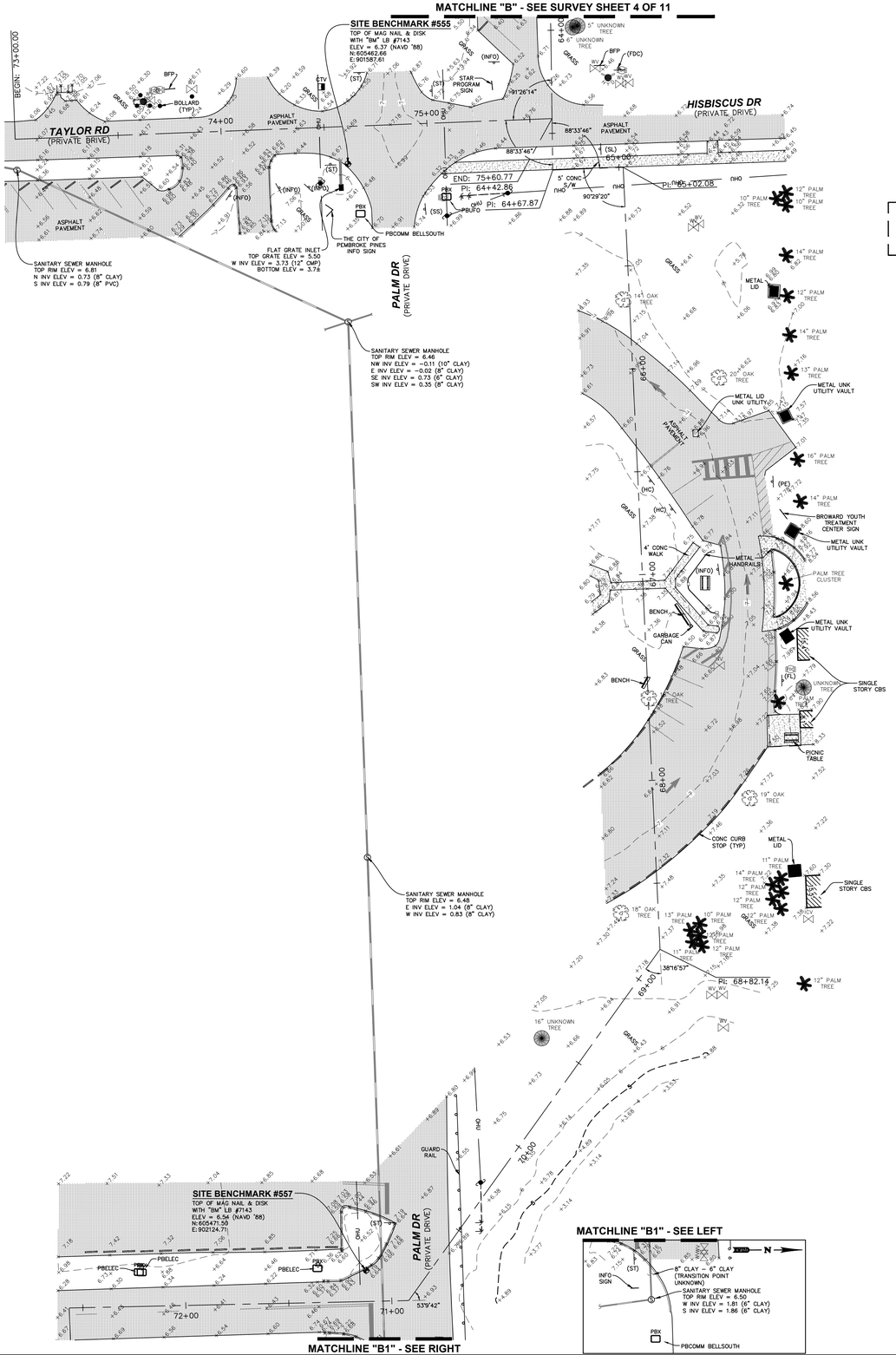
Survey Sheet 6
Sheet No. V1.5

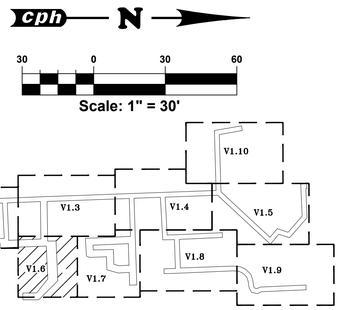
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MATCHLINE "B" - SEE SURVEY SHEET 4 OF 11





No.	Date	Revision	By	No.	Date	Revision	By
1				6			
2				7			
3				8			
4	12/16/24	ADDT'L TOPO INFORMATION W OF POINCIANA DR & N OF W CYPRESS DR		9			

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CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS
1627 POINCIANA DRIVE
SECTIONS 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

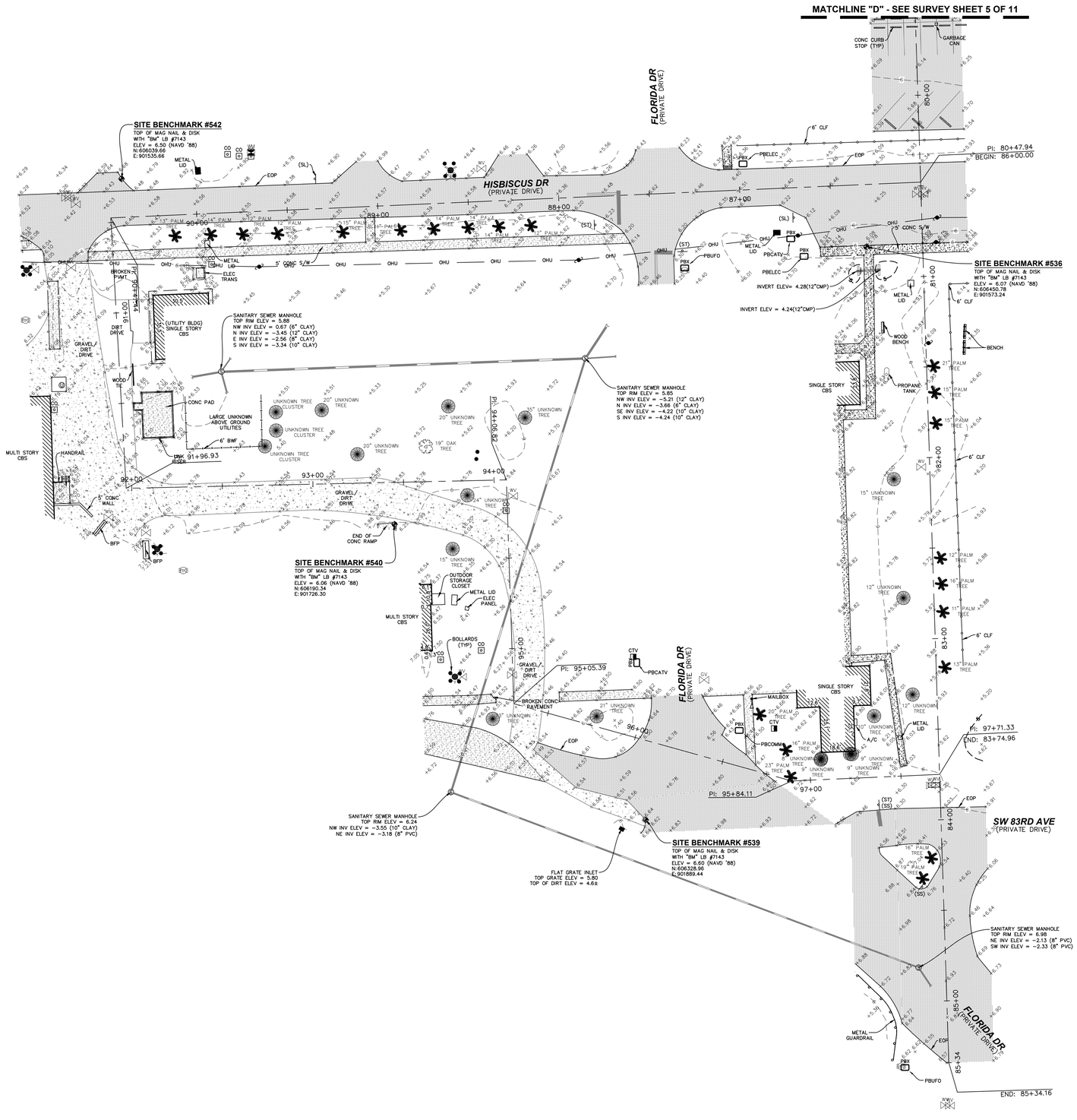
TOPOGRAPHIC SURVEY

Survey Sheet 7
Sheet No.
V1.6

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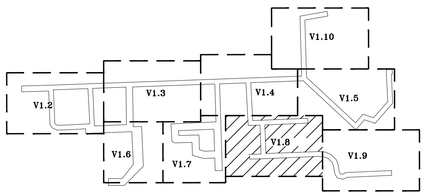

MATCHLINE "D" - SEE SURVEY SHEET 5 OF 11
SITE BENCHMARK #542
TOP OF MAG NAIL & DISK
WITH "BM" LB #7143
ELEV = 6.50 (NAVD '88)
N:606039.66
E:901535.66
SITE BENCHMARK #536
TOP OF MAG NAIL & DISK
WITH "BM" LB #7143
ELEV = 6.07 (NAVD '88)
N:606450.78
E:901573.24
SITE BENCHMARK #540
TOP OF MAG NAIL & DISK
WITH "BM" LB #7143
ELEV = 6.06 (NAVD '88)
N:606190.34
E:901726.30
SITE BENCHMARK #539
TOP OF MAG NAIL & DISK
WITH "BM" LB #7143
ELEV = 6.60 (NAVD '88)
N:606328.96
E:901889.44
HISBISCUS DR
(PRIVATE DRIVE)
FLORIDA DR
(PRIVATE DRIVE)
SW 83RD AVE
(PRIVATE DRIVE)
SANITARY SEWER MANHOLE
TOP RIM ELEV = 5.88
NW INV ELEV = 0.67 (6" CLAY)
N INV ELEV = -3.45 (12" CLAY)
E INV ELEV = -2.56 (8" CLAY)
S INV ELEV = -3.34 (10" CLAY)
SANITARY SEWER MANHOLE
TOP RIM ELEV = 5.85
NW INV ELEV = -5.21 (12" CLAY)
N INV ELEV = -3.66 (6" CLAY)
SE INV ELEV = -4.22 (10" CLAY)
S INV ELEV = -4.24 (10" CLAY)
SANITARY SEWER MANHOLE
TOP RIM ELEV = 6.24
NW INV ELEV = -3.55 (10" CLAY)
NE INV ELEV = -3.18 (8" PVC)
SANITARY SEWER MANHOLE
TOP RIM ELEV = 6.98
NE INV ELEV = -2.13 (6" PVC)
SW INV ELEV = -2.33 (8" PVC)
FLAT GRATE INLET
TOP GRATE ELEV = 5.80
TOP OF DIRT ELEV = 4.6±
INVERT ELEV= 4.28(12"CMP)
INVERT ELEV = 4.24(12"CMP)
PI: 80+47.94
BEGIN: 86+00.00
PI: 91+96.82
PI: 95+05.39
PI: 95+84.11
PI: 97+71.33
END: 83+74.96
END: 85+34.16
(UTILITY BLDG)
SINGLE STORY
CBS
MULTI STORY
CBS
SINGLE STORY
CBS
GRAVEL/
DIRT
DRIVE
BROKEN
PVMT
BROKEN CONC
PAVEMENT
CONC PAD
LARGE UNKNOWN
ABOVE GROUND
UTILITIES
UNKNOWN TREE
CLUSTER
20" UNKNOWN
TREE
19" OAK
TREE
15" UNKNOWN
TREE
24" UNKNOWN
TREE
21" UNKNOWN
TREE
12" UNKNOWN
TREE
9" UNKNOWN
TREE
8" UNKNOWN
TREE
14" PALM
TREE
15" PALM
TREE
16" PALM
TREE
20" PALM
TREE
23" PALM
TREE
21" PALM
TREE
12" PALM
TREE
11" PALM
TREE
13" PALM
TREE
19" PALM
TREE
HANDRAIL
5' CONC
WALL
6' BWF
6' CLF
5' CONC S/W
4' CONC S/W
WOOD
TIE
WOOD
BENCH
BENCH
PROPANE
TANK
BOLLARDS
(TYP)
OUTDOOR
STORAGE
CLOSET
METAL LID
ELEC
PANEL
ELEC
TRANS
BROKEN CONC
PVMT
MAILBOX
METAL
GUARDRAIL
END OF
CONC RAMP
BFP
DBL
DBL
DBL

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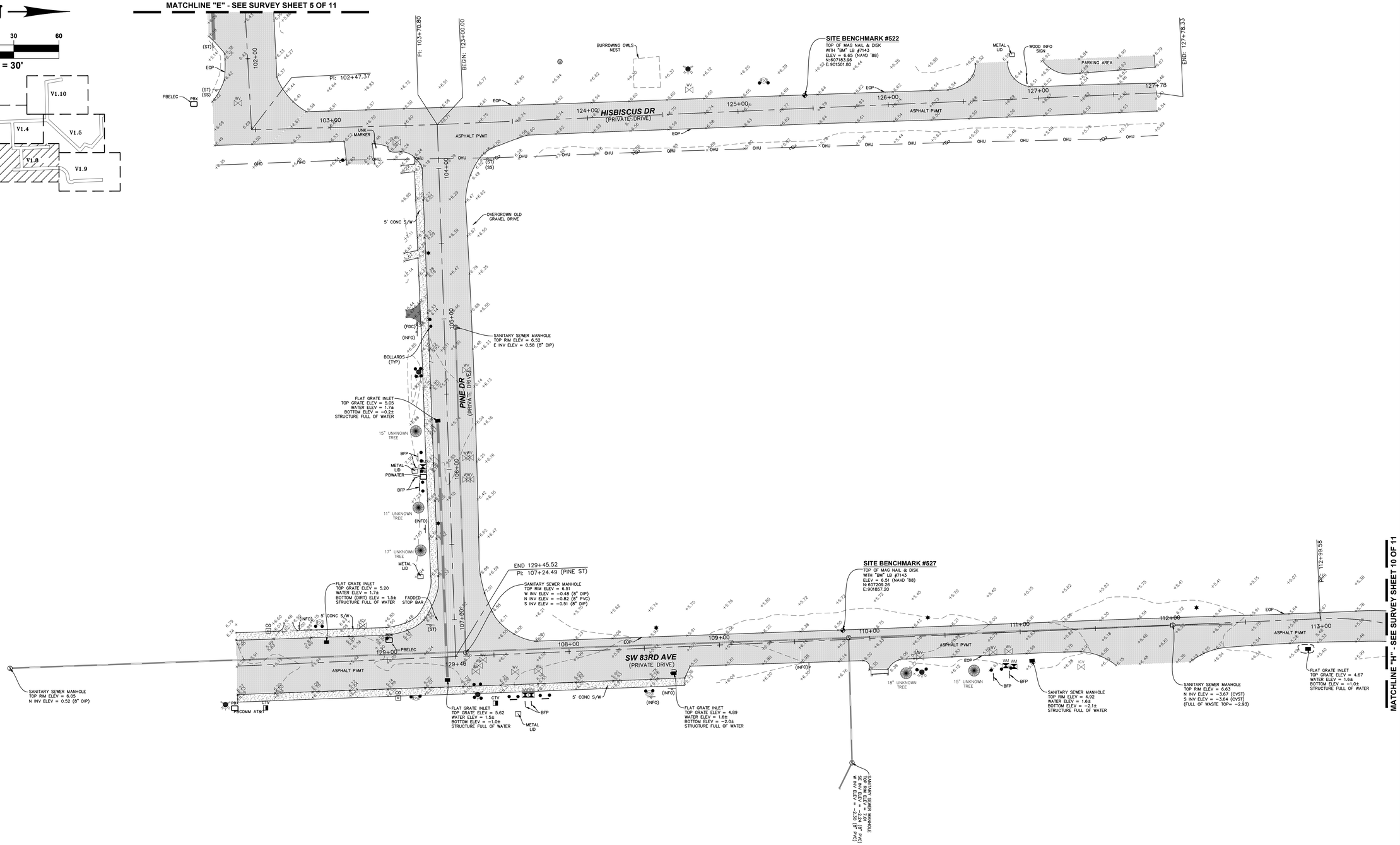
cph N

30 0 30 60

Scale: 1" = 30'



MATCHLINE "E" - SEE SURVEY SHEET 5 OF 11



MATCHLINE "H" - SEE SURVEY SHEET 10 OF 11

No.	Date	Revision	By	No.	Date	Revision	By
1				4			
2				5			
3				6			
4	12/16/24	ADDT'L TOPO INFORMATION W OF POINCIANA DR & N OF W CYPRESS DR		7			

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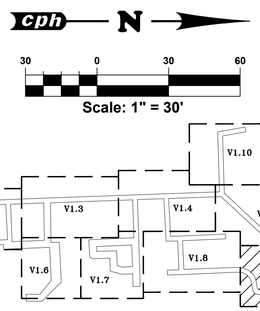
CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS
1627 POINCIANA DRIVE
SECTIONS 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

TOPOGRAPHIC SURVEY

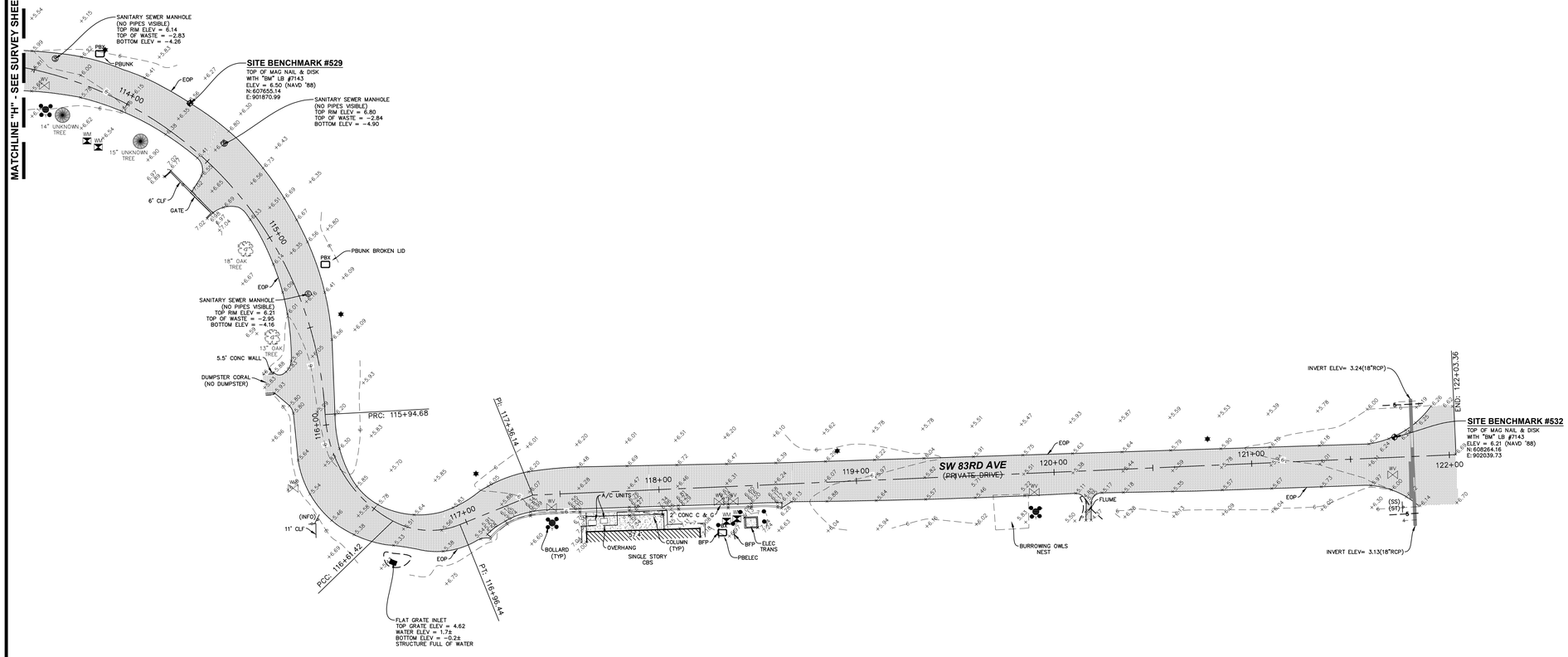
Survey Sheet 9
Sheet No.
V1.8

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MATCHLINE "H" - SEE SURVEY SHEET 9 OF 11



No.	Date	Revision	By
1			
2			
3			
4	12/16/24	ADDT'L TOPO INFORMATION W OF POINCIANA DR & N OF W CYPRESS DR	

No.	Date	Revision	By
5			
6			
7			
8			

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BROWARD COUNTY, FLORIDA

TOPOGRAPHIC SURVEY

Survey Sheet 10
Sheet No.
V1.9

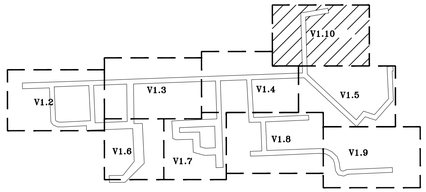
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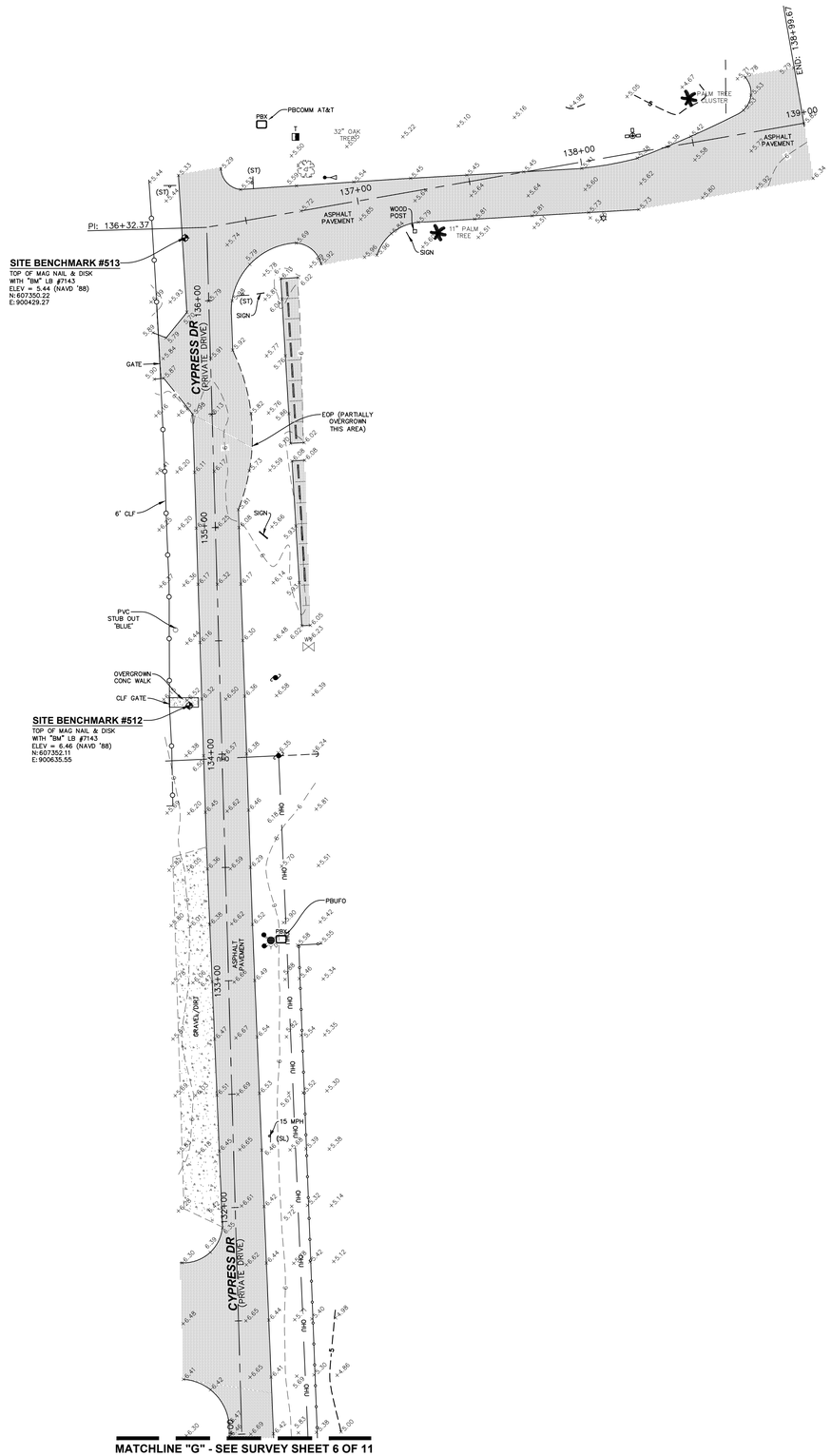
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cph N

30 0 30 60

Scale: 1" = 30'





MATCHLINE "G" - SEE SURVEY SHEET 6 OF 11

No.	Date	Revision	By
4			
3			
2			
1	12/16/24	ADDT'L TOPO INFORMATION W OF POINCIANA DR & N OF W CYPRESS DR	

No.	Date	Revision	By
8			
7			
6			
5			

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TOPOGRAPHIC SURVEY

Survey Sheet 11
Sheet No.
V1.10

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GENERAL CONSTRUCTION NOTES:

ALL WORK AND REQUIREMENTS FROM THE NOTES IN THIS PAGE SHALL BE A REQUIREMENT OF THE CONTRACT AND EXECUTED BY THE CONTRACTOR AT NO ADDITIONAL COST.

1. ALL CONSTRUCTION CONNECTING TO CITY OF PEMBROKE PINES SYSTEM SHALL CONFORM TO THE CONTRACT DOCUMENTS AND CITY'S STANDARDS.
2. THE UTILITIES IMPROVEMENTS AND ADJUSTMENTS SHOWN ON THESE DRAWINGS ARE INTENDED TO MAINTAIN THE INTEGRITY OF THE CITY'S WATER, WASTEWATER, AND RAW WATER SYSTEMS. ALL MATERIALS AND CONSTRUCTION TO BE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. THE DRAWINGS DO NOT INCLUDE WORK PERFORMED ON, OR FOR UTILITY SYSTEMS OWNED BY OTHERS.
3. LOCATIONS OF EXISTING UTILITIES AS SHOWN ARE APPROXIMATE. THE CONTRACTOR SHALL FIELD VERIFY THE EXISTENCE AND LOCATION OF ALL ABOVE GROUND AND UNDERGROUND UTILITIES. CONTRACTOR SHALL CONTACT SUNSHINE ONE CALL PER STATE LAW PRIOR TO EXCAVATION. ALL EXISTING UTILITIES SHALL REMAIN AND ARE TO BE PROTECTED AND SUPPORT AS NEEDED FOR WATER MAIN INSTALLATION.
4. ALL EXISTING AND NEW WATER AND SEWER VALVES, VALVE BOXES, AND MANHOLES SHALL BE PROTECTED AND ADJUSTED TO FINISHED GRADE AS SHOWN ON THE DRAWINGS. VALVE AND VALVE BOXES SHALL REMAIN ACCESSIBLE AT ALL TIMES. ANY VALVES THAT MIGHT BE COVERED DURING CONSTRUCTION SHALL BE MARKED WITH A MARKER (GREEN FOR SEWER AND BLUE FOR WATER), A MINIMUM OF FOUR (4) FEET ABOVE GRADE. ALL VALVES UNDER CONSTRUCTION ARE TO REMAIN CLOSED DURING CONSTRUCTION AND REMAIN CLOSED UNTIL DIRECTION TO OPEN IS ISSUED BY CITY.
5. THE CONTRACTOR SHALL PROTECT EXISTING SERVICE CONNECTIONS AND MAINS DURING CONSTRUCTION AND SHALL COORDINATE THE RELOCATION OF SERVICES WITH CITY AND EOR PROJECT REPRESENTATIVE(S). THE CONTRACTOR WILL RELOCATE EXISTING SERVICES AS NECESSARY AND AS DIRECTED BY CITY PERSONNEL.
6. SEE DETAIL SHEET FOR SEPARATION REQUIREMENTS BETWEEN WATER MAINS, SEWER MAINS AND OTHER PIPELINES AND MAINS. NO CONCRETE ENCASEMENT OF PIPES WILL BE PERMITTED.
7. WHEN USING SCALED DATA CONSIDER THAT THESE PLANS MAY HAVE BEEN ALTERED IN SIZE DURING REPRODUCTION.
8. LOCATIONS AND DIMENSIONS OF EXISTING RIGHT-OF-WAYS AND EASEMENTS ARE BASED ON BEST AVAILABLE INFORMATION. CONTRACTOR SHALL VERIFY AND STAKE THE LIMITS OF THE RIGHT-OF-WAYS AND EASEMENTS IN ORDER TO AVOID ENCROACHMENTS BEFORE CONSTRUCTION.
9. WHEN OBTAINING DATA AND INFORMATION FROM THE PLANS, NUMERICAL FIGURES SHALL BE USED IN PREFERENCE TO SCALED DIMENSIONS AND LARGER SCALE DRAWINGS IN PREFERENCE TO SMALLER SCALE DRAWINGS.
10. PIPE LENGTHS SHOWN ON PLANS ARE APPROXIMATE. ACTUAL LENGTHS ARE TO BE DETERMINED DURING CONSTRUCTION.
11. NOTIFY FIBER OPTICS COMPANIES SEVEN (7) DAYS PRIOR TO ANY CONSTRUCTION. EXTREME CAUTION SHALL BE EXERCISED IN THE AREAS OF FIBER OPTICS.
12. ALL STATIONS AND OFFSETS REFER TO THE BASELINE OF STATIONING.
13. MAINTAIN ACCESS TO ALL BUSINESSES AND RESIDENCES AT ALL TIMES.
14. ALL FITTINGS ON EXISTING MAINS ARE ASSUMED TO HAVE THRUST BLOCKS. CONTRACTOR SHALL USE CAUTION WHEN WORKING IN THESE AREAS.
15. LOCAL RESIDENTIAL ACCESS SHALL BE MAINTAINED AT ALL TIMES. PROVIDE WRITTEN NOTIFICATION TO RESIDENTS SEVEN (7) DAYS PRIOR TO IMPLEMENTING ANY ROADWAY OR DRIVEWAY CLOSURE. A SECOND NOTICE WILL BE GIVEN 24 HOURS IN ADVANCE OF CLOSURE.
16. SUPPORT & PROTECT ALL EXISTING UTILITIES. CONTRACTOR SHALL CONTACT UTILITY OWNERS FOR LOCATION OF ALL EXISTING FACILITIES. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH UTILITY OWNERS AND BE RESPONSIBLE FOR PROVIDING TEMPORARY SUPPORT FOR UTILITY POLES AND ALL OTHER UTILITIES.
17. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHEN EXCAVATING IN PROXIMITY OF WATER MAINS, WASTEWATER FORCE MAINS, GRAVITY MAINS, AND RECLAIMED WATER MAINS. MAIN LOCATIONS SHOWN ON PLANS ARE NOT EXACT OR GUARANTEED. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING UTILITY LOCATIONS.
18. ALL WATER MAINS SHALL BE CONSTRUCTED AS SHOWN ON THE PLANS. A MINIMUM COVER OF 36 INCHES SHALL BE MAINTAINED ON ALL WATER MAINS UNDER ASPHALT, WHERE IT IS NOT OTHERWISE SPECIFIED ON PLANS OR DIRECTED BY THE ENGINEER. ALL DIRECTION CHANGES IN THE PIPE BOTH HORIZONTAL AND VERTICAL SHALL BE BY JOINT DEFLECTION UNLESS OTHERWISE NOTED OR DIRECTED BY THE ENGINEER. JOINT DEFLECTION SHALL NOT EXCEED 50% OF THE MANUFACTURER'S RECOMMENDED DEFLECTION.
19. ALL PIPE SHALL BE RESTRAINED IN ACCORDANCE WITH THE RESTRAINT TABLES SHOWN ON THE DETAIL SHEETS. IN ADDITION, ALL FITTINGS AND PIPE SHALL BE MECHANICAL JOINT RESTRAINED. NO THRUST BLOCKS SHALL BE PERMITTED UNLESS SHOWN. (RESTRAIN EXISTING PIPE JOINTS IN ACCORDANCE WITH THE RESTRAINT TABLES).
20. COMPLETE ALL CONSTRUCTION WITHIN RIGHT OF WAY LIMITS AND EASEMENT LIMITS.
21. PIPE SIZES SHOWN ON PLANS ARE MINIMUM NOMINAL INSIDE DIAMETER.
22. ALL CONNECTIONS TO EXISTING MAINS SHALL BE MADE BY THE CONTRACTOR ONLY AFTER THE PROPOSED CONNECTION PROCEDURE AND WORK SCHEDULE HAVE BEEN REVIEWED AND ACCEPTED BY THE OWNER. THE CONTRACTOR SHALL SUBMIT A WRITTEN REQUEST TO THE OWNER A MINIMUM OF FIVE (5) WORKING DAYS PRIOR TO SCHEDULING ANY CONNECTIONS. ALL CONNECTIONS TO BE COMPLETED IN THE PRESENCE OF AUTHORIZED CITY PERSONNEL. THE REQUEST SHALL REFERENCE THE PROFESSIONAL LAND SURVEYOR CERTIFIED COMPLETED AS-BUILT RECORD DRAWINGS PREVIOUSLY SUBMITTED AND SHALL OUTLINE THE FOLLOWING:
    a. POINTS OF CONNECTION, FITTINGS TO BE USED, METHODS OF FLUSHING AND DISINFECTION AND VERIFICATION OF RESTRAINT ON EXISTING PIPE.
    b. ESTIMATED CONSTRUCTION TIME FOR THE CONNECTIONS.

    THE OWNER SHALL REVIEW THE SUBMITTAL WITHIN FIVE (5) WORKING DAYS AFTER RECEIVING IT AND INFORM THE CONTRACTOR REGARDING APPROVAL OR DENIAL OF THE REQUEST. IF THE OWNER REJECTS THE REQUEST, THE CONTRACTOR SHALL RESUBMIT THE REQUEST MODIFYING IT IN A MANNER ACCEPTABLE TO THE OWNER. ALL CONNECTIONS SHALL ONLY BE MADE ON THE AGREED UPON DATE AND TIME.
    SHOULD THE CONTRACTOR NOT INITIATE AND COMPLETE THE CONNECTION WORK IN THE AGREED UPON MANNER, HE SHALL BE REQUIRED TO RESCHEDULE THE CONNECTION BY FOLLOWING THE PROCEDURE OUTLINED ABOVE.
23. THE CONTRACTOR SHALL NOT OPERATE ANY VALVES IN THE SYSTEM WITHOUT THE PRESENCE AND AUTHORIZATION OF CITY PERSONNEL.
24. MAINS SHALL NOT BE PLACED IN SERVICE UNTIL CLEARANCE IS RECEIVED FROM FDEP.
25. PROTECT EXISTING IMPROVEMENTS TO THE MAXIMUM EXTENT POSSIBLE.
26. RESTORE ALL EXISTING IMPROVEMENTS AND DISTURBED AREAS TO ORIGINAL OR BETTER CONDITION. PAVEMENT TO BE RESTORED IN ACCORDANCE WITH THE PAVEMENT RESTORATION DETAILS SHOWN ON THE CONSTRUCTION DETAIL SHEETS. CONTRACTOR TO PROVIDE OWN SURVEY AS NEEDED TO MATCH EXISTING CONDITIONS.
27. ASPHALTIC CONCRETE RESURFACING SHALL BE COMPLETED TO THE ORIGINAL EDGE OF PAVEMENT. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE EXISTING PAVEMENT OUTSIDE OF RESURFACING LIMITS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ALL DAMAGE TO THE EXISTING ROADWAY OUTSIDE THE LIMITS OF THE RESURFACING.
28. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SATISFYING ALL REQUIREMENTS OF REGULATORY AGENCY PERMITS FOR CONSTRUCTION ACTIVITIES AND RELATED ACTIVITIES.
29. BENCHMARK LOCATIONS AND ELEVATION ARE SHOWN IN THE PLANS AS REPRESENTED BY SURVEYOR AT THE TIME OF SURVEY. CONTRACTOR SHALL INSTALL HIS OWN TEMPORARY BENCHMARKS AS DEEMED NECESSARY. ANY DISCREPANCIES SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF CITY INSPECTOR.
30. IMMEDIATELY AT ONSET OF CONSTRUCTION, CONTRACTOR SHALL FIELD VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF ALL EXISTING UTILITIES CRITICAL TO COMPLETING THE PROJECT (INCLUDING WATER, SEWER, POWER, TELEPHONE, GAS, AND CABLE TV) AND SHALL EVALUATE POTENTIAL CONFLICTS IN A WRITTEN REPORT. ANY CONFLICTS SHALL BE REPORTED TO ENGINEER/OWNER IMMEDIATELY UPON DISCOVERY AND DETAILED IN THE REPORT. CONTRACTOR SHALL ASSUME ALL EXISTING UTILITIES SHALL REMAIN AND WILL BE SUPPORTED BY THE CONTRACTOR DURING CONSTRUCTION.
31. NO VALVE BOXES, METERS, PORTIONS OF MANHOLES, OR OTHER APPURTENANCES OF ANY KIND RELATING TO ANY UNDERGROUND UTILITIES SHALL BE LOCATED IN ANY PORTION OF A CURB-AND-GUTTER OR SIDEWALK SECTION. CONTRACTOR SHALL ADVISE EOR IMMEDIATELY UPON DISCOVERY OF A POTENTIAL CONFLICT.
32. WHERE REQUIRED, AT NO ADDITIONAL COST TO THE CITY, THE CONTRACTOR SHALL USE TEMPORARY SHEETING OR TRENCH BOXES TO MINIMIZE THE SIZE OF EXCAVATIONS AND PROTECT EXISTING ROADWAYS, UTILITIES, STORM WATER SYSTEMS AND OTHER FACILITIES. CONTRACTOR TO COMPLY WITH OSHA TRENCH SAFETY REQUIREMENTS AT ALL TIMES. CITY PERSONNEL ARE AUTHORIZED TO SHUT DOWN ANY UNSAFE OPERATIONS IF WITNESSED, WITHOUT REPERCUSSION OR LIABILITY FOR DELAY, OR COST IMPACT.
33. THE CONTRACTOR SHALL RECOGNIZE AND ABIDE BY ALL OSHA EXCAVATION SAFETY STANDARDS, INCLUDING THE FLORIDA TRENCH SAFETY ACT (90-96, LAWS OF FLORIDA). ANY MATERIAL, CONSTRUCTION METHODS, OR MATERIAL COST TO COMPLY WITH THESE LAWS SHALL BE INCIDENTAL TO THE CONTRACT.
34. ALL COMPACTION SHALL BE 98% OF AASHTO T-180.
35. PAVED / CONCRETE DRIVEWAYS SHALL BE TEMPORARILY RESTORED WITHIN 24 HOURS WITH AN ALL WEATHER PATCH. ALL DIRT DRIVEWAYS SHALL BE RESTORED TO SAME TYPE OR BETTER CONDITION WITHIN 24 HOURS.
36. CONTRACTOR SHALL PROVIDE A DETAILED RESTORATION SCHEDULE WHICH SHALL BE SUBMITTED FOR REVIEW PRIOR TO CITY PERMITS BEING ISSUED.
37. CONTRACTOR SHALL MAINTAIN DRAINAGE IN DITCHES AND SWALES AT ALL TIMES. THIS INCLUDES ALL TURBIDITY BARRIERS, SYNTHETIC HAY BAILS, ADDITIONAL FILL MATERIAL, BYPASS PUMPING AND SWALE RESTORATION INCLUDING SODDING. ALL DITCH WORK SHALL MEET THE TEMPORARY EROSION AND SEDIMENT CONTROL REQUIREMENT OF INDEX 102 AND INDEX 103 OF THE LATEST FDOT DESIGN STANDARDS. PAYMENT FOR DITCH AND SWALE MAINTENANCE SHALL BE INCLUDED IN THE PRICE OF THE PIPE AND NO SEPARATE PAYMENT WILL BE CONSIDERED.
38. PRIOR TO THE CONNECTION TO ANY EXISTING MAIN, THE PROPOSED WATER MAIN SHALL BE FLUSHED, BACTERIOLOGICALLY TESTED, DISINFECTED, ENGINEER APPROVED PRESSURE TESTING, AND HAVE FDEP CLEARANCE. REFER TO FDEP PERMIT FOR ANY ADDITIONAL REQUIREMENTS. ALL CONNECTIONS SHALL BE MADE IN THE PRESENCE OF CITY PERSONNEL.
39. THE CONTRACTOR SHALL INSTALL TEMPORARY WATER TIGHT BULKHEADS, APPROVED BY THE ENGINEER, WITHIN THE END OF THE NEW PIPELINE, WHENEVER PIPE LAYING OPERATIONS ARE NOT TAKING PLACE.
40. ALL EXISTING TRAFFIC SIGNS WITHIN THE PROPOSED CONSTRUCTION LIMITS ARE TO BE PROTECTED. CAUTION SHOULD BE EXERCISED WHILE RELOCATING EXISTING SIGNS WHERE DIRECTED. IF THE SIGNS ARE DAMAGED BEYOND USE, AS DETERMINED BY THE ENGINEER, THE DAMAGED SIGNS SHALL BE REPLACED AT THE CONTRACTORS EXPENSE.
41. DIRECTIONAL DRILL OPERATION SHALL MEET THE REQUIREMENTS OF FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, SECTION 555, DIRECTIONAL BORE.
42. BORE TRACKING AND MONITORING: AT ALL TIMES DURING THE PILOT BORE THE CONTRACTOR SHALL PROVIDE AND MAINTAIN A BORE TRACKING SYSTEM THAT IS CAPABLE OF ACCURATELY LOCATING THE POSITION OF THE DRILL HEAD IN THE X, Y, AND Z AXES. THE CONTRACTOR SHALL RECORD THESE DATA AT LEAST ONCE PER DRILL PIPE LENGTH OR EVERY THIRTY (30) FEET, WHICHEVER IS LESS. DOWNHOLE AND SURFACE GRID TRACKING SYSTEM: CONTRACTOR SHALL MONITOR AND RECORD X, Y, AND Z COORDINATES RELATIVE TO AN ESTABLISHED SURFACE SURVEY BENCHMARK, FROM DOWNHOLE SURVEY DATA USING A DOWNHOLE WIRELINE SYSTEM. "TRU-TRACKER" ENERGIZED SURFACE GRID, OR EQUIVALENT, SHALL BE INSTALLED AND USED TO SUPPLEMENT THE WIRELINE SYSTEM. THE GRIDS SHALL BE SURVEYED TO ESTABLISH HORIZONTAL AND VERTICAL POSITION TO 0.1 FEET ACCURACY. DATA TO BE RECORDED MUST INCLUDE CLOCK AND PITCH INFORMATION, DEPTH, TRANSMITTER TEMPERATURE, BATTERY STATUS, AND POSITION (X, Y) THE DATA SHALL BE CONTINUOUSLY MONITORED AND RECORDED AT LEAST ONCE PER DRILL PIPE LENGTH.
43. CONTRACTOR SHALL PROVIDE ALL TEMPORARY FILL AND STORM PIPING NECESSARY TO INSTALL NEW CONSTRUCTION. RESTORE ALL DISTURBED AREAS TO PRE EXISTING CONDITIONS OR BETTER.
44. ALL DISTURBED SOD SHALL BE PERMANENTLY REPLACED WITH SOD. NO SEEDING IS ALLOWED AS A METHOD OF REPLACEMENT, ONLY AS PART OF A TEMPORARY EROSION CONTROL PLAN TO STABILIZE DISTURBED SOD PRIOR TO END OF PROJECT SOD RESTORATION.
45. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SURVEYING DURING CONSTRUCTION. AS-BUILTS SHALL BE ELECTRONICALLY SUBMITTED TO EOR FOR REVIEW PRIOR TO ACCEPTANCE AND FINAL COMPLETION OF WORK.

PERMITS, PLANS, SHOP DRAWINGS:

1. PERMITS OR LETTERS OF DETERMINATION FROM FDEP WILL BE PROVIDED BY THE EOR FOR THE SANITARY SEWER COLLECTION SYSTEM AND WATER DISTRIBUTION SYSTEM PRIOR TO COMMENCEMENT OF CONSTRUCTION. ALL WORK MUST BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS AND CONDITIONS OF THE APPROVED PERMITS.
2. A STAMPED APPROVED SET OF PLANS BY THE EOR SHALL BE PRESENT ON THE SITE AT ALL TIMES.
3. SHOP DRAWINGS SHALL BE ELECTRONICALLY SUBMITTED TO CITY AND EOR FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. PROGRESS AS-BUILTS SHALL BE SUBMITTED WITH EACH PAY REQUEST.
4. INSTALLATION OF MATERIALS AND/OR STRUCTURES PRIOR TO SHOP DRAWING APPROVAL IS NOT ACCEPTABLE.
5. TWO HARD COPIES AND ONE ELECTRONIC COPY OF RECORD DRAWINGS SHALL BE SUBMITTED TO CITY AND EOR AT OR BEFORE THE FINAL INSPECTION. RECORD DRAWINGS SHALL CONFORM TO CITY STANDARDS, SPECIFICATIONS AND DETAILS.

WATER MAIN:

WATER - TESTING:

1. WATER LINE SHALL BE INSTALLED, CLEANED, FLUSHED, DISINFECTED AND BACTERIOLOGICALLY TESTED AND CLEARED FOR SERVICE IN ACCORDANCE WITH THE LATEST AWWA STANDARDS, FDEP RULES AND REGULATIONS, AND CITY STANDARDS AND SPECIFICATIONS.
2. ALL WATER DISTRIBUTION SYSTEMS SHALL BE FLUSHED CLEAN OF ALL DELETERIOUS MATERIAL PRIOR TO ANY TESTING. FULL DIAMETER FLUSHING IS REQUIRED. LINES 4" AND GREATER SHALL BE PIGGED.
3. WATER LINE SHALL BE PRESSURE TESTED IN ACCORDANCE WITH AWWA-C600 (DUCTILE IRON PIPE) AND AWWA- C605/M23 (PVC PIPE) SPECIFICATIONS AT 150 PSI AND WITNESSED BY EOR PERSONNEL. NO LEAKAGE SHALL BE ALLOWED. SCHEDULE TEST A MINIMUM OF 72 HOURS IN ADVANCE.
4. ALL WATER MAINS SHALL BE DISINFECTED IN ACCORDANCE WITH THE LATEST VERSION OF AWWA C651 AND WITNESSED BY EOR PERSONNEL.
5. ALL BACTERIOLOGICAL SAMPLES SHALL BE TAKEN BY CONTRACTOR AT NO ADDITIONAL COST TO THE CITY. EOR TO REVIEW RESULTS PRIOR TO ACCEPTANCE.

WATER - MATERIALS:

1. **PVC PIPE**: FOUR (4) INCHES THROUGH TWELVE (12) INCHES SHALL BE AWWA C-900, LATEST EDITION. FOURTEEN (14) INCHES THROUGH THIRTY-SIX (36) INCHES SHALL BE AWWA C-905, LATEST EDITION.
2. **DIP PIPE**: FOUR (4)" THROUGH FIFTY-FOUR (54)" SHALL BE ANSI/AWWA A21.51/C151 WITH A MINIMUM WORKING PRESSURE CLASS 150 PIPE.

ANY FITTINGS REQUIRED SHALL BE MECHANICAL JOINT DUCTILE IRON CONFORMING TO ANSI/AWWA A21.10/C110, 250 PSI MINIMUM PRESSURE RATING, OR DUCTILE IRON COMPACT FITTINGS IN ACCORDANCE WITH ANSI/AWWA A21.53/C153.

JOINTS FOR DUCTILE IRON PIPE SHALL BE PUSH-ON OR MECHANICAL JOINTS CONFORMING TO ANSI/AWWA A21.11/C111. ABOVE GROUND JOINTS SHALL BE FLANGED WITH T5 CADMIUM PLATED BOLTS, NUTS AND WASHERS. FLANGED JOINTS SHALL CONFORM TO ANSI STANDARD B 16.1-125 LB.

WHERE DUCTILE IRON PIPE AND FITTINGS ARE TO BE BELOW GROUND OR INSTALLED IN A CASING PIPE THE COATING SHALL BE A MINIMUM 1.0 MIL THICK IN ACCORDANCE WITH ANSI/AWWA A21.51/C151.

WHERE DUCTILE IRON PIPE AND FITTINGS ARE TO BE INSTALLED ABOVE GROUND, PIPE, FITTINGS AND VALVES SHALL BE THOROUGHLY CLEANED AND GIVEN ONE FIELD COAT (MINIMUM 1.5 MILS DRY THICKNESS) OF RUST INHIBITOR PRIMER, AND TWO FINISH COATS (MINIMUM 1.5 MILS DRY THICKNESS EACH).

ALL DUCTILE IRON PIPE AND FITTINGS SHALL HAVE AN INTERIOR PROTECTIVE LINING OF CEMENT-MORTAR WITH A SEAL COAT OF ASPHALTIC MATERIAL IN ACCORDANCE WITH ANSI/AWWA A21.4/C104.

THE PIPE SHALL BE POLYETHYLENE ENCASED (8 MIL) WHERE SHOWN ON THE PLANS, IN ACCORDANCE WITH ANSI/AWWA A21.51/C105.

3. **POLYETHYLENE PIPE**: FOUR (4)" THROUGH TWELVE (12)" SHALL BE AWWA STANDARD C906, PE3408 LATEST EDITION. THE POLYETHYLENE PIPE SHALL HAVE A MINIMUM WORKING PRESSURE RATING OF 160 PSI AND SHALL HAVE A STANDARD DIMENSION RATIO (SDR) OF 11. PIPE SHALL BE THE SAME ID AS DUCTILE IRON PIPE.

   POLYETHYLENE PIPE SHALL HAVE FUSION BONDED JOINTS.

   FITTINGS USED WITH POLYETHYLENE PIPE SHALL BE FUSION FITTINGS IN ACCORDANCE WITH AWWA STANDARD C906.

4. **SERVICE PIPES:** ALL SERVICE LINES SHALL BE 1", 1-1/2" OR 2" BLUE, PC200, DR9, POLYETHYLENE TUBING CONFORMING TO SPECIFICATIONS IN AWWA C901, PE3608. 4" AND LARGER SERVICE PIPE SHALL BE C-900 PVC OR DIP.
5. VALVES SHALL BE RESILIENT WEDGE GATE VALVES.
6. VALVES SHALL BE LOCATED AT NOT MORE THAN 500 FOOT INTERVALS IN COMMERCIAL, INDUSTRIAL AND HIGH DENSITY RESIDENTIAL AREAS AND AT NOT MORE THAN 1000 FOOT INTERVALS IN ALL OTHER AREAS. APPROPRIATE VALVING SHALL ALSO BE PROVIDED AT THE DOWNSTREAM SIDES OF TEES AND CROSSES AND BOTH SIDES OF A DIRECTIONAL BORE OR JACK AND BORE.. THIS SHALL INCLUDE ALL SIDES OF TEES AND CROSSES WITHIN LOOPED SYSTEMS, WHERE FLOW IS POTENTIALLY MULTIDIRECTIONAL.

M.O.T. NOTES:

1. THE MAINTENANCE OF TRAFFIC FOR THIS PROJECT SHALL BE IN ACCORDANCE WITH U.S. DEPARTMENT OF TRANSPORTATION "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD), LATEST EDITION, AND THE FLORIDA DEPARTMENT OF TRANSPORTATION'S "ROADWAY AND TRAFFIC DESIGN STANDARDS" LATEST EDITION. CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING AND SUBMITTING A M.O.T. PLAN IN ACCORDANCE WITH FDOT GUIDELINES, REGULATIONS AND STANDARDS TO THE CITY OR COUNTY(WHICHEVER IS APPLICABLE) FOR APPROVAL PRIOR TO COMMENCING WORK. THE CONTRACTOR'S M.O.T. PLAN SHALL BE SEALED BY A FLORIDA REGISTERED CIVIL ENGINEER WITH KNOWLEDGE OF PREPARING TRAFFIC CONTROL PLANS.
2. THE POSTED SPEED LIMITS ALONG THE ROADWAYS UNDER CONSTRUCTION SHALL BE IN FORCE, UNLESS IT IS DEEMED APPROPRIATE THAT THE SPEED BE REDUCED.
3. THE CONTRACTOR SHALL MAINTAIN EXISTING DRAINAGE PATTERNS DURING CONSTRUCTION ACTIVITIES.
4. THE CONTRACTOR SHALL NOTIFY BUSINESSES AND RESIDENCES WITHIN THE CONSTRUCTION AREA AT LEAST (5) WORKING DAYS PRIOR TO CONSTRUCTION AND SHALL MAINTAIN ACCESS AT ALL TIMES.
5. THE CONTRACTOR SHALL ADJUST THE MAINTENANCE OF TRAFFIC SIGNS AND BARRICADES AS NEEDED PER FIELD CONDITIONS.
6. CONTRACTOR SHALL MAINTAIN PEDESTRIAN AND VEHICULAR TRAFFIC PER FDOT REQUIREMENTS. CONTRACTOR SHALL PROVIDE ALL WARNING SIGNALS, SIGNS, LIGHTS AND FLAG MEN AS REQUIRED BY FDOT IN THE "MANUAL OF TRAFFIC CONTROL AND SAFE PRACTICES" (FDOT INDEXES 600 - 8501, TO ENSURE SAFE PASSAGE OF VEHICULAR AND PEDESTRIAN TRAFFIC DURING CONSTRUCTION ACTIVITIES.

EROSION AND SEDIMENT CONTROLS:

1. AN EROSION CONTROL PLAN SHALL BE PREPARED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO THE PRE-CONSTRUCTION MEETING. THE CONTRACTOR SHALL EXECUTE ALL MEASURES NECESSARY TO LIMIT THE TRANSPORT OF SEDIMENTS OUTSIDE THE LIMITS OF THE PROJECT TO THE VOLUME AND AMOUNT AS THAT ARE EXISTING PRIOR TO THE COMMENCEMENT OF CONSTRUCTION PERIOD. PROVISION MUST BE MADE TO PRESERVE THE INTEGRITY AND CAPACITY OF CHECK WEIRS, SEDIMENT BASINS, SLOPE DRAINS, GRADING PATTERNS, ETC. REQUIRED TO MEET THIS PROVISION THROUGHOUT THE LIFE OF THE CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE HAY BALES, SILT BARRIERS, TEMPORARY GRASSING, ETC. AS REQUIRED TO FULLY COMPLY WITH THE INTENT OF THIS SPECIFICATION. PROVIDE STORM WATER BY-PASS PIPING OF PUMPING TO MAINTAIN DRAINAGE IN ALL LOCATIONS NECESSARY FOR EQUIPMENT STAGING.

   A. STOCKPILING MATERIAL
   NO EXCAVATED MATERIAL SHALL BE STOCKPILED IN SUCH A MANNER AS TO DIRECT RUNOFF DIRECTLY OFF THE PROJECT SITE OR INTO ANY ADJACENT WATER BODY OR STORMWATER COLLECTION FACILITY.

   B. EXPOSED AREA LIMITATION
   THE SURFACE AREA OF OPEN, RAW ERODABLE SOIL EXPOSED BY CLEARING AND GRUBBING OPERATIONS OR EXCAVATION AND FILLING OPERATIONS SHALL BE CONTROLLED, SO THAT THIS OPERATION WILL NOT SIGNIFICANTLY AFFECT OFFSITE DEPOSIT SEDIMENTS.

   C. INLET PROTECTION
   INLETS AND CATCH BASINS SHALL BE PROTECTED FROM SEDIMENT LADEN STORMWATER RUNOFF UNTIL THE COMPLETION OF THE ALL CONSTRUCTION OPERATIONS THAT MAY CONTRIBUTE SEDIMENT TO THE INLET.

   D. TEMPORARY SEEDING
   AREAS OPENED BY CONSTRUCTION OPERATIONS THAT ARE NOT ANTICIPATED TO BE DRESSED OR RECEIVE FINAL GRASSING TREATMENT WITHIN THIRTY (30) DAYS SHALL BE SEEDED WITH A QUICK GROWING GRASS SPECIES WHICH WILL PROVIDE AN EARLY COVER, DURING THE SEASON IN WHICH IT IS PLANTED. TEMPORARY SEEDING SHALL BE CONTROLLED SO AS TO NOT ALTER OR COMPETE WITH PERMANENT GRASSING. THE RATE OF SEEDING SHALL BE 30 POUNDS PER ACRE.

   E. TEMPORARY SEEDING AND MULCHING
   SLOPES STEEPER THAN 6:1 THAT FALL WITHIN THE CATEGORY ESTABLISHED IN 4 ABOVE, SHALL ADDITIONALLY RECEIVE MULCHING OF APPROXIMATELY TWO (2) INCHES, LOOSE MEASURE, OF MULCH MATERIAL CUT INTO THE SOIL OF THE SEEDED AREA TO A DEPTH OF FOUR (4) INCHES.

   F. TEMPORARY GRASSING
   SEEDED OR SEEDED AND MULCHED AREA(S) SHALL BE ROLLED AND WATERED AS REQUIRED TO ASSURE OPTIMUM GROWING CONDITIONS FOR THE ESTABLISHMENT OF A GOOD GRASS COVER.

   G. TEMPORARY RE-GRASSING
   IF, AFTER 14 DAYS, THE TEMPORARY GRASSED AREAS HAVE NOT ATTAINED A MINIMUM OF 75% GOOD GRASS COVER, THE AREA WILL BE REWORKED AND ADDITIONAL SEEDS APPLIED TO ESTABLISH THE DESIRED VEGETATION COVER.

   H. MAINTENANCE
   ALL FEATURES OF THE PROJECT SHALL BE CONSTRUCTED TO PREVENT EROSION AND SEDIMENT AND SHALL BE MAINTAINED DURING THE LIFE OF THE CONSTRUCTION SO AS TO FUNCTION PROPERLY WITHOUT THE TRANSPORT OF SEDIMENTS OUTSIDE THE LIMITS OF THE PROJECT.

2. TEMPORARY SILT FENCES AND STAKED SILT BARRIERS, SHALL BE IN ACCORDANCE WITH F.D.O.T. STANDARD SPECIFICATION, SEC. 104.6, 104.7 AND SEC. 985 AND SHALL BE INSTALLED ALONG THE WESTERN LIMITS OF THE PROJECT.
3. ALL DISTURBED AREAS SHALL BE RESTORED WITH SOD (NO SEED AND MULCH) WITH THE SAME TYPE OF SOD UNLESS NOTED OTHERWISE ON PLANS.

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No.	Date	Revision	By

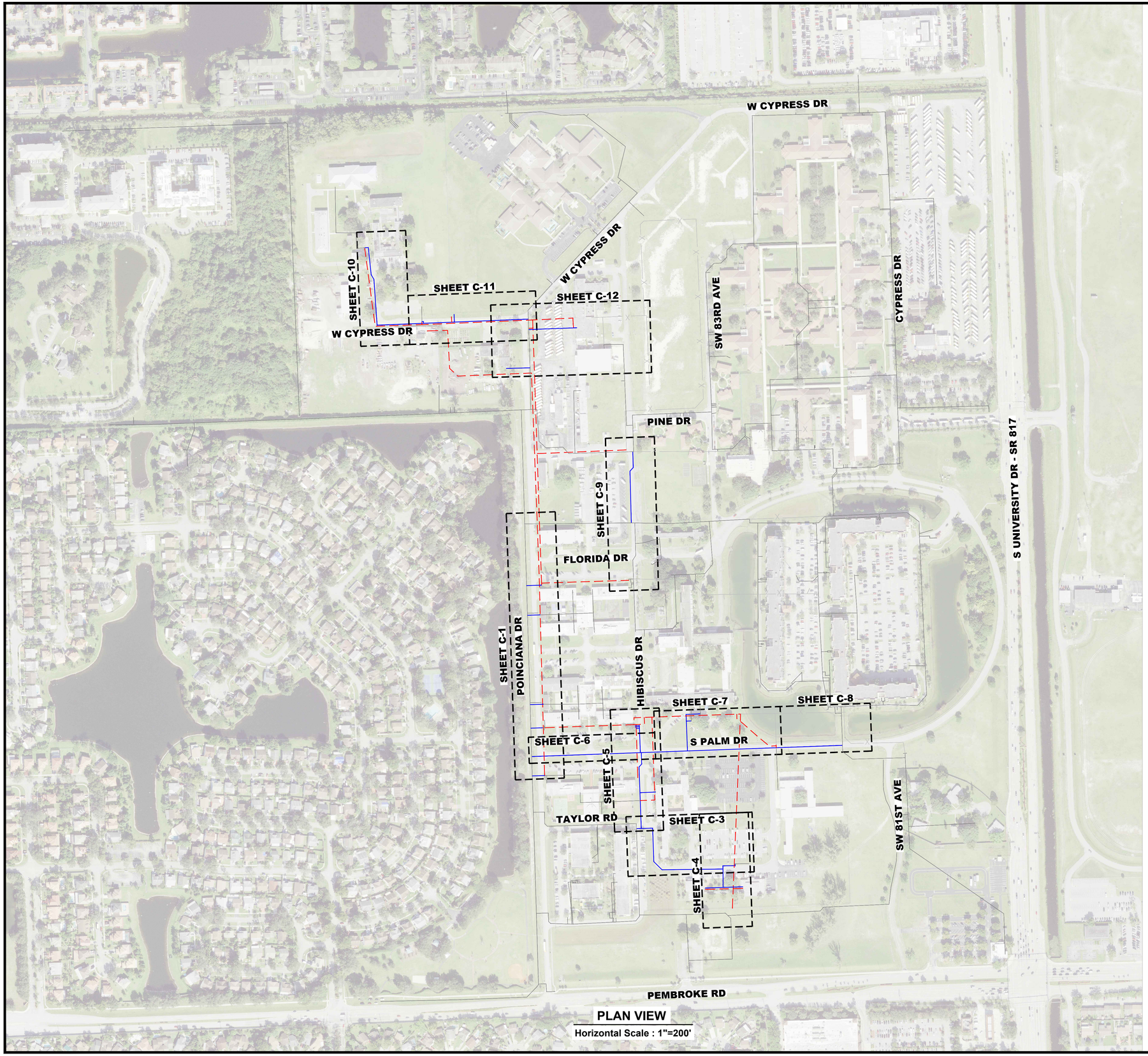
Designed by:	K.B.
Drawn by:	J.C.
Checked by:	A.M.
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Job No.:	P19702
Date:	03/03/26

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GENERAL NOTES

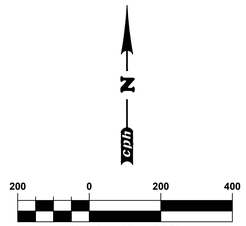
CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
G-1



PLAN VIEW

Horizontal Scale : 1"=200'



Scale: 1" = 200'

LEGEND

- PROPOSED WM
- WM TO BE PLACED OUT OF SERVICE AND ABANDONED IN PLACE (UNDER THIS PROJECT)
- EXISTING WM TO REMAIN IN SERVICE
- EXISTING ABANDONED WM

GENERAL NOTES

1. EXPLORATORY DIGS TO BE PERFORMED BY CONTRACTOR BEFORE COMMENCING WORK.
2. ALIGNMENTS AND CONNECTIONS SHALL BE VERIFIED BY CONTRACTOR BEFORE STARTING PIPELINE SECTIONS. .
3. ALL EXISTING SERVICE CONNECTIONS TO BE RECONNECTED TO THE NEW PIPES.
4. PIPES TO BE REMOVED/DEMOLISHED MUST BE CUT, CAPPED, AND ABANDONED IN PLACE.
5. ANY DISCREPANCIES BETWEEN PLANS AND FIELD OBSERVATIONS WHEN DEVELOPING CIVIL WORKS, TO BE REPORTED TO EOR AND CITY FOR INSTRUCTIONS.
6. IT IS THE INTENTION OF THESE PLANS THAT UTILITY CROSSINGS BE DEFLECTION TYPE, IN ACCORDANCE WITH DETAIL G-5, WHEN WITHIN THE RECOMMENDED LIMITS OF DEFLECTION AS PER THE PIPE MANUFACTURER. FITTING TYPE UTILITY CROSSINGS, IN ACCORDANCE WITH DETAIL G-6, MAY BE ALLOWED SHOULD THIS LIMIT BE EXCEEDED OR WHERE SPECIFIED. THE CONTRACTOR SHALL PERFORM EXPLORATORY INVESTIGATIONS OF EXISTING UTILITIES SUFFICIENTLY IN ADVANCE AS NOT TO DELAY THE PROGRESS OF THE WORK. EXISTING UTILITY LOCATIONS IN PLAN AND PROFILE ARE APPROXIMATE ONLY.

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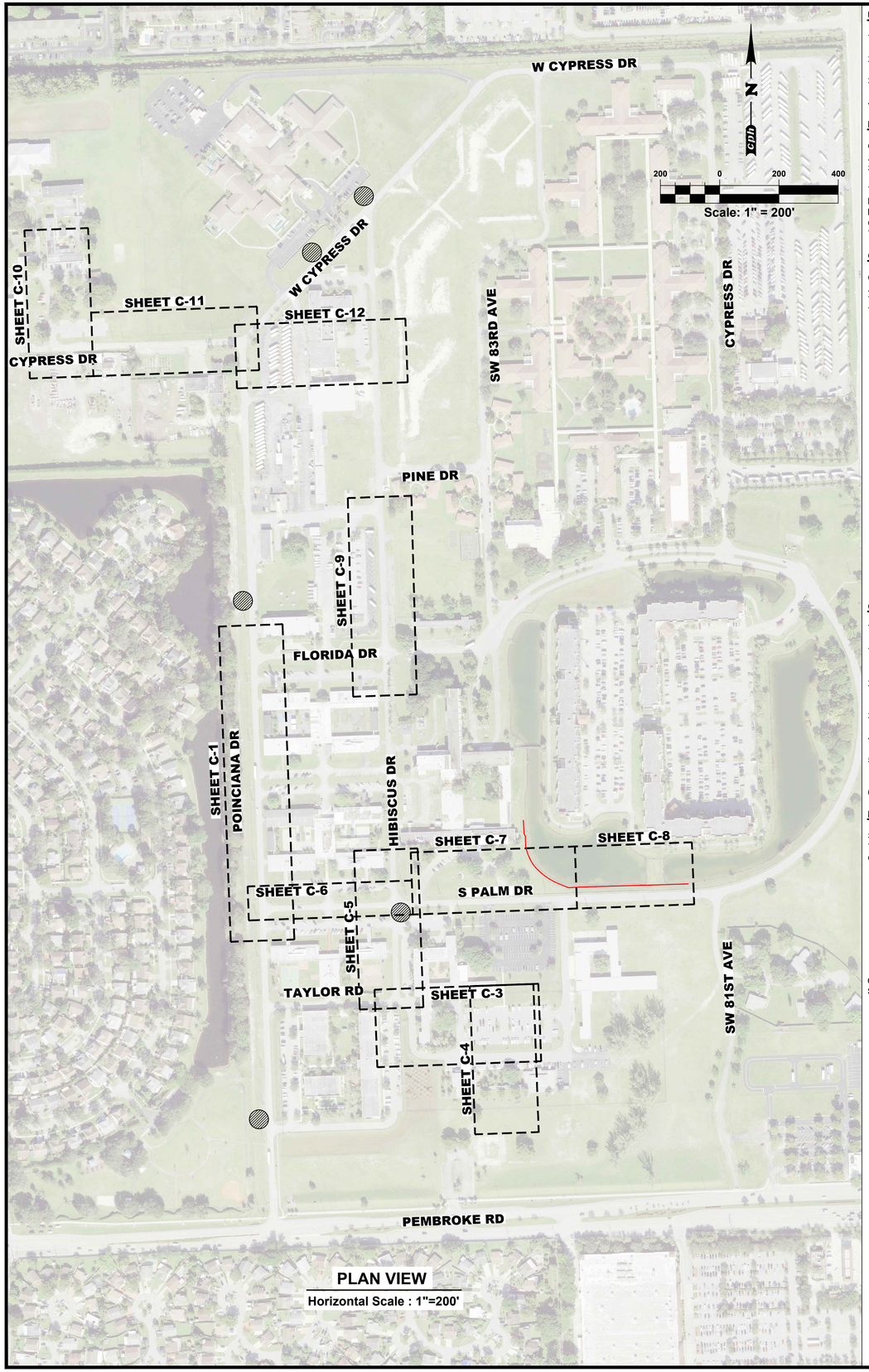
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KEY MAP

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
G-2



USAGE NOTES:

1. ANCHORING STAKES BE SIZED, SPACED, AND BE OF A MATERIAL THAT EFFECTIVELY SECURES THE FILTER SOCK. STAKE SPACING SHALL BE A MAXIMUM OF THREE FEET.

2. OVERLAP ENDS OF SOCK PER MANUFACTURERS RECOMMENDATIONS. (1' MIN. 3' MAX.)

3. USE 8" TO 12" DIA. SOCK ON CURBSIDE IN TRAFFIC AREAS.

4. USE 12"-18" DIA. SOCK IN NON-TRAFFIC AREAS OR AREAS WJERE SAFETY IS NOT A CONCERN.

DESIGN CRITERIA:

COMPOST FILTER SOCKS ARE DESIGNED TO RETAIN SEDIMENT TRANSPORTED IN SHEET FLOW FROM DISTURBED AREAS. COMPOST FILTER SOCKS PERFORM THE SAME FUNCTION AS SILT FENCE, ALLOW A HIGHER FLOW RATE, AND ARE USUALLY FASTER AND CHEAPER TO INSTALL. WHERE ALL RUNOFF IS TO BE TREATED BY THE COMPOST FILTER SOCK THE MAXIMUM SLOPE LENGTH BEHIND THE COMPOST FILTER SOCK SHALL NOT EXCEED THOSE SHOWN IN TABLE 1. THE DRAINAGE AREA SHALL NOT EXCEED ¼ ACRE FOR EVERY 100 FT OF COMPOST FILTER SOCK.

THE SEDIMENT AND POLLUTANT REMOVAL PROCESS CHARACTERISTIC TO COMPOST FILTER SOCKS COMBINES BOTH FILTERING AND DEPOSITION FROM SETTLING SOLIDS. THIS IS DIFFERENT THAN METHODS THAT RELY ON PONDING FOR DEPOSITION OF SOLIDS FOR SEDIMENT CONTROL, SUCH AS SILT FENCE. PONDING OCCURS WHEN WATER FLOWING TO THE COMPOST FILTER SOCK ACCUMULATES FASTER THAN THE HYDRAULIC FLOW THROUGH RATE OF THE COMPOST FILTER SOCK. HYDRAULIC FLOW-THROUGH RATES FOR COMPOST FILTER SOCKS ARE 50% GREATER THAN SILT FENCE FILTER FABRIC. GREATER HYDRAULIC FLOW-THROUGH RATES REDUCE PONDING. COMPOST FILTER SOCK MESH NETTING SHALL MEET THE NETTING SPECIFICATION IN TABLE 2. COMPOST FILTER SOCKS SHALL MEET THE SPECIFICATIONS IN TABLE 3. COMPOST USED IN COMPOST FILTER SOCKS SHALL MEET THE SPECIFICATION DESCRIBED UNDER COMPOST FILTER MEDIA SPECIFICATIONS.

COMPOST FILTER MEDIA SPECIFICATIONS

COMPOST USED FOR COMPOST FILTER SOCK FILLER MATERIAL (FILTER MEDIA) SHALL BE WEED FREE AND DERIVED FROM A WELL-DECOMPOSED SOURCE OF ORGANIC MATTER. THE COMPOST SHALL BE PRODUCED USING AN AEROBIC COMPOSTING PROCESS MEETING CFR 503 REGULATIONS INCLUDING
TIME AND TEMPERATURE DATA. THE COMPOST SHALL BE FREE OF ANY REFUSE, CONTAMINANTS OR OTHER MATERIALS TOXIC TO PLANT GROWTH. NON-COMPOSTED PRODUCTS WILL NOT BE ACCEPTED. TEST METHODS FOR THE ITEMS BELOW SHOULD FOLLOW US COMPOSTING COUNCIL TEST METHODS FOR THE EXAMINATION OF COMPOSTING AND COMPOST GUIDELINES FOR LABORATORY PROCEDURES:

A. PH – 5.0-8.0 IN ACCORDANCE WITH TMECC 04.11-A, "ELECTROMETRIC PHDETERMINATIONS FOR COMPOST"

B. PARTICLE SIZE – 99% PASSING A 2 IN (50MM) SIEVE AND A MAXIMUM OF 40% PASSING A 3/8 IN (9.5MM) SIEVE, IN ACCORDANCE WITH TMECC 02.02-B, "SAMPLE SIEVING FOR AGGREGATE SIZE CLASSIFICATION". (NOTE- IN THE FIELD, PRODUCT COMMONLY IS BETWEEN ½ IN [12.5MM] AND 2 IN [50MM] PARTICLE SIZE.)

C. MOISTURE CONTENT OF LESS THAN 60% IN ACCORDANCE WITH STANDARDIZED TEST METHODS FOR MOISTURE DETERMINATION.

D. MATERIAL SHALL BE RELATIVELY FREE (<1% BY DRY WEIGHT) OF INERT OR FOREIGN MAN MADE MATERIALS.

E. A SAMPLE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO BEING USED AND MUST COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS.

TABLE 1

Land Slope	Move
Percent	Feet
<2	100
2 to 5	75
5 to 10	50
10 to 20	25
>20*	15

*In areas where the slope is greater than 20% , a flat area length of 10 ft between the toe of the slope to the compost filter sock should be provided.

Table 2

Material Type	Multi-Filament Polypropylene	Multi-Filament Polypropylene
Material Characteristic	Photodegradable	Photodegradable
Mesh Opening	3/8 in (10mm)	1/8 in (3mm)
"Tensile Strength (ASTM 5035-95)"	44 psi (3.09 kg/cm2)	202 psi (14.2 kg/cm2)*
% Original Strength from Ultraviolet Exposure (ASTM G-155)	100% at 1000 hr	100% at 1000 hr

TABLE 3

Material Type	12 in (300mm) Diameter
Effective Circumference	38 in (960mm)
Density (when filled)	32 lbs/ft (50 kg/m)
Air Space	20%
Hydraulic Flow Through Rate	11.3 gpm/ft (141 L/min/m)
P Factor (RUSLE)	0.1-0.32

CONSTRUCTION SPECIFICATIONS

THE COMPOST FILTER SOCK SHALL BE INSTALLED ACCORDING TO THIS SPECIFICATION, AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

1. COMPOST FILTER SOCKS SHOULD BE INSTALLED PARALLEL TO THE BASE OF THE SLOPE OR OTHER DISTURBED AREA. IN EXTREME CONDITIONS (I.E., 2:1 SLOPES), A SECOND COMPOST FILTER SOCK SHALL BE CONSTRUCTED AT THE TOP OF THE SLOPE.

2. STAKES SHALL BE INSTALLED THROUGH THE MIDDLE OF THE COMPOST FILTER SOCK ON 10 FT (3M) CENTERS, USING 2 IN (50MM) BY 2 IN (50MM) BY 3 FT (1M) WOODEN STAKES. IN THE EVENT STAKING IS NOT POSSIBLE, I.E., WHEN COMPOST FILTER SOCKS ARE USED ON PAVEMENT, HEAVY CONCRETE BLOCKS SHALL BE USED BEHIND THE COMPOST FILTER SOCKS TO HELP STABILIZE DURING RAINFALL/RUNOFF EVENTS.

3. STAKING DEPTH FOR SAND AND SILT LOAM SOILS SHALL BE 12 IN (300MM), AND 8 IN (200MM) FOR CLAY SOILS.

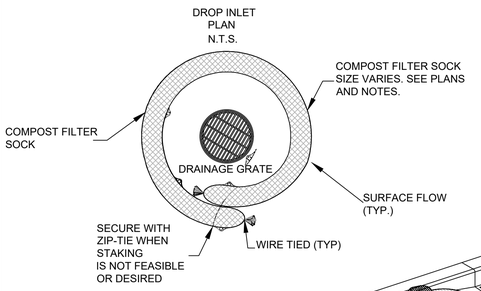
4. LOOSE COMPOST MAY BE BACKFILLED ALONG THE UPSLOPE SIDE OF THE COMPOST FILTER SOCK, FILLING THE SEAM BETWEEN THE SOIL SURFACE AND THE DEVICE, IMPROVING FILTRATION AND SEDIMENT RETENTION.

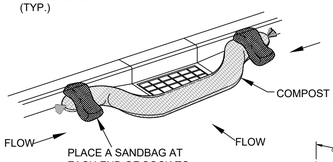
5. IF THE COMPOST FILTER SOCK IS TO BE LEFT AS A PERMANENT FILTER OR PART OF THE NATURAL LANDSCAPE, IT MAY BE SEEDED AT TIME OF INSTALLATION FOR ESTABLISHMENT OF PERMANENT VEGETATION. THE ENGINEER WILL SPECIFY SEED REQUIREMENTS.

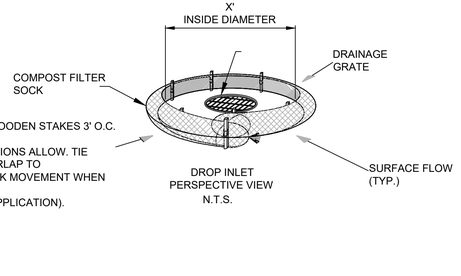
6. COMPOST FILTER SOCKS ARE NOT TO BE USED IN PERENNIAL, EPHEMERAL, OR INTERMITTENT STREAMS.

MAINTENANCE

SEDIMENT SHALL BE REMOVED ONCE IT HAS ACCUMULATED TO ONE-HALF THE ORIGINAL HEIGHT OF THE BARRIER. COMPOST FILTER SOCKS SHALL BE REPLACED WHENEVER IT HAS DETERIORATED TO SUCH AN EXTENT THAT THE EFFECTIVENESS OF COMPOST FILTER SOCK IS REDUCED. COMPOST FILTER SOCKS SHALL REMAIN IN PLACE UNTIL DISTURBED AREAS HAVE BEEN PERMANENTLY STABILIZED. ALL SEDIMENT ACCUMULATION AT THE COMPOST FILTER SOCK SHALL BE REMOVED AND PROPERLY DISPOSED OF BEFORE THE COMPOST FILTER SOCK IS REMOVED





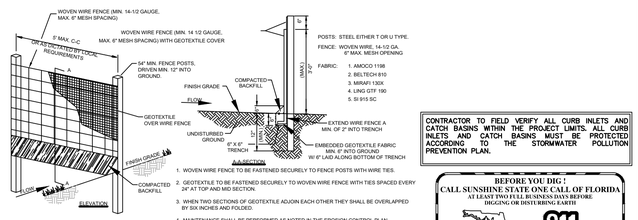


LEGEND

TEMPORARY GRAVEL INLET SEDIMENT FILTER

PROPOSED SILT FENCE

CURB INLET
PERSPECTIVE VIEW
N.T.S.



SEDIMENTATION/SILT FENCE WITH WIRE SUPPORT SF
N.T.S.

CONTRACTOR TO FIELD VERIFY ALL CURB INLETS AND CATCH BASINS WITHIN THE PROJECT LIMITS. ALL CURB INLETS AND CATCH BASINS MUST BE PROTECTED ACCORDING TO THE STORMWATER POLLUTION PREVENTION PLAN.

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Designed by:	K.B.
Drawn by:	J.C.
Checked by:	A.M.
Approved by:	K.B.
Job No.:	P19702
Date:	03/03/26

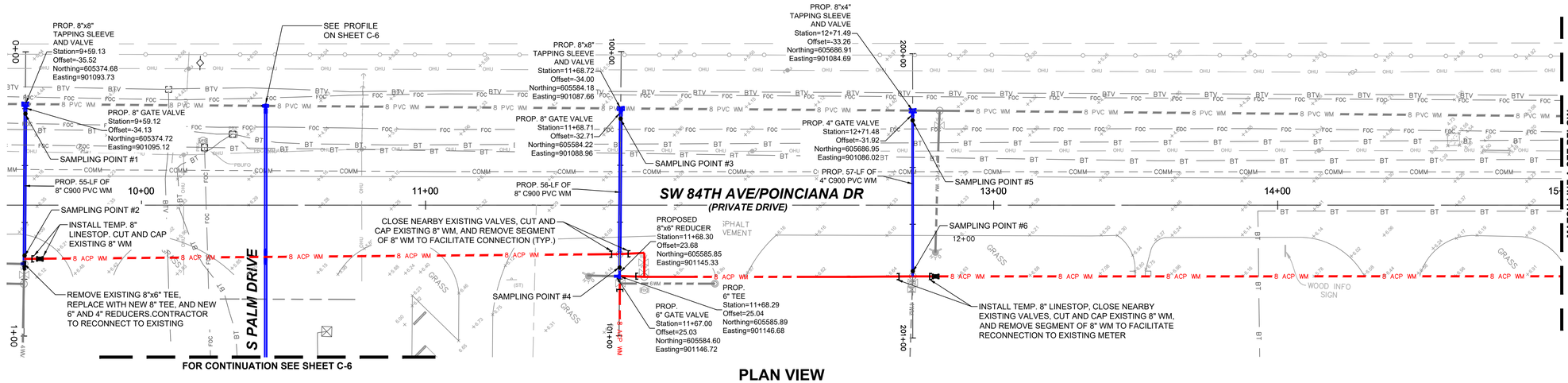
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Survey L.B. No. 7143
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STORMWATER POLLUTION PREVENTION PLAN

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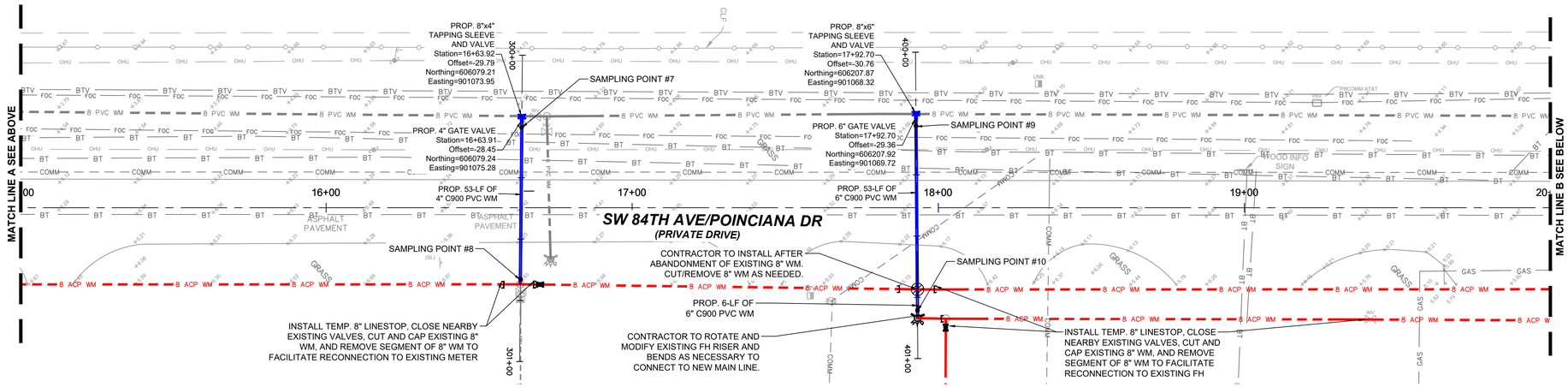
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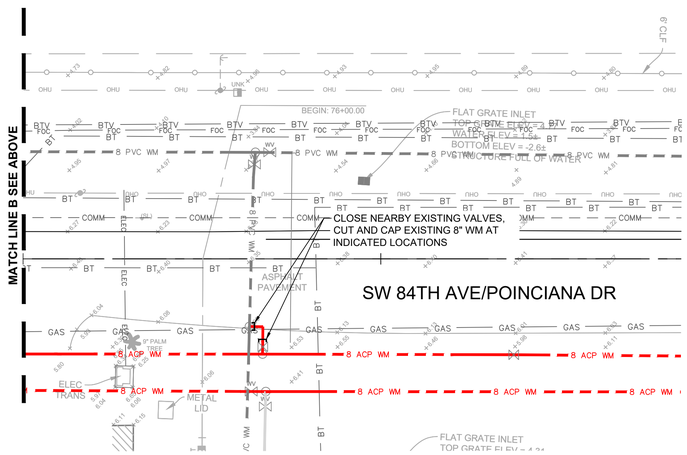
PLAN VIEW

Horizontal Scale : 1"=20'



PLAN VIEW

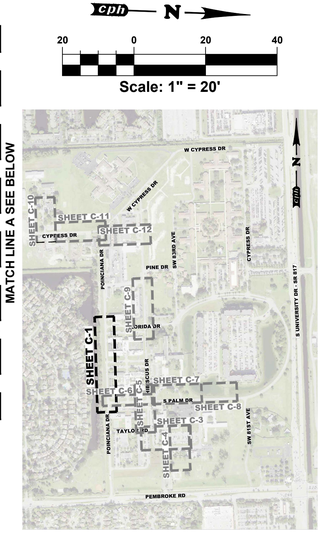
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KEY MAP

Scale : 1"=800'

LEGEND

- PROPOSED WM
- WM TO BE PLACED OUT OF SERVICE AND ABANDONED IN PLACE
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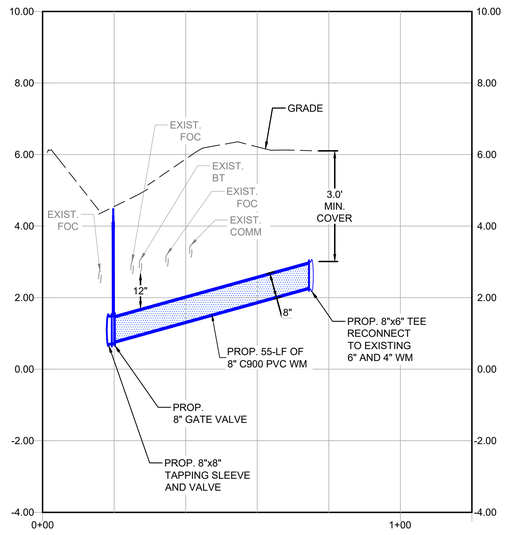
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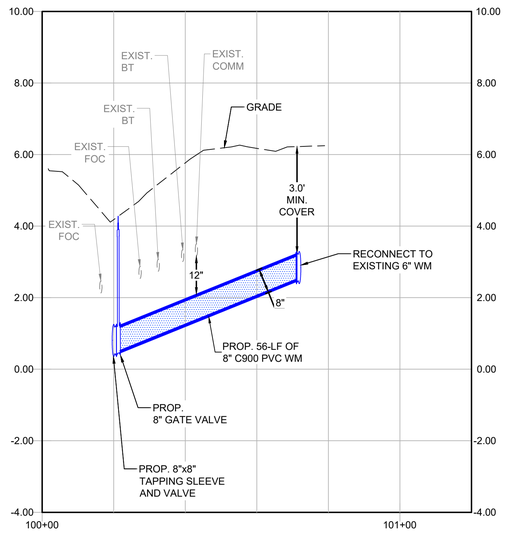
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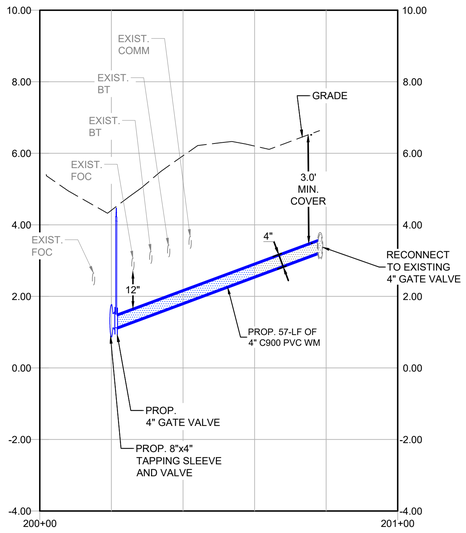
PROFILE VIEW - STA=9+59

Vertical Scale : 1"=2'



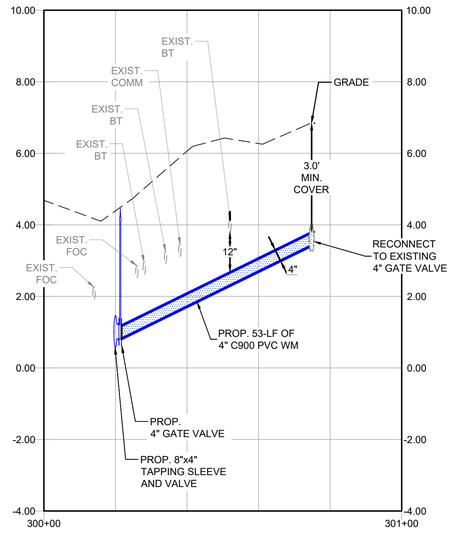
PROFILE VIEW - STA=11+68

Vertical Scale : 1"=2'



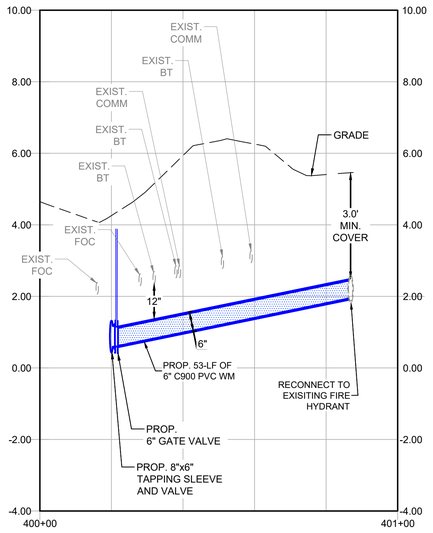
PROFILE VIEW - STA=12+71

Vertical Scale : 1"=2'



PROFILE VIEW - STA=16+63

Vertical Scale : 1"=2'



PROFILE VIEW - STA=17+92

Vertical Scale : 1"=2'

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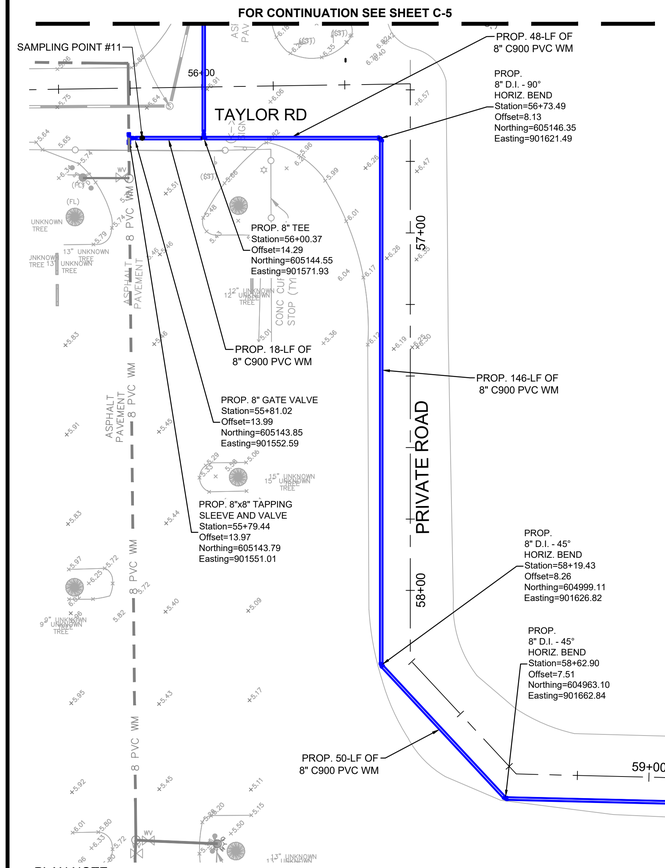
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POTABLE WATER PROFILES

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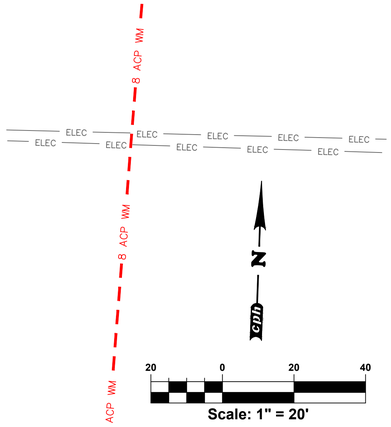
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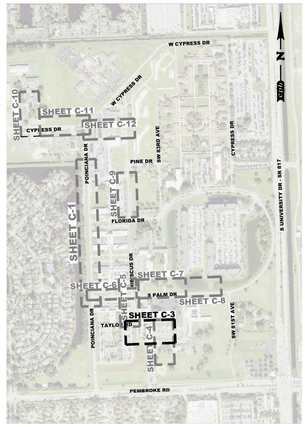


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PLAN VIEW

Horizontal Scale : 1"=20'



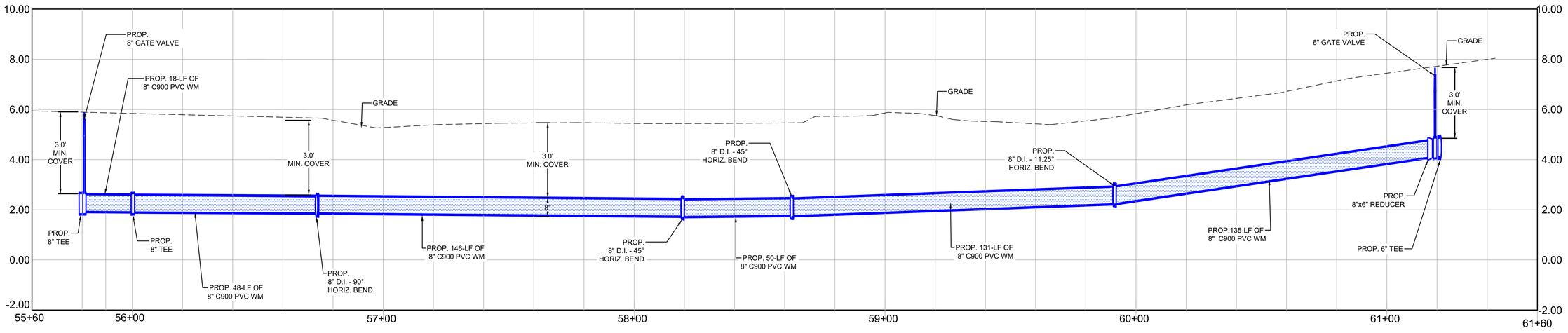


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PROFILE VIEW

Vertical Scale : 1"=2'

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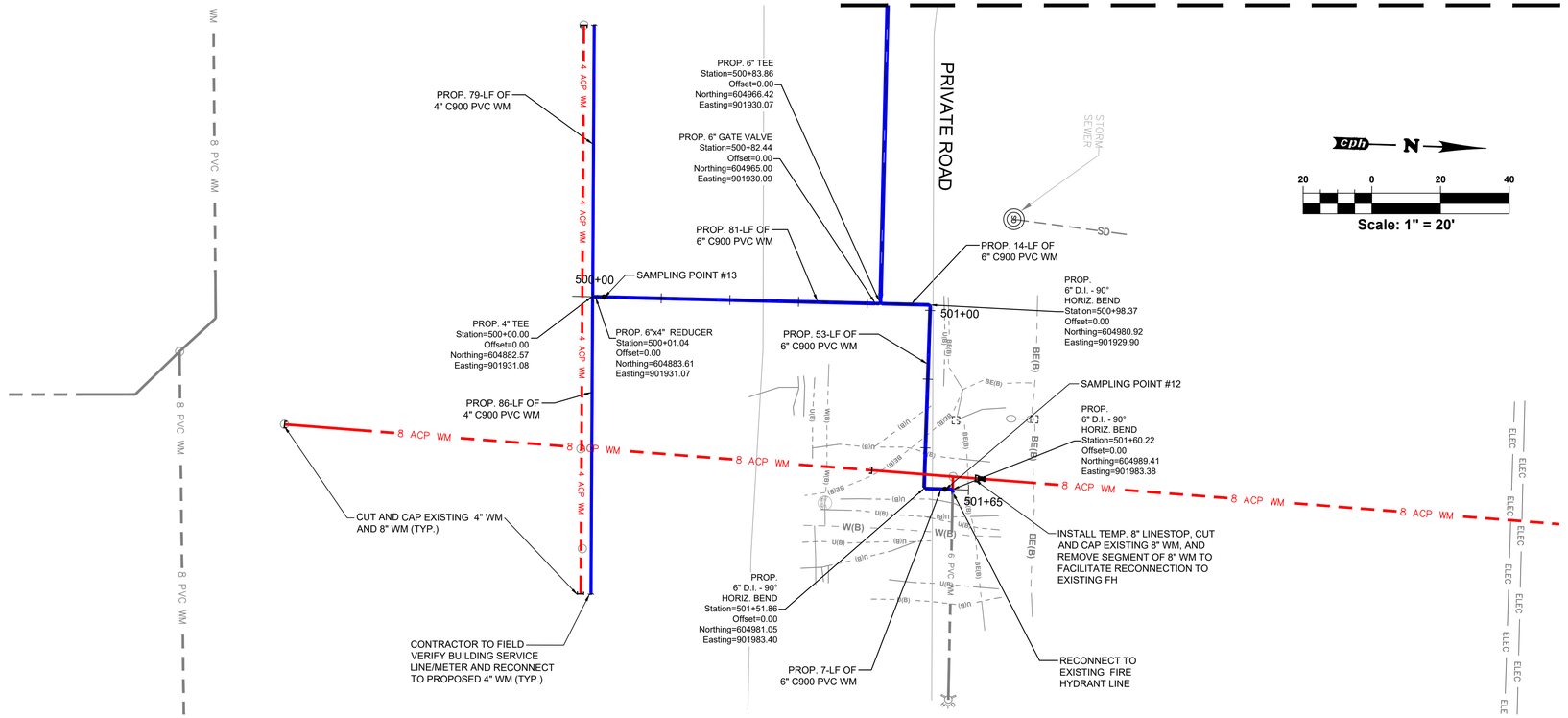
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POTABLE WATER PLAN & PROFILE

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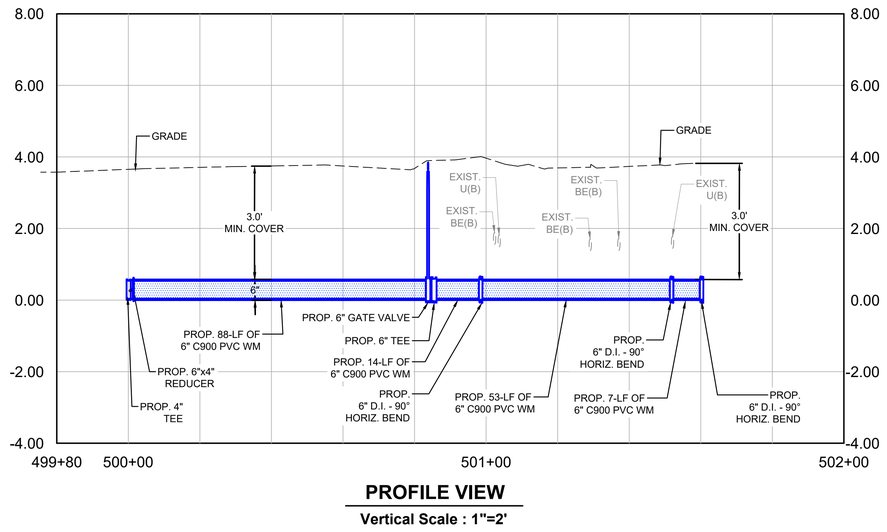
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PLAN VIEW

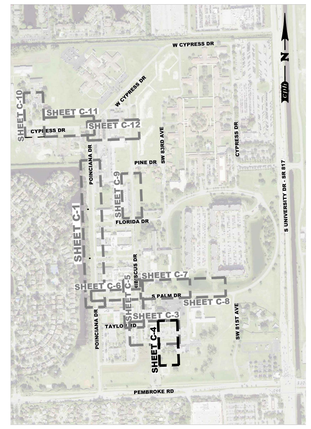
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PROFILE VIEW

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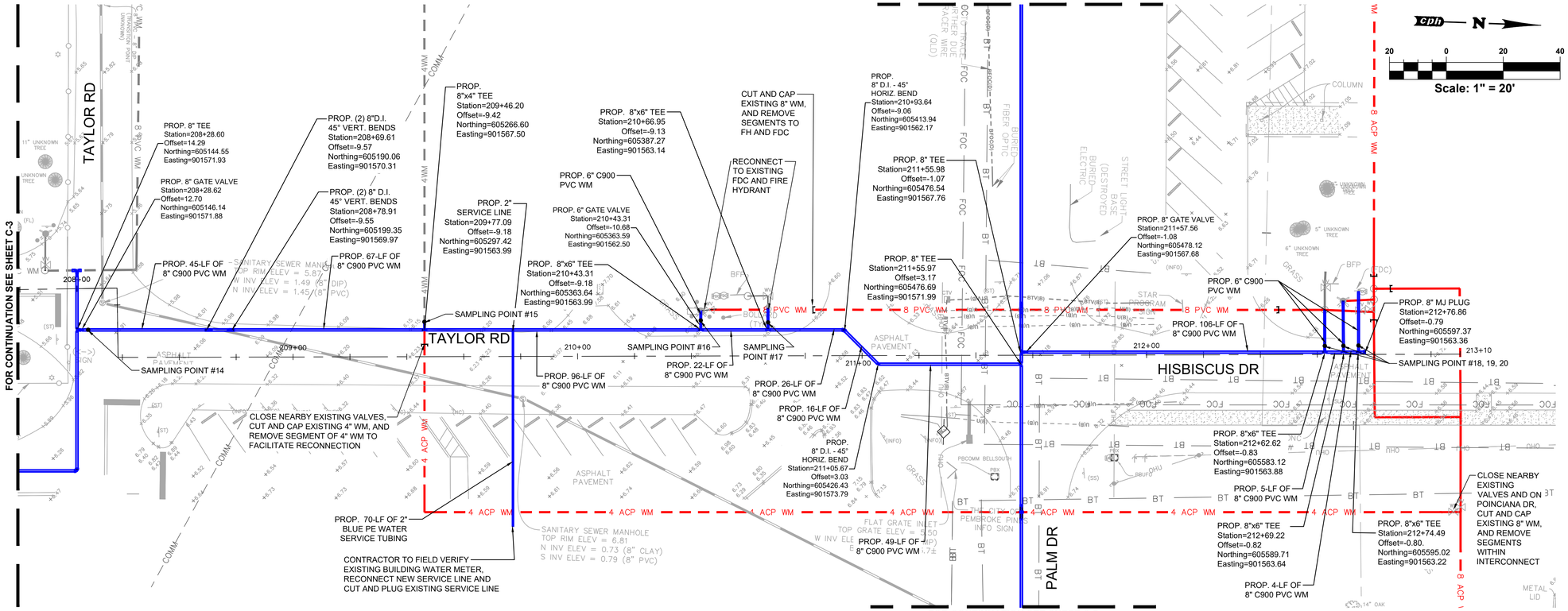
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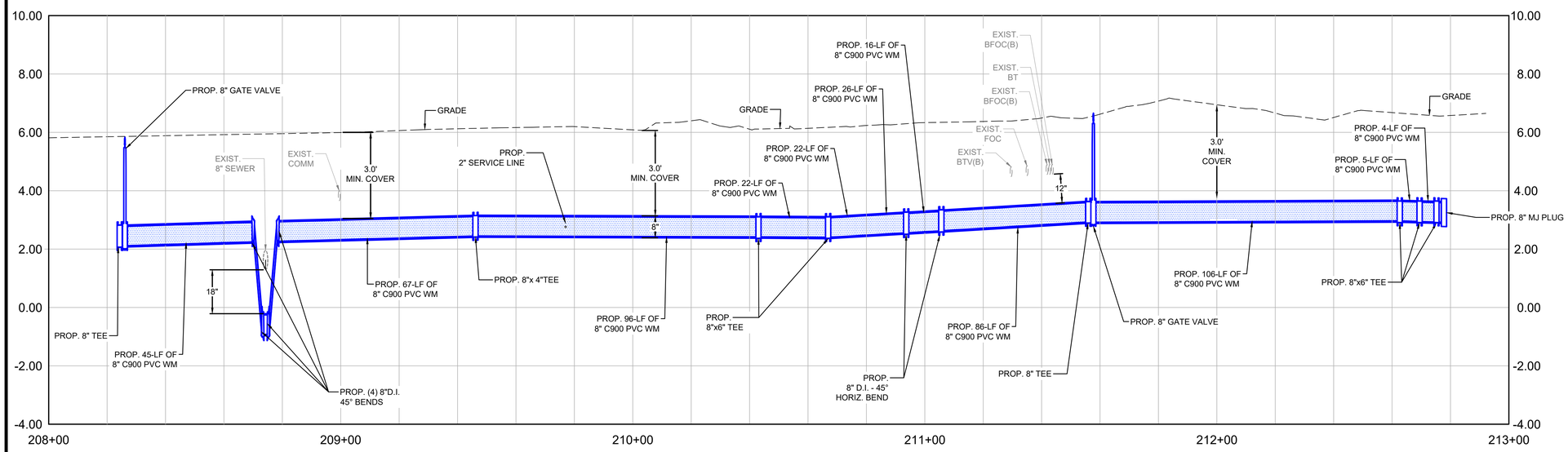
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C-4



PLAN NOTE:
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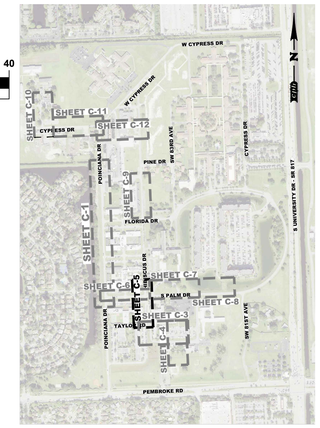
PLAN VIEW

Horizontal Scale : 1"=20'



PROFILE VIEW

Vertical Scale : 1"=2'



KEY MAP

Scale : 1"=800'

LEGEND

- PROPOSED WM
- WM TO BE PLACED OUT OF SERVICE AND ABANDONED IN PLACE
- EXISTING WM TO REMAIN IN SERVICE
- EXISTING ABANDONED WM
- EXISTING FIRE HYDRANT

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No.	Date	Revision	By

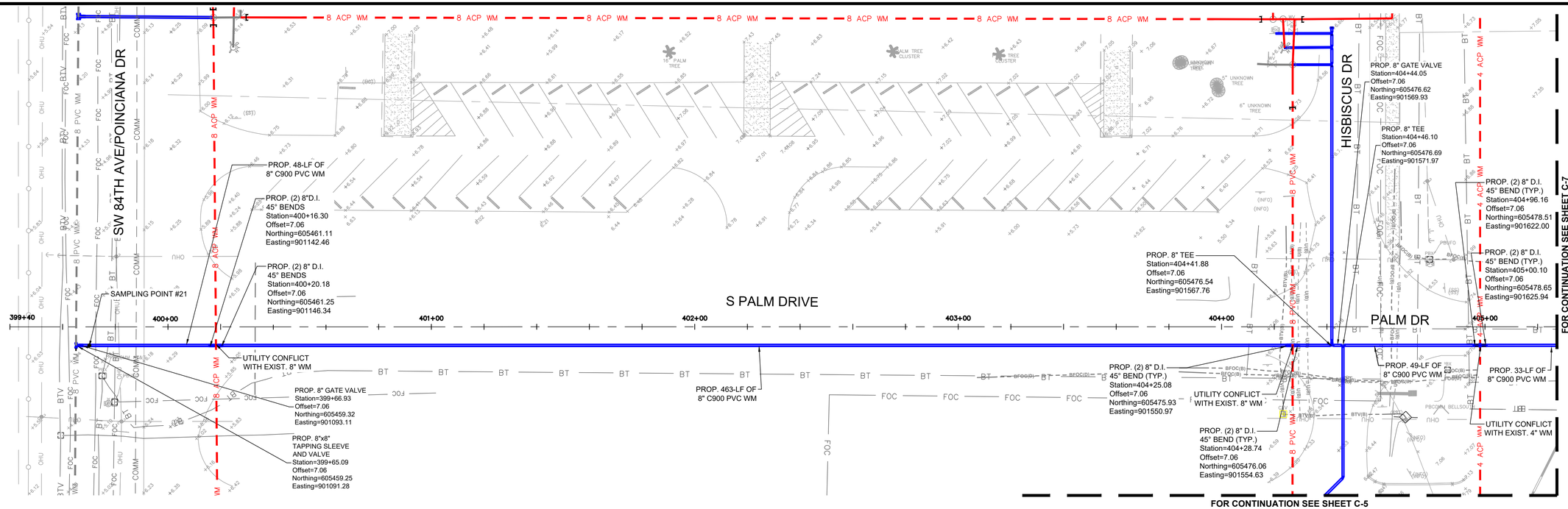
Designed by:	K.B.
Drawn by:	J.C.
Checked by:	A.M.
Approved by:	K.B.
Job No.:	P19702
Date:	03/03/26

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Licenses:
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Survey L.B. No. 7143
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POTABLE WATER PLAN & PROFILE

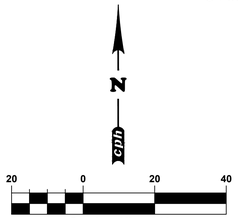
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HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
C-5

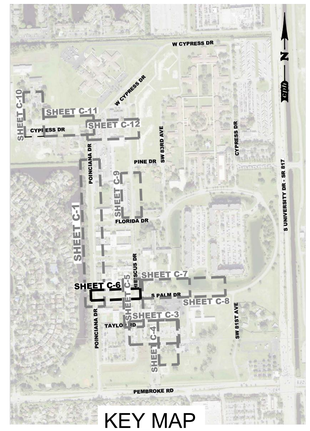


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PLAN VIEW
Horizontal Scale : 1"=20'



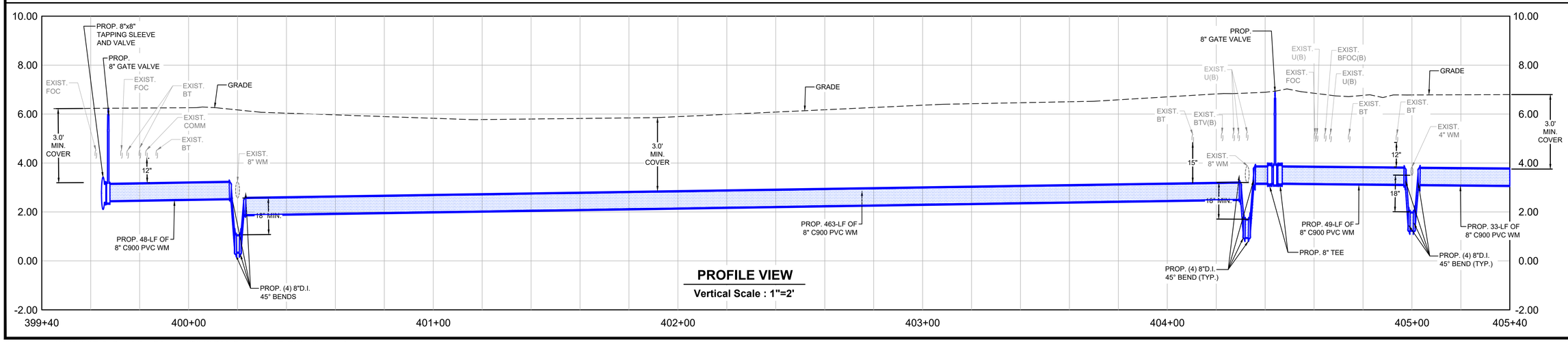
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KEY MAP
Scale : 1"=800'

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PROFILE VIEW
Vertical Scale : 1"=2'

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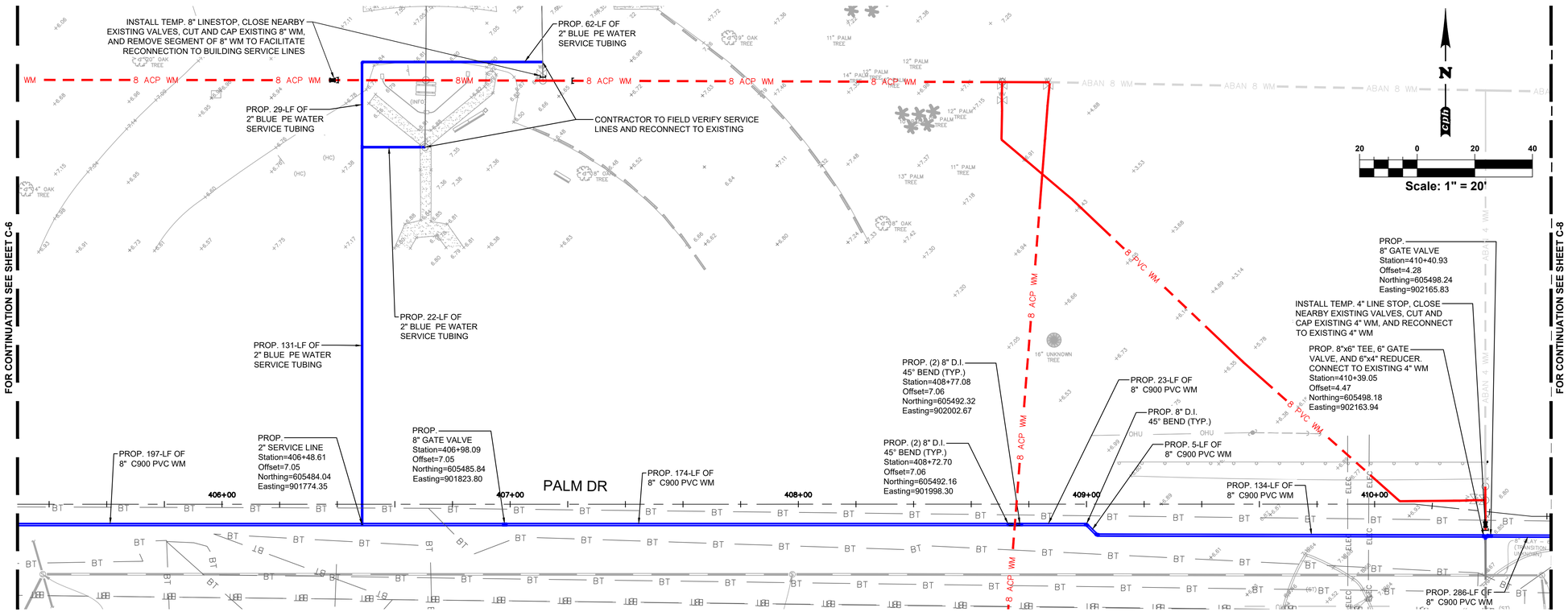
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HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

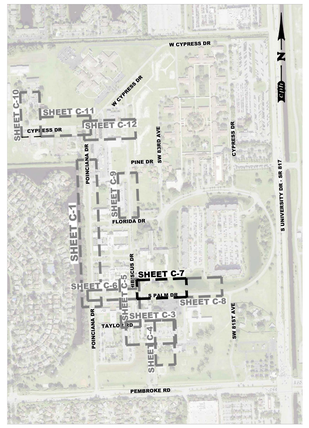
Sheet No.
C-6



PLAN VIEW

Horizontal Scale : 1"=20'

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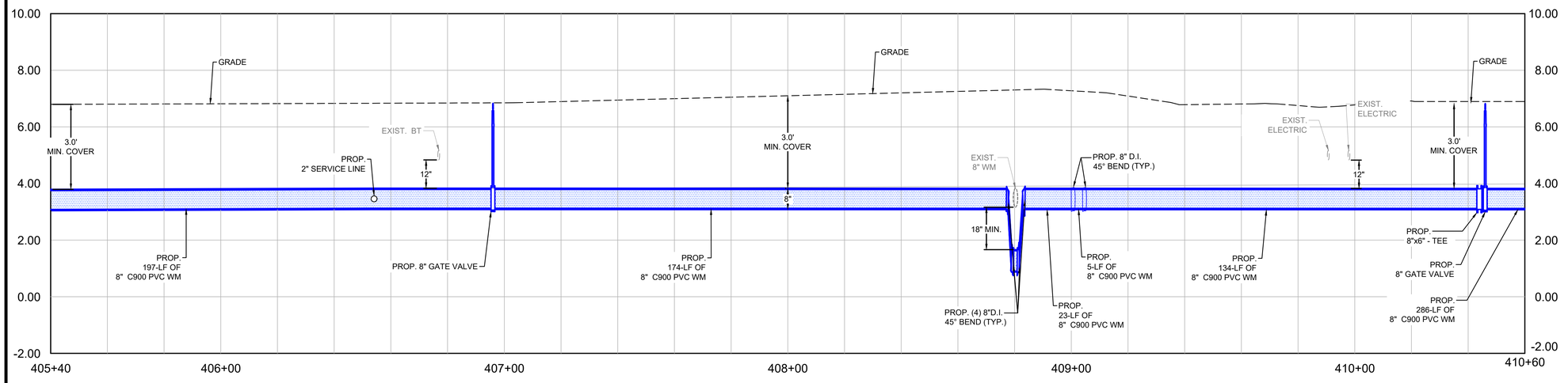


KEY MAP

Scale : 1"=800'

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PROFILE VIEW

Vertical Scale : 1"=2'

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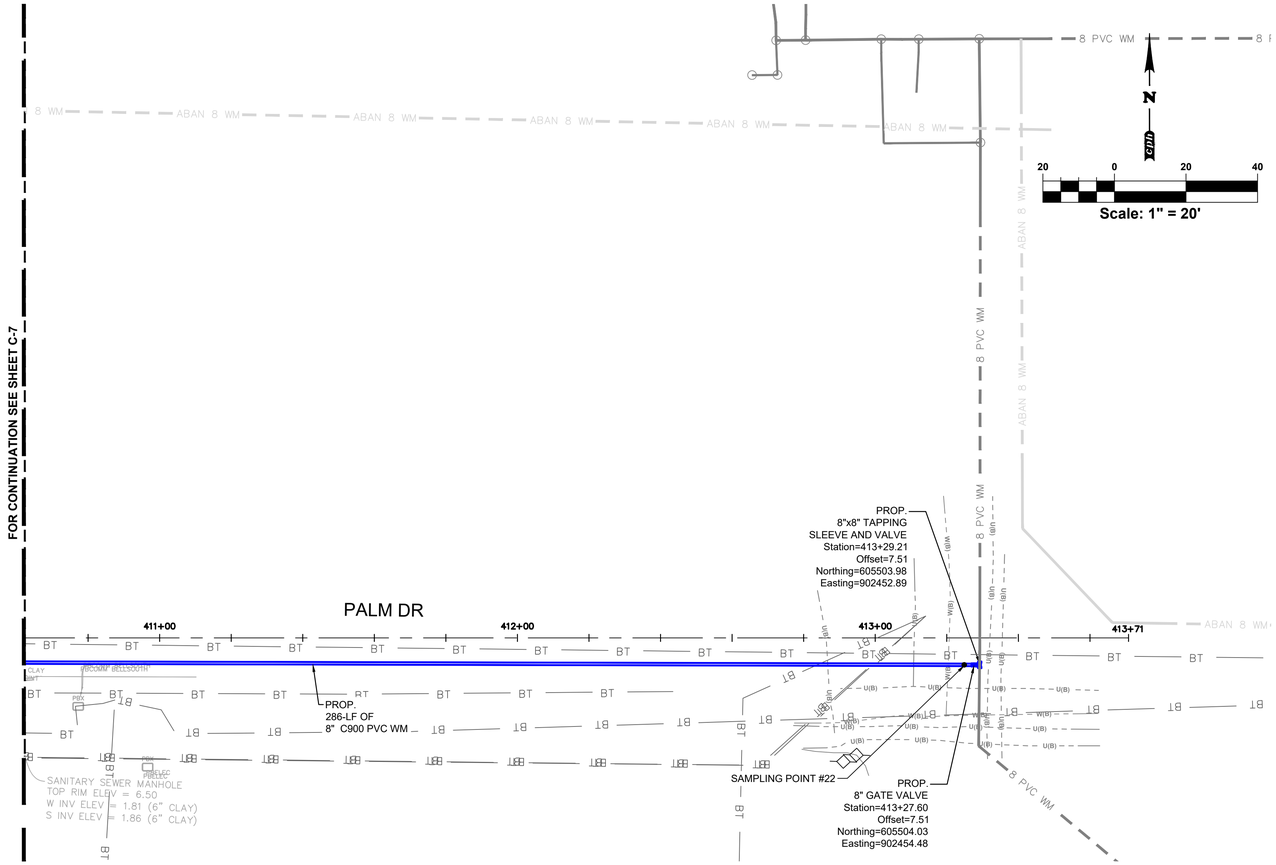
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HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

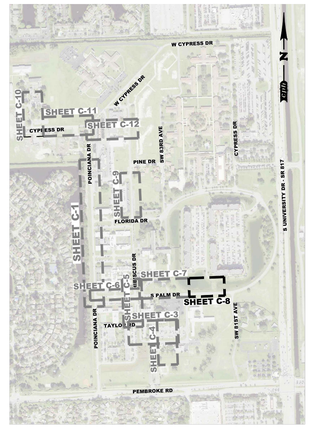
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C-7

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PLAN VIEW

Horizontal Scale : 1"=20'



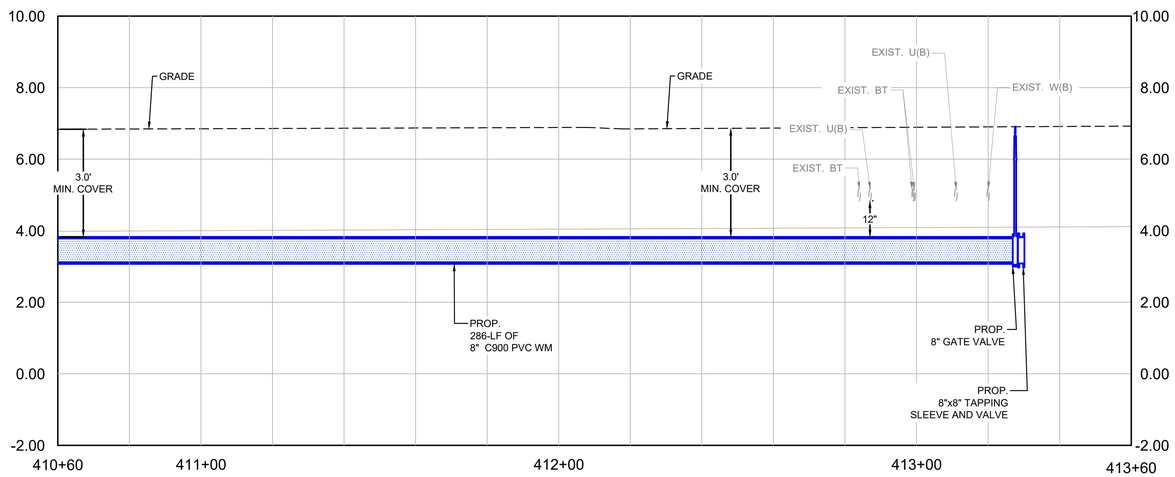
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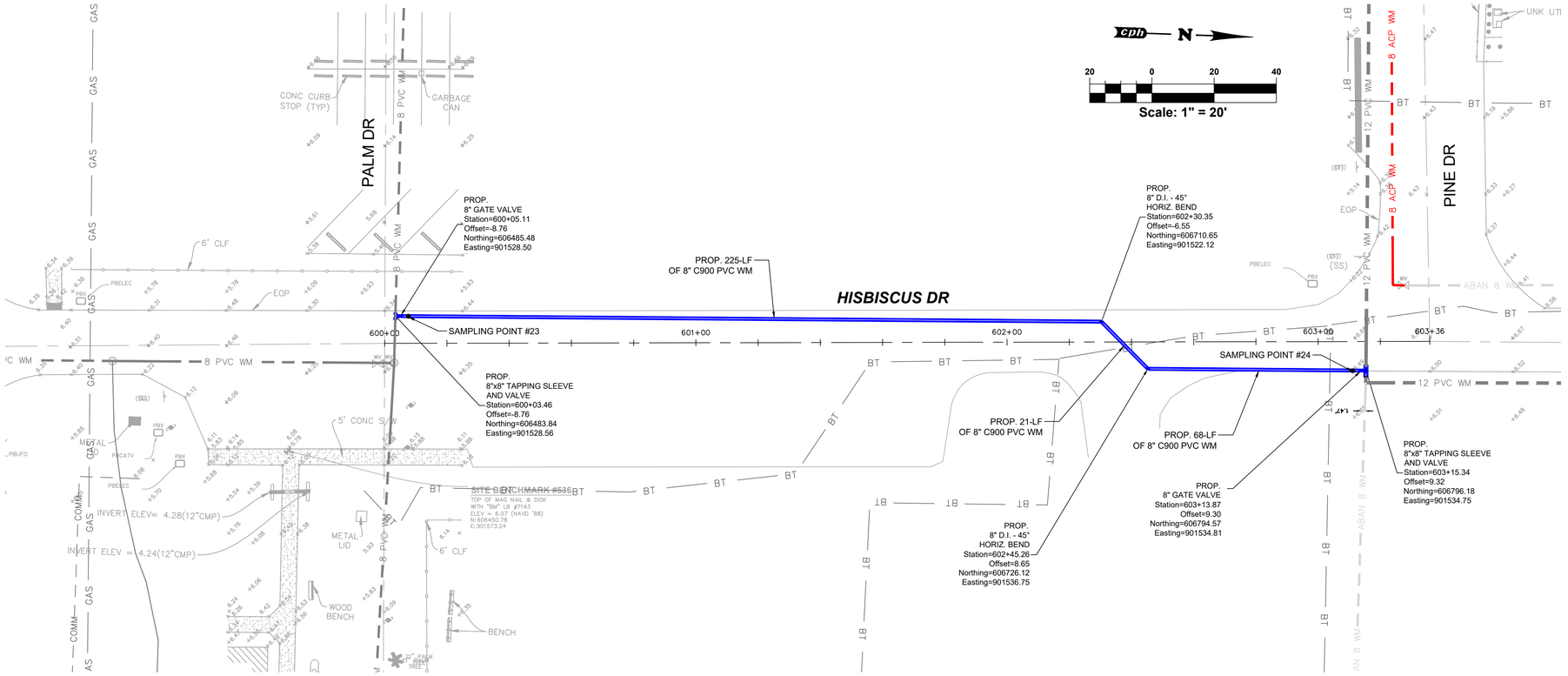
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POTABLE WATER PLAN & PROFILE

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HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

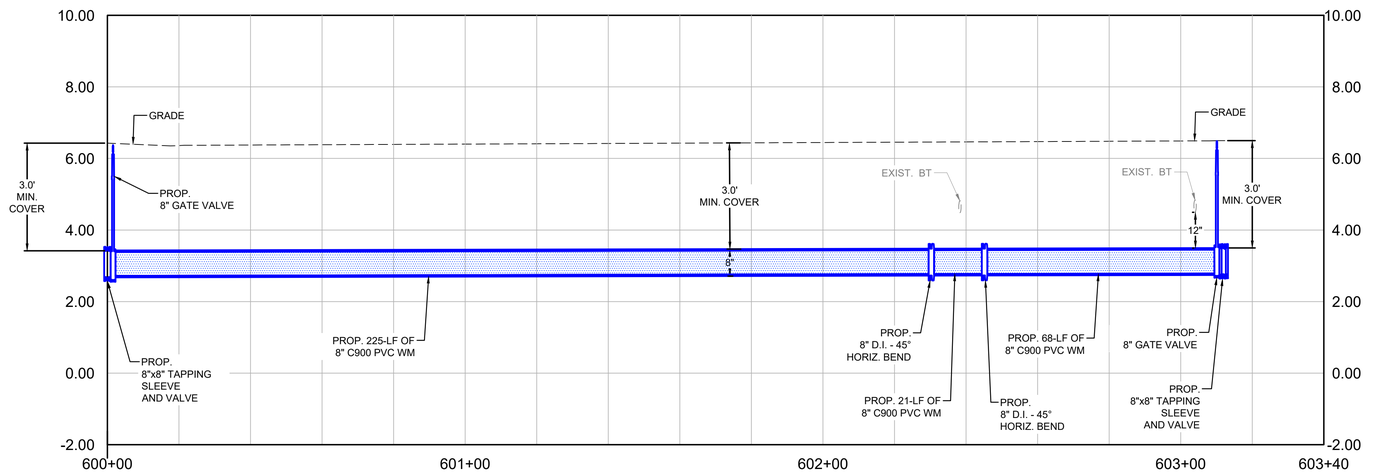
Sheet No.
C-8



PLAN VIEW

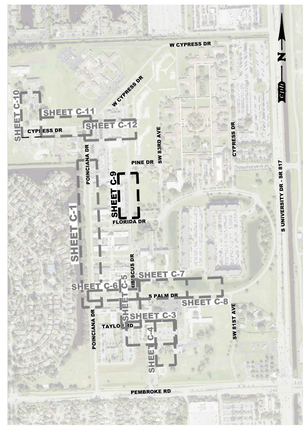
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PROFILE VIEW

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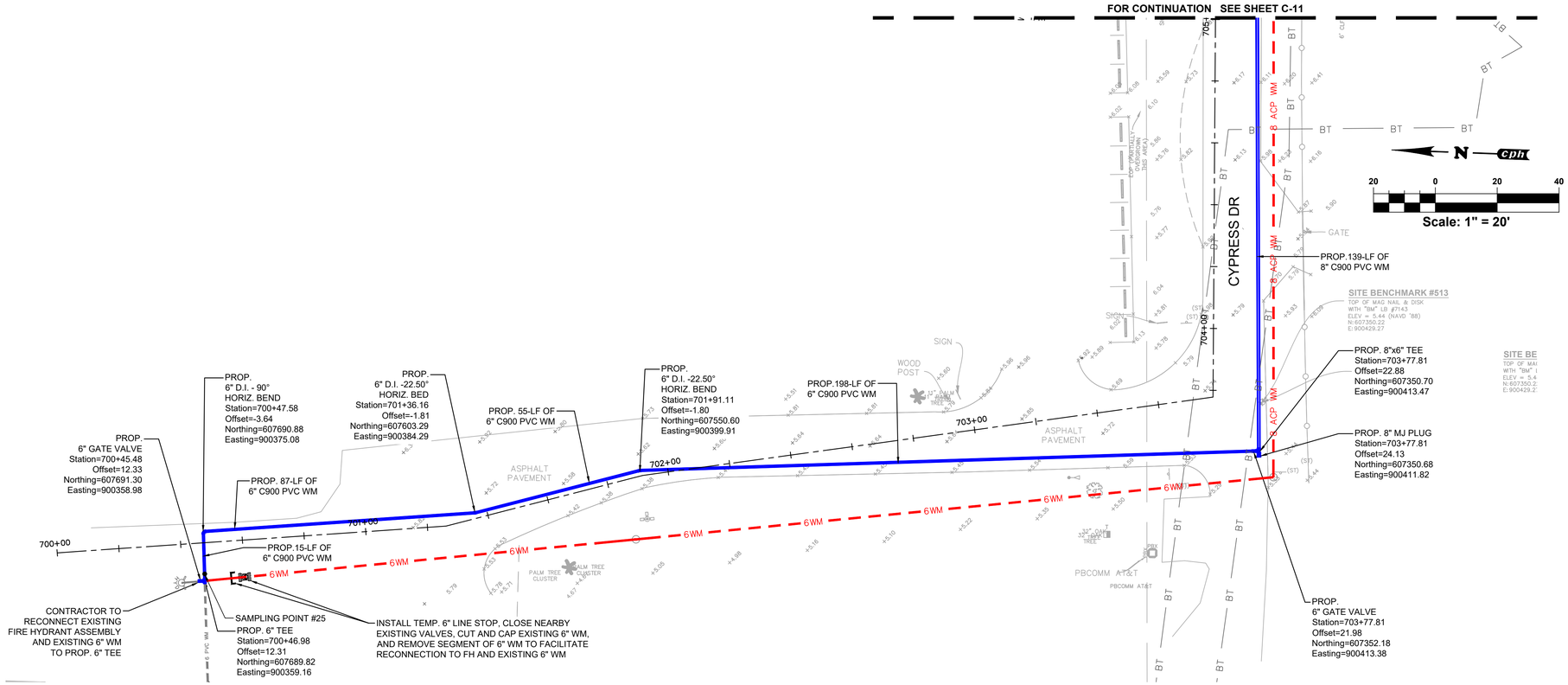
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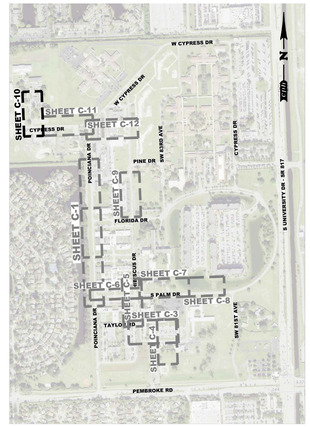
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CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
C-9

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KEY MAP

Scale : 1"=800'

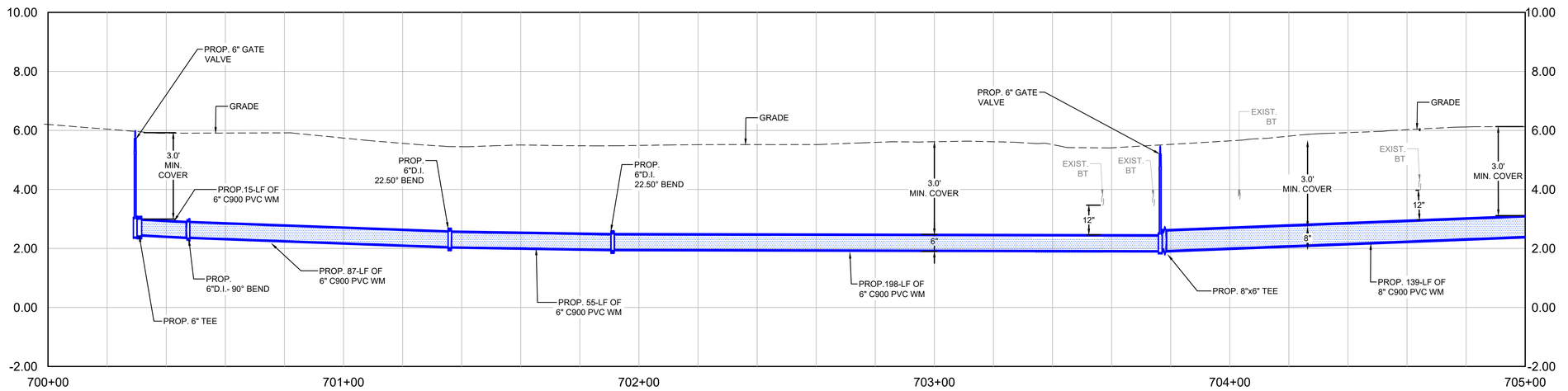
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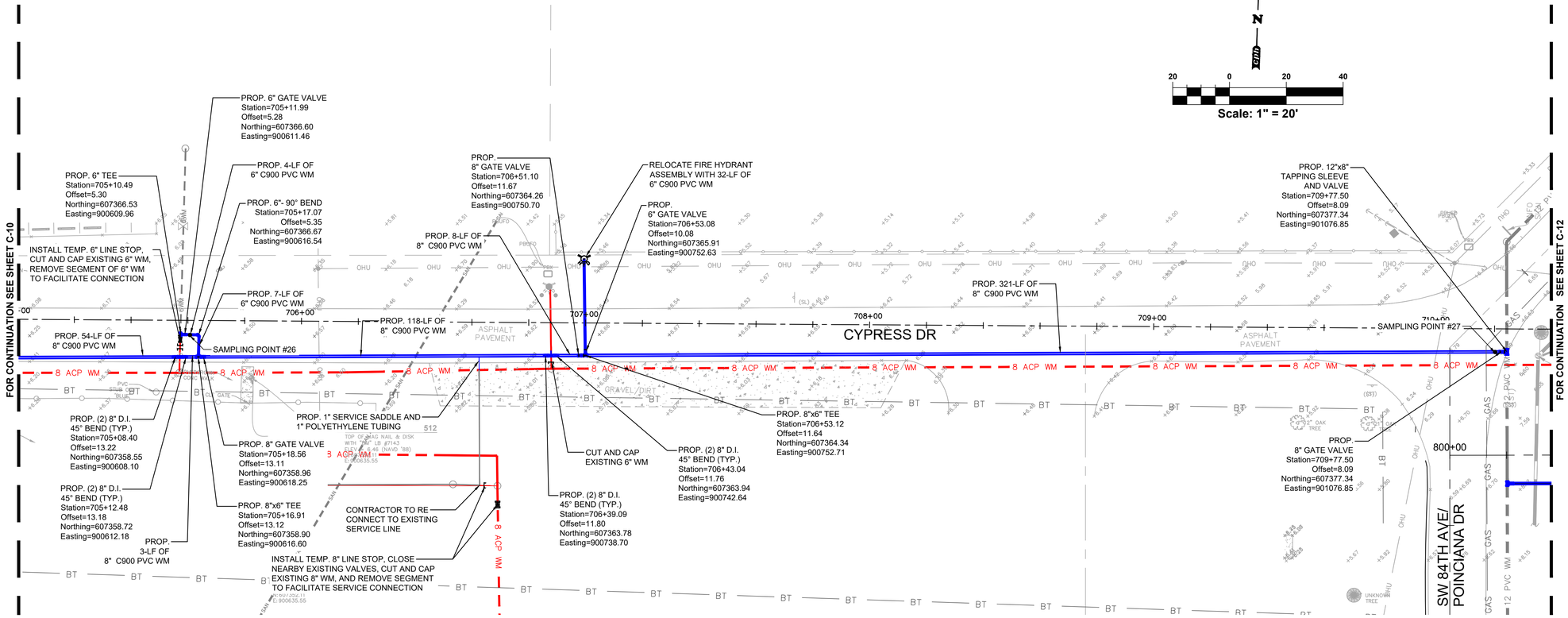
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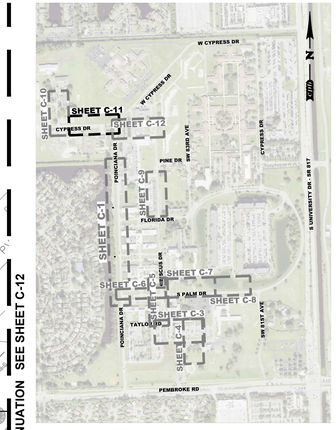
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PLAN VIEW

Horizontal Scale : 1"=20'



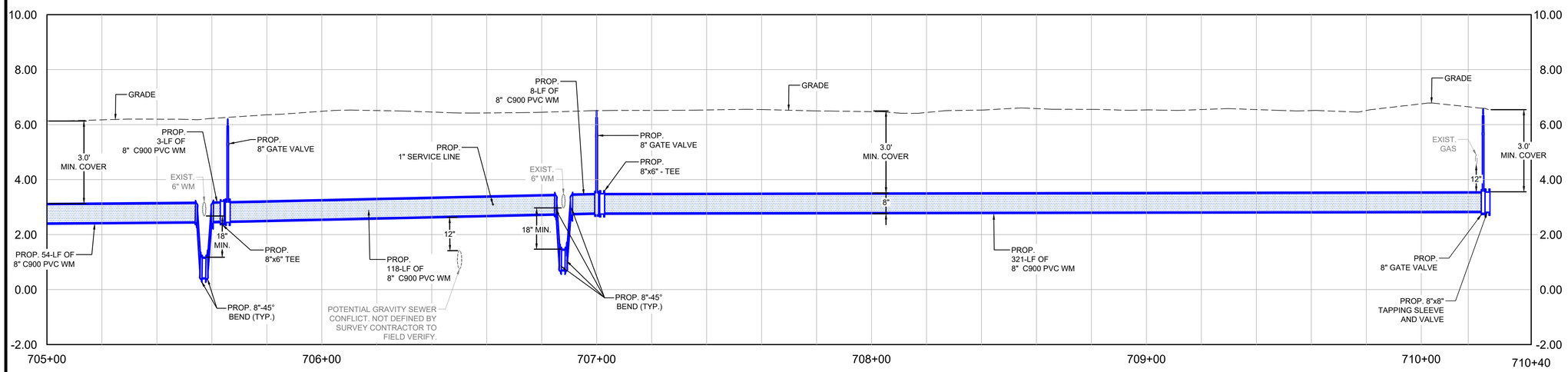
KEY MAP

Scale : 1"=800'

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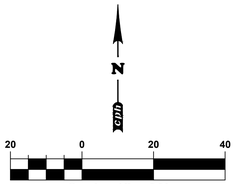
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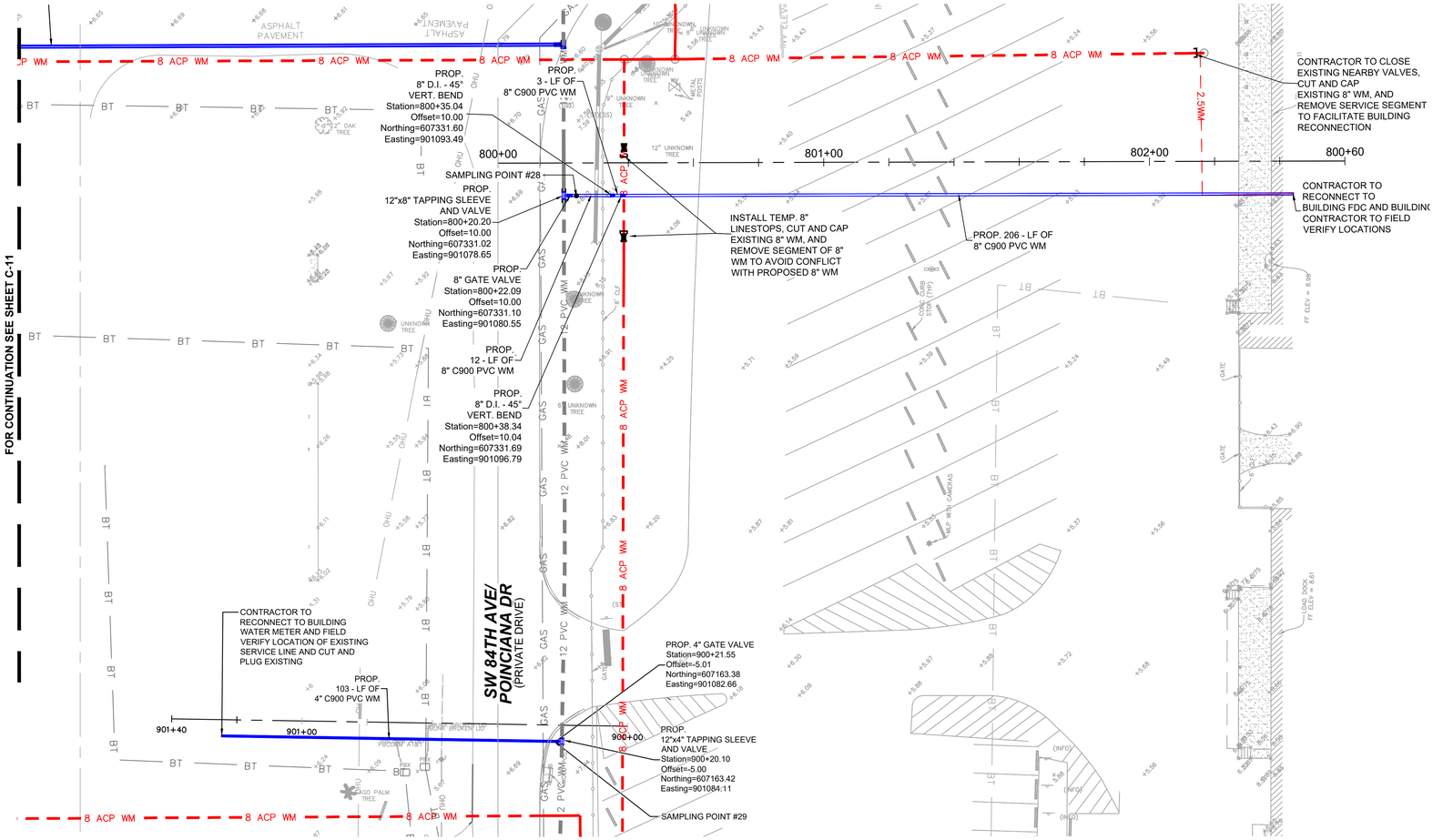
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POTABLE WATER PLAN & PROFILE

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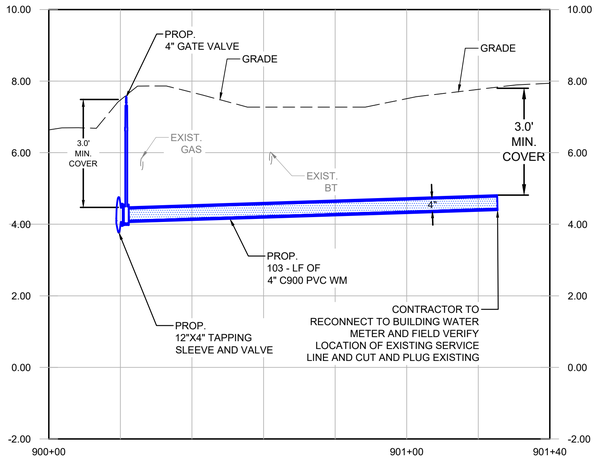
Sheet No.
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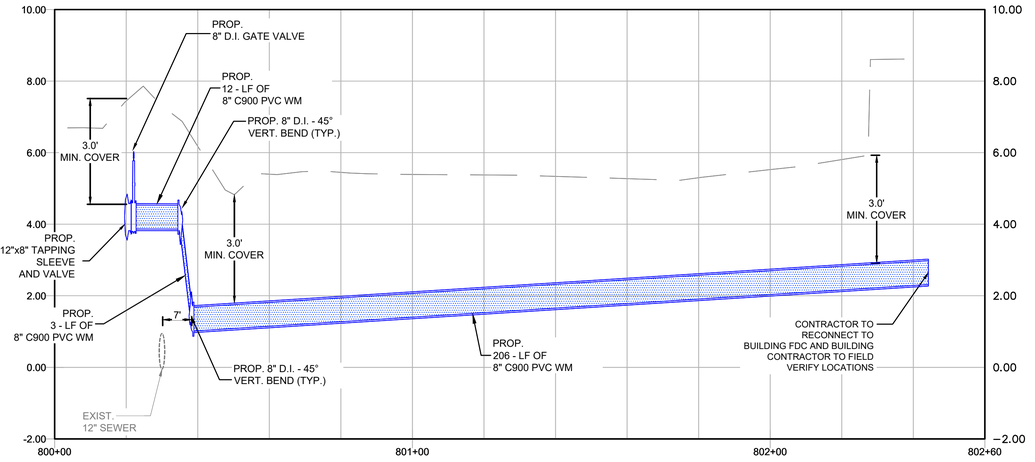
PLAN VIEW

Horizontal Scale : 1"=20'



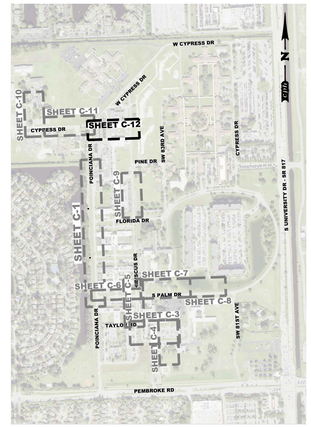
PROFILE VIEW

Vertical Scale : 1"=2'



PROFILE VIEW

Vertical Scale : 1"=2'



KEY MAP

Scale : 1"=800'

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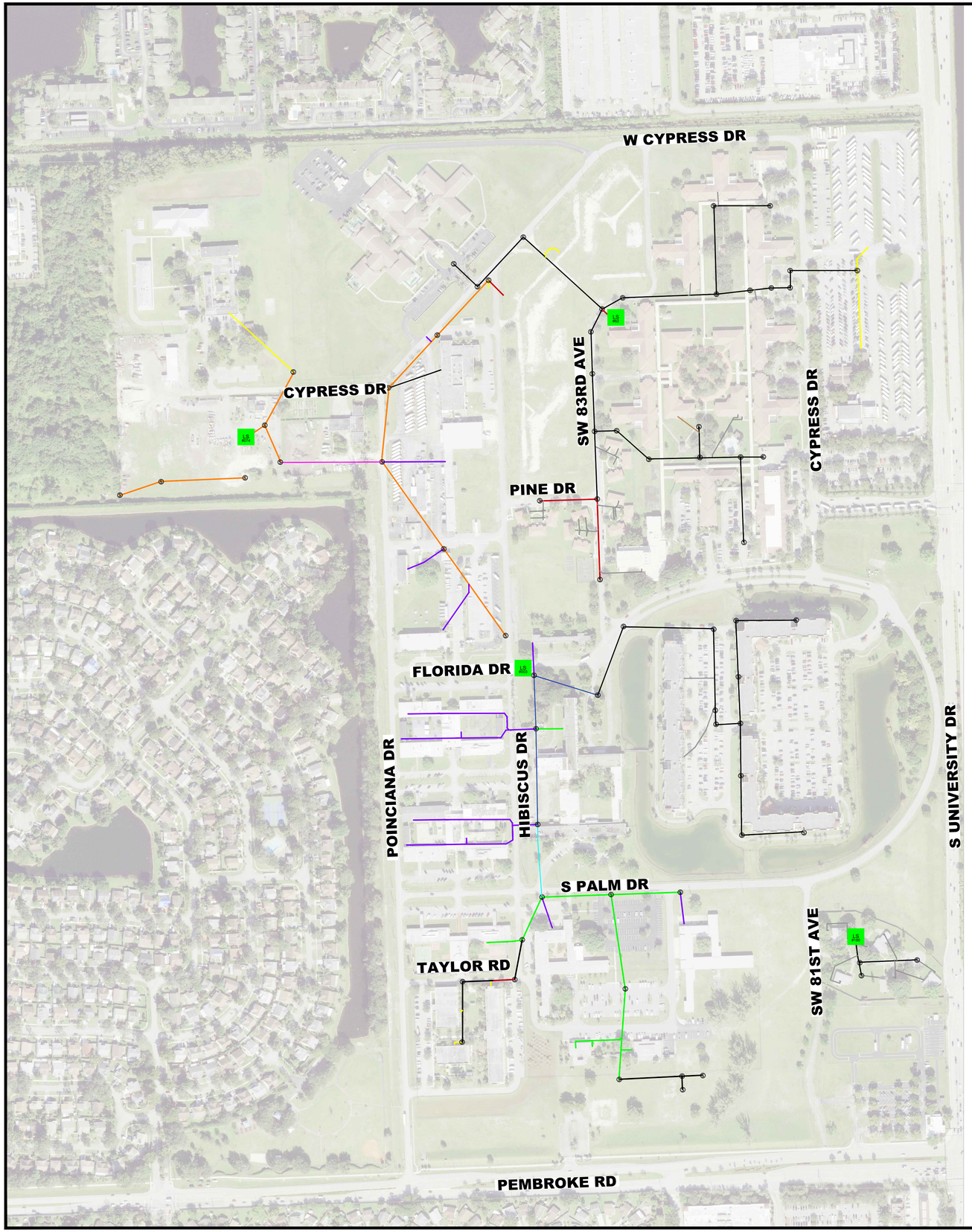
Designed by:	K.B.
Drawn by:	J.C.
Checked by:	A.M.
Approved by:	K.B.
Job No.:	P19702
Date:	03/03/26

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CPH, Inc.
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Miami, FL 33135
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Licenses:
Eng. C.O.A. No. 3215
Survey L.B. No. 7143
Arch. Lic. No. AA2600926
Lndscp. Lic. No. LC0000298

POTABLE WATER PLAN

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
C-12



N

200 0 200 400

Scale: 1" = 200'

LEGEND

Ⓢ EXIST. SANITARY MANHOLE

LS EXIST. LIFT STATION

PIPE COLOR	PIPE SIZE	PIPE MATERIAL	PIPE LENGTH	ACTION
	10" / 12"	VCP	803 LF	NO ACTION, PREVIOUSLY LINED
	6"	UNK.	922 LF	CCTV + SLIP LINE
	6"	VCP	3,045 LF	CCTV + SLIP LINE
	8"	VCP	1,870 LF	CCTV + SLIP LINE
	10"	VCP	273 LF	CCTV + SLIP LINE
	12"	VCP	2,570 LF	CCTV + SLIP LINE
	15"	VCP	379 LF	CCTV + SLIP LINE
	4"	PVC	100 LF	CCTV
	6"	PVC	2,747 LF	CCTV
	8"	PVC	7,467 LF	CCTV
	8"	DIP	707 LF	CCTV
		TOTAL =	20,883 LF	

PLAN NOTES:

1. CONTRACTOR SHALL VERIFY ALL PIPE TYPES, SIZES, AND LENGTHS DURING TELEVISING POST-CLEANING. ALL QUANTITIES ARE ESTIMATED AND SUBJECT TO CHANGE.
2. ALL DUCTILE IRON PIPE SHALL BE TELEVISED AND SUBMITTED TO EOR FOR REVIEW.
3. ALL PIPE LINING PRODUCTS MUST MEET THE SPECIFICATION WITHIN DIVISION 2, AND PROPERLY SIZED TO FIT WITHIN THE FULL CIRCUMFERENCE DIAMETER (BLD). SELECTED PRODUCTS AND MATERIALS WILL REQUIRE APPROVAL PRIOR TO INSTALLATION.
4. ALL LATERAL WYE CONNECTIONS SHALL BE LINED WITH FULL CIRCUMFERENCE LATERAL LINERS.

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KYLE BECHTELHEIMER, P.E.
FL. P.E. NO. 86673

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CCTV AND SLIP LINING PLAN

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
C-13

DRAFT DOCUMENT FOR COMMISSION REVIEW

PROCEDURE FOR RESTORATION OF FLEXIBLE PAVEMENT

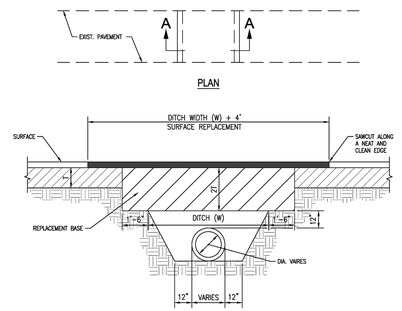
THE PROCEDURE FOR BACKFILL AND PAVEMENT RESTORATION SHALL BE AS FOLLOWS:

DENSITY TESTS OF COMPACTED FILL, BACKFILL AND/OR BASE SHALL BE TAKEN AT EACH SIX-INCH LIFT, PRIOR TO PLACEMENT OF THE SUCCEEDING LIFT OF MATERIAL ACCORDING TO THE FOLLOWING SCHEDULE.

1. FOR ANY ROAD CROSSING IN WHICH THE ROAD IS CUT AND RESTORED ONE LANE AT A TIME, ONE DENSITY TEST SHALL BE TAKEN IN EACH LANE AT EACH SIX-LIFT.
2. FOR ANY ROAD CROSSING IN WHICH THE ROAD IS CUT AND RESTORED TWO LANES AT A TIME, DENSITIES SHALL BE TESTED IN ONE LANE PER LIFT, ALTERNATING LANES WITH EACH LIFT.
3. FOR ANY ROAD CROSSING IN WHICH THE ROAD IS CUT AND RESTORED THREE LANES AT A TIME, DENSITIES SHALL BE TESTED IN TWO LOCATIONS PER SIX-INCH LIFT, STAGGERING LOCATIONS WITH EACH SUCCESSIVE LIFT.
4. CUTS ACROSS ROADS SHALL NOT BE LEFT OPEN OVERNIGHT UNLESS ABSOLUTELY NECESSARY. TRENCHES SHALL BE BACKFILLED AND TEMPORARY ASPHALT APPLIED TO MAKE A SMOOTH LEVEL PATCH. THE TRENCHES SHALL THEN BE EXCAVATED THE NEXT DAY AND PERMANENT BACKFILL AND PAVEMENT INSTALLED IN ACCORDANCE WITH THESE STANDARDS. THE ONLY EXCEPTION WILL BE WHEN THE INSTALLED FACILITY MUST BE TESTED BEFORE THE ROAD IS RESTORED. IN THESE CASES, THE PERMANENT RESTORATION MUST BE PERFORMED ON THE DAY OF TESTING OR THE NEXT DAY.
5. WHEN THE INSTALLATION PARALLELS THE ROADWAY AND DAMAGES THE PAVEMENT, THE DENSITY TESTS SHALL BE MADE EVERY 100 L.F. AT SIX-INCH LAYERS, WITH TEST LOCATIONS STAGGERED 25 INCHES EACH LIFT. A COPY OF ALL PROCTOR AND FIELD DENSITY TESTS SHALL BE FURNISHED TO THE ENGINEERING DIVISION UPON REQUEST.
6. ROADWAY BASE MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 98% OF MAXIMUM DRY DENSITY, AS DETERMINED BY AASHTO T-180 (MODIFIED PROCTOR TEST). SUBGRADE MATERIAL UNDER PAVED AREAS SHALL BE COMPACTED TO A MINIMUM OF 100% OF MAXIMUM DRY DENSITY. SHOULDER AREAS AND SWALE AREAS BEYOND SHOULDERS SHALL BE COMPACTED TO A MINIMUM OF 98% OF MAXIMUM DRY DENSITY, AS DETERMINED BY AASHTO T-99-C (STANDARD PROCTOR TEST).
7. RESTORATION OF STRIPING, SIGNING AND SIGNALIZATION DEVICES SHALL BE ACCOMPLISHED IMMEDIATELY AFTER PAVEMENT RESTORATION IS COMPLETED.

NOTE: THE ABOVE LISTED REPRESENTS THE MINIMUM PROCEDURE. THE INSPECTOR MAY REQUIRE ADDITIONAL TESTING IF, IN HIS OPINION, CONDITIONS OR PRIOR TEST RESULTS WARRANT THEM.

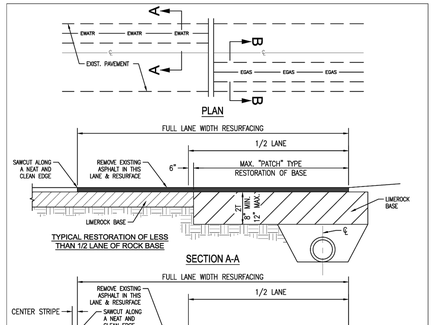
CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD ROAD DETAIL	R-33
APPROVED: J.M.	REVISED:	PROCEDURE FOR RESTORATION OF FLEXIBLE PAVEMENT	
DATE: 11/05/99			



NOTES:
1. REPLACED BASE MATERIAL OVER DITCH SHALL BE TWICE THE THICKNESS OF THE ORIGINAL BASE. MINIMUM 8", MAXIMUM 18".
2. BASE MATERIAL SHALL BE PLACED IN 6" MAXIMUM (LOOSE MEASUREMENT) LAYERS AND EACH LAYER THOROUGHLY ROLLED OR TAMPED TO 98% OF MAXIMUM DENSITY. PER AASHTO T-180.
3. ASPHALT CONCRETE PAVEMENT JOINTS SHALL BE MECHANICALLY SAWED.
4. SURFACED TREATED PAVEMENT JOINTS SHALL BE LAPPED AND FEATHERED.
5. SURFACE MATERIAL WILL BE CONSISTENT WITH THE EXISTING SURFACE.
6. BASE MATERIAL SHALL HAVE A MINIMUM LBR. OF 100 AND A MINIMUM CARBONATE CONTENT OF 70% (60% FOR LOCAL STREETS).
7. IF THE DITCH IS FILLED TEMPORARILY. IT SHALL BE COVERED WITH A 2" ASPHALTIC CONCRETE PATCH TO KEEP THE FILL MATERIAL FROM RAVELING UNTIL REPLACED WITH A PERMANENT PATCH.
8. BACKFILL SHALL BE IN ACCORDANCE WITH DETAIL R- 33, EXCEPT AS SHOWN ABOVE.

RE: B.C.P.W.D. PLATE No.6

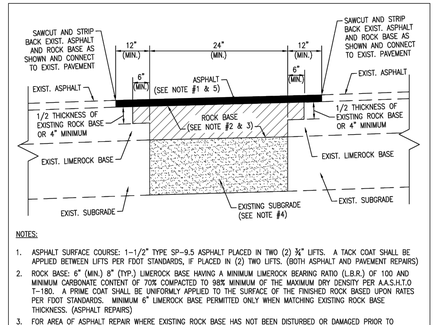
CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD ROAD DETAIL	R-34
APPROVED: J.M.	REVISED:	FLEXIBLE PAVEMENT RESTORATION PERPENDICULAR UTILITY INSTALLATION	
DATE: 11/05/99			



NOTES:
1. BASE MATERIAL SHALL HAVE A MINIMUM L.B.R. OF 100 AND A MINIMUM CARBONATE CONTENT OF 70% (60% FOR LOCAL STREETS).
2. BASE SHALL BE PLACED IN 6" MAXIMUM THICKNESS LAYERS WITH EACH LAYER COMPACTED AS REQUIRED AND TESTED PRIOR TO THE PLACEMENT OF THE SUCCEEDING LAYERS.
3. SUBGRADE MATERIAL SHALL BE GRANULAR AND SHALL HAVE A MINIMUM L.B.R. OF 40.
4. BACKFILL SHALL BE PLACED AND COMPACTED IN 6" LAYERS, BUT TESTING WILL BEGIN 12" ABOVE THE INSTALLED FACILITY.
5. ALL EDGES OF EXISTING ASPHALT PAVEMENT WHERE RESURFACING WILL ADJUT SHALL BE SAWCUT TO STRAIGHT LINES PARALLEL TO PERPENDICULAR TO THE ROADWAY, PRIOR TO THE RESURFACING.
6. RESURFACING MATERIAL SHALL BE OF THE SAME MIX AS THE EXISTING SURFACE AND SHALL BE APPLIED A MINIMUM OF TWO INCHES IN THICKNESS.
7. REFER TO DETAIL R-33 (DETAILED PROCEDURE).

RE: B.C.P.W.D. PLATE No.7

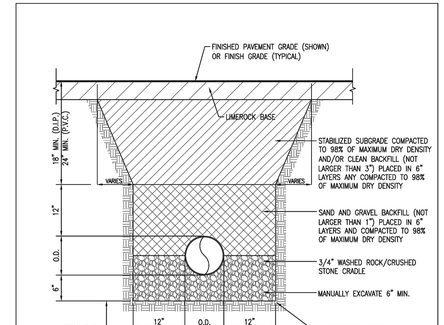
CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD ROAD DETAIL	R-35
APPROVED: J.M.	REVISED:	FLEXIBLE PAVEMENT RESTORATION PARALLEL UTILITY INSTALLATION	
DATE: 11/05/99			



NOTES:
1. ASPHALT SURFACE COURSE: 1-1/2" TYPE SP-9.5 ASPHALT PLACED IN TWO (2) ¾" LIFTS. A TACK COAT SHALL BE APPLIED BETWEEN LIFTS PER FDOT STANDARDS, IF PLACED IN (2) TWO LIFTS. (BOTH ASPHALT AND PAVEMENT REPAIRS)
2. ROCK BASE: 6" (MIN.) 8" (TYP.) LIMEROCK BASE HAVING A MINIMUM LIMEROCK BEARING RATIO (L.B.R.) OF 100 AND MINIMUM CARBONATE CONTENT OF 70% COMPACTED TO 98% MINIMUM OF THE MAXIMUM DRY DENSITY PER A.A.S.H.T.O T-180. A PRIME COAT SHALL BE UNIFORMLY APPLIED TO THE SURFACE OF THE FINISHED ROCK BASED UPON RATES PER FDOT STANDARDS. MINIMUM 6" LIMEROCK BASE PERMITTED ONLY WHEN MATCHING EXISTING ROCK BASE THICKNESS. (ASPHALT REPAIRS)
3. FOR AREA OF ASPHALT REPAIR WHERE EXISTING ROCK BASE HAS NOT BEEN DISTURBED OR DAMAGED PRIOR TO REMOVAL OF DETERIORATED ASPHALT, ROCK BASE SHALL BE PERMITTED TO BE SCARIFIED AND RE-COMPACTED IN LIEU OF CONSTRUCTION OF NEW LIMEROCK BASE PRIOR TO PLACEMENT OF ASPHALT. (ASPHALT REPAIRS)
4. SUBGRADE: 12" STABILIZED SUBGRADE MATERIAL HAVING A MINIMUM LIMEROCK BEARING RATIO (L.B.R.) OF 40 COMPACTED TO 98% MINIMUM OF THE MAXIMUM DRY DENSITY PER A.A.S.H.T.O T-180. (PAVEMENT REPAIRS)
   EXISTING SUBGRADE SHALL BE RE-COMPACTED AS A MINIMUM FOR ALL PAVEMENT REPAIR AREAS. FOR AREAS OF PAVEMENT REPAIR WHERE SUBGRADE HAS BEEN DISTURBED BY REMOVAL OF TREE ROOTS, IRRIGATION PIPING WORK, ETC., NEW SUBGRADE SHALL BE CONSTRUCTED AS PART OF THE PAVEMENT REPAIR.
5. MINIMUM ALLOWABLE PAVEMENT REPAIR SHALL BE 2'x2' AS MEASURED FOR THE AREA OF NEW FULL DEPTH LIMEROCK BASE CONSTRUCTION. MINIMUM ALLOWABLE ASPHALT REPAIR SHALL BE 3'x3' AS MEASURED FOR AREA OF ROCK BASE SCARIFICATION AND RE-COMPACTION. ASPHALT REMOVAL AND REPLACEMENT FOR BOTH ASPHALT AND PAVEMENT REPAIRS SHALL BE 4'x4' MINIMUM.

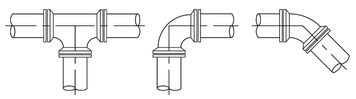
ALL MATERIALS AND CONSTRUCTION OF THE PAVEMENT REPAIR STRUCTURE SHALL BE IN ACCORDANCE WITH THE FDOT 'STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION', LATEST EDITION.

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD ROAD DETAIL	R-47
APPROVED: K.M.K.	REVISED: 06/08/21	ASPHALT AND PAVEMENT REPAIR	
DATE: 02/08/21	10/21/21		



NOTES:
1. MAXIMUM DENSITY SHALL BE DETERMINED BY AASHTO T-180.
2. MAXIMUM DEPTH TO BOTTOM OF PRESSURE MAINS SHALL NOT EXCEED SIX (6) FEET UNLESS OTHERWISE APPROVED BY THE CITY OF PEMBROKE PINES UTILITY DEPARTMENT.
3. MAXIMUM WATER LEVEL IN TRENCH SHALL BE MAINTAINED AT BOTTOM OF "BEDDING MATERIAL" UNLESS SOIL AND WATER TABLE CONDITIONS DICTATE OTHERWISE, THEN AN ALTERNATE METHOD OF CONTROLLING THE WATER LEVEL IN THE TRENCH AND/OR ALTERNATE METHOD OF INSTALLATION IN "WET CONDITIONS" SHALL BE PROPOSED BY CONTRACTOR AND ENGINEER AND APPROVED BY CITY'S FIELD REPRESENTATIVE FOR FIELD USE.

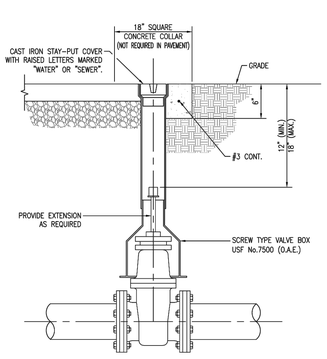
CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD GENERAL DETAIL	G-1
APPROVED: J.M.	REVISED:	WATER AND SEWER TRENCH BACKFILL	
DATE: 11/05/99	8/15/20		



RESTRAINED PIPE LENGTH (LINEAL FEET)					
PIPE SIZE	TEE & WYE	90°BEND	45°BEND	22 1/2°BEND	11 1/4°BEND
6"	27	27	16	9	5
8"	34	34	20	11	6
10"	41	41	24	14	7
12"	48	48	28	16	8
14"	55	55	32	18	10
16"	62	62	35	20	11
18"	69	69	39	22	12
20"	75	75	42	24	13
24"	87	87	49	27	14
30"	104	104	57	31	17
36"	120	120	65	35	19
42"	134	134	72	39	21
48"	147	147	79	42	22
54"	160	160	85	45	24

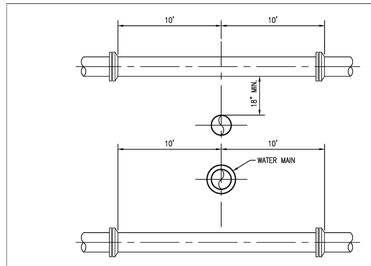
NOTE:
THE FIGURES IN THIS TABLE ARE BASED ON 150 PSI TEST PRESSURE WITH 2.5 FEET OF COVER AND 2000 POUNDS PER SQUARE FOOT SOIL BEARING AGAINST UNDISTURBED TRENCH. A 20% SAFETY FACTOR HAS BEEN ADDED.

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD GENERAL DETAIL	G-2
APPROVED: J.M.	REVISED:	RESTRAINED JOINTS	
DATE: 11/05/99			



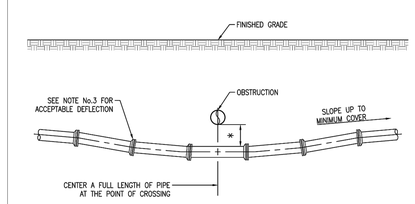
NOTE:
1. CONCRETE SHALL BE CLASS 1 WITH MINIMUM COMPRESSIVE STRENGTH OF 3,500 PSI AT 28 DAYS WITH FIBER MESH REINFORCEMENT FOR PRIVATE STREETS AND PRIVATE DEVELOPMENT.

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD GENERAL DETAIL	G-3
APPROVED: J.M.	REVISED: 1/23/23	VALVE AND BOX	
DATE: 11/05/99			



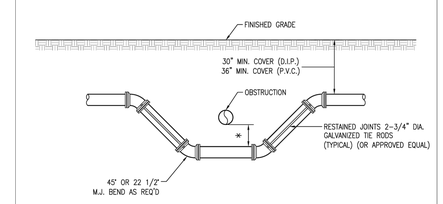
NOTES:
1. A WATER MAIN SHOULD CROSS OVER PIPES WHEREVER POSSIBLE MAINTAINING A 36 INCH COVER FOR PVC, 30 INCH COVER FOR D.I.P. AND 18 INCH SEPARATION AS MINIMUMS.
2. WHEREVER A WATER MAIN CROSSES UNDER A SEWER MAIN, OR CROSSES OVER WITH LESS THAN 18 INCHES VERTICAL SEPARATION, THEN D.I.P. SHALL BE USED FOR BOTH PIPES FOR A DISTANCE OF 20 FEET CENTERED ON CROSSING WITH NO JOINTS WITHIN 10 FEET OF THE CROSSING.
3. 18 INCH SEPARATION SHOULD BE MAINTAINED BETWEEN ALL PIPES (STORM, SEWER, WATER) WHENEVER POSSIBLE. 12 INCHES IS THE ABSOLUTE MINIMUM SEPARATION WITH D.I.P. REQUIRED FOR ANY SEPARATION LESS THAN 18 INCHES.
4. MAINTAIN 10 FEET HORIZONTAL SEPARATION BETWEEN WATER AND SEWER AS A MINIMUM.
5. 3 FOOT HORIZONTAL CLEARANCE SHALL BE PROVIDED BETWEEN UTILITIES AND ANY OBSTRUCTIONS (CATCH BASINS, CONCRETE POLES, ETC.)
6. 5 FOOT HORIZONTAL CLEARANCE SHALL BE PROVIDED BETWEEN UTILITIES AND TREES.

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD GENERAL DETAIL	G-4
APPROVED: J.M.	REVISED:	UTILITY CROSSING GENERAL REQUIREMENTS	
DATE: 11/05/99			



NOTES:
1. (*) 18" MINIMUM CLEARANCE REQUIRED FOR WATER AND SEWER MAIN CROSSINGS, 12" MINIMUM CLEARANCE REQUIRED FOR OTHER UTILITY CROSSINGS.
2. THE DEFLECTION TYPE CROSSING SHALL BE USED WHENEVER POSSIBLE. ONLY UNDER SPECIFIC ORDERS BY THE ENGINEER SHALL THE FITTING TYPE CROSSING BE ALLOWED.
3. CONSTRUCT CROSSING USING 75% OF MANUFACTURES MAXIMUM JOINT DEFLECTION (MAXIMUM).

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD GENERAL DETAIL	G-5
APPROVED: J.M.	REVISED:	UTILITY CROSSING DEFLECTION TYPE	
DATE: 11/05/99			



NOTES:
1. (*) 18" MINIMUM CLEARANCE REQUIRED FOR WATER AND SEWER MAIN CROSSINGS, 12" MINIMUM CLEARANCE REQUIRED FOR OTHER UTILITY CROSSINGS.
2. COAT TIE RODS WITH A COAL TAR ENAMEL AFTER ASSEMBLY (2 COATS MIN.)
3. TIE RODS MAY BE OMITTED WHEN OTHER APPROVED METHODS OF RESTRAINING ARE UTILIZED.

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD GENERAL DETAIL	G-6
APPROVED: J.M.	REVISED:	UTILITY CROSSING FITTING TYPE	
DATE: 11/05/99			

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FL. P.E. NO. 86673

No.	Revision	Date	By

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Drawn by: J.C.
Checked by: A.M.
Approved by: K.B.
Job No.: P19702
Date: 03/03/26

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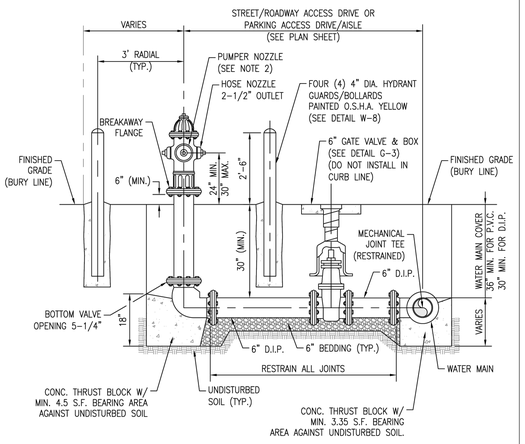
DETAILS

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
C-14

Drawing name: J:\P19702\Civil\DWG_Current_Plan_Set\Working\P19702_C-14 - C-15.dwg Feb 13, 2026 - 5:36pm amartin

DRAFT DOCUMENT FOR COMMISSION REVIEW



NOTE:

1. REFER TO SHEET 2 OF 2 FOR APPLICABLE "NOTES".

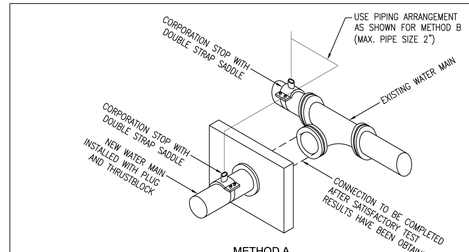
CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD WATER DISTRIBUTION DETAIL	
APPROVED: K.M.K.	REVISED:	FIRE HYDRANT	W-1
DATE: 04/23/19			SHEET 1 OF 2

NOTES:

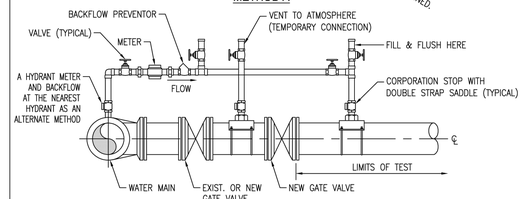
1. FIRE HYDRANT SHALL BE 'AMERICAN DARLING' OR 'MUELLER' TYPE HAVING A MINIMUM 51/4" BOTTOM VALVE OPENING WITH A 41/2" PUMPER NOZZLE AND TWO (2) 21/2" HOSE NOZZLE OUTLETS. FIRE HYDRANT SHALL BE FACTORY PAINTED O.S.H.A. YELLOW.
2. PUMPER NOZZLE OF THE FIRE HYDRANT TO FACE THE NEAREST ADJACENT STREET/ROADWAY, ACCESS DRIVE OR PARKING ACCESS DRIVE/AISLE AND A BLUE REFLECTIVE PAVEMENT MARKER (RPM) SHALL BE INSTALLED IN THE CENTER OF THE TRAVEL LANE OF THE NEAREST ADJACENT STREET/ROADWAY, ACCESS DRIVE OR PARKING ACCESS DRIVE/AISLE.
3. FIRE HYDRANT BURY LINE TO MATCH ADJACENT STREET/ROADWAY CROWN ELEVATION, AS MAY BE APPLICABLE, AND THE CLEARANCE BETWEEN THE BOTTOM OF THE BOLTS OF THE BREAKAWAY FLANGE AND GRADE SHALL BE 6" MINIMUM.
4. FIRE HYDRANTS SHALL BE LOCATED RELATIVE TO THE EDGE OF PAVEMENT FOR STREETS/ROADWAYS BASED UPON "LATERAL OFFSET" REQUIREMENTS PER CHAPTER 4, "ROADSIDE SAFETY", OF THE FLORIDA DEPARTMENT OF TRANSPORTATION (F.D.O.T.) "PLANS PREPARATION MANUAL", LATEST EDITION.
5. FIRE HYDRANTS SHALL BE LOCATED A MINIMUM OF 6' FROM THE EDGE OF THE PAVEMENT/FACE OF CURB OF AN ACCESS DRIVE OR PARKING ACCESS DRIVE/AISLE AND A MINIMUM OF 5' FROM THE FACE OF CURB OF THE SIDE OF ANY TERMINAL OR INTERIOR PARKING LANDSCAPE ISLAND.
6. HYDRANT GUARDS/BOLLARDS SHALL BE PROVIDED AROUND THE FIRE HYDRANT AS SHOWN WHEN THE FIRE HYDRANT IS LOCATED WITH SIX (6') FEET OF THE EDGE OF PAVEMENT OF A PUBLIC/PRIVATE STREET/ROADWAY, ACCESS DRIVE, PARKING ACCESS DRIVE/AISLE OR "TURNING RADIUS".
7. A SEVEN AND HALF (7.5') FOOT RADIUS AROUND THE FIRE HYDRANT CLEAR OF ALL IMPROVEMENTS SHALL BE MAINTAINED.
8. ALL WATER MAIN PIPING FITTINGS BACK TO THE "SUPPLY MAIN" SHALL BE CLASS 52 DUCTILE IRON PIPE (D.I.P.) AND FITTINGS/SPOOL PIECES SHALL BE CLASS 350 DUCTILE IRON.
9. ALL D.I.P. AND FITTINGS/SPOOL PIECES SHALL BE RESTRAINED WITH "MEGALUGS" OR CITY APPROVED EQUAL.
10. FIRE HYDRANT GATE VALVE SHALL BE INSTALLED AS CLOSE AS POSSIBLE TO THE "SUPPLY MAIN". SHOULD THE DISTANCE FROM THE "SUPPLY MAIN" TO THE FIRE HYDRANT LOCATION EXCEED TWENTY (20') FEET THEN A SECOND GATE VALVE IS REQUIRED TO BE INSTALLED AT THE HYDRANT.
11. DEPTH OF COVER TO THE TOP OF THE D.I.P. WATER MAIN SHALL BE 30" MINIMUM.
12. FIRE HYDRANTS SHALL HAVE THEIR TOP COLOR CODED TO INDICATE THE "FLOW CAPACITY" IN GALLONS PER MINUTE (GPM) OF FLOW, AS FOLLOWS:

FLOW	COLOR OF BONNET AND CAP
1,500 GPM OR GREATER	BLUE
1,000 GPM OR GREATER	GREEN
500 – 1,000 GPM	ORANGE
LESS THAN 500 GPM	RED

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD WATER DISTRIBUTION DETAIL	
APPROVED: K.M.K.	REVISED:	FIRE HYDRANT	W-1
DATE: 04/23/19			SHEET 2 OF 2



METHOD A

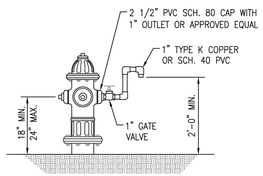


METHOD B

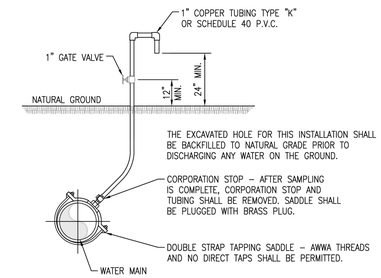
NOTES:

1. WATER MAIN TO BE PRESSURE TESTED AND DISINFECTED ACCORDING TO BROWARD COUNTY PUBLIC HEALTH UNIT REGULATIONS, AWWA, AND MUNICIPAL SPECIFICATIONS IN EFFECT.
2. BACTERIOLOGICAL TESTS ARE TO BE PERFORMED BY THE CONTRACTOR AND AN APPROVED TESTING LABORATORY.
3. REMOVE TEMPORARY CONNECTION AT SADDLE ON NEW MAINS AFTER FILLING AND FLUSHING HAS BEEN COMPLETED AND REPLACE WITH BRASS PLUG.
4. PROVIDE ALL NECESSARY THRUST BLOCKS OR OTHER RESTRAINTS.
5. FILLING AND FLUSHING LOCATIONS SHALL BE COORDINATED BY THE CONTRACTOR, ENGINEER, AND CITY.
6. VENT TO ATMOSPHERE SHALL REMAIN OPEN DURING ALL PHASES OF PRESSURE TESTING.

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD WATER DISTRIBUTION DETAIL	
APPROVED: J.M.	REVISED: 04/20/23	FILLING AND FLUSHING	W-2
DATE: 11/05/99	06/22/22		



HYDRANT CONNECTION

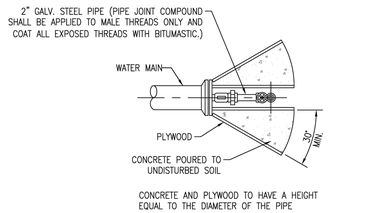


MAIN CONNECTION

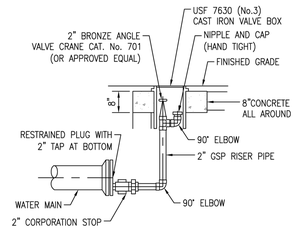
NOTE:

1. SEE 2" TERMINAL BLOW-OFF ALSO.

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD WATER DISTRIBUTION DETAIL	
APPROVED: J.M.	REVISED:	TYPICAL SAMPLE POINTS	W-3
DATE: 11/05/99			



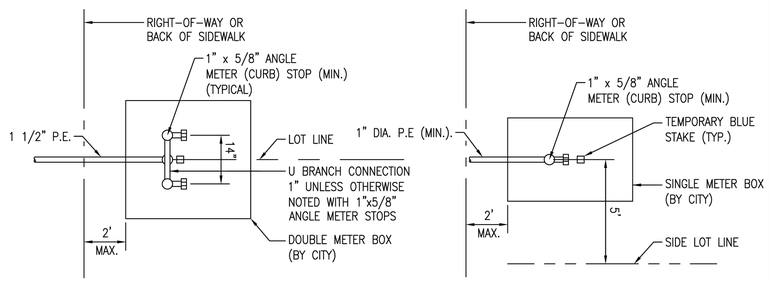
PLAN



ELEVATION

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD WATER DISTRIBUTION DETAIL	
APPROVED: J.M.	REVISED:	2" TERMINAL BLOW-OFF	W-5
DATE: 11/05/99			

CITY OF PEMBROKE PINES ENGINEERING/UTILITIES DIVISION		STANDARD WATER DISTRIBUTION DETAIL	
APPROVED: J.M.	REVISED: 07/17/19 06/13/22	TYPICAL SINGLE & DOUBLE SERVICE CONNECTION	W-4
DATE: 11/05/99	05/13/21 06/01/22		

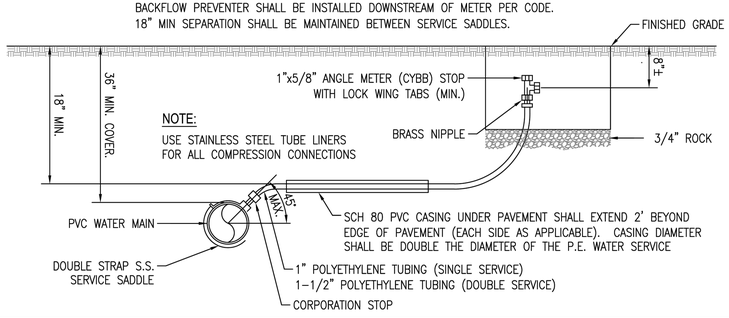


DOUBLE SERVICE PLAN

SINGLE SERVICE PLAN

NOTE:

METER AND METER BOX TO BE SUPPLIED BY CITY AND INSTALLED BY CONTRACTOR.
BACKFLOW PREVENTER SHALL BE INSTALLED DOWNSTREAM OF METER PER CODE.
18" MIN SEPARATION SHALL BE MAINTAINED BETWEEN SERVICE SADDLES.



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FL. P.E. NO. 86673

No.	Revision	By

No.	Date

Designed by:	K.B.
Drawn by:	J.C.
Checked by:	A.M.
Approved by:	K.B.
Job No.:	P19702
Date:	03/03/26

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DETAILS

CITY OF PEMBROKE PINES
HUMAN SERVICES CAMPUS UTILITY REHABILITATION
POINCIANA DRIVE
SECTION 16 & 21-TOWNSHIP 51 SOUTH-RANGE 41 EAST
BROWARD COUNTY, FLORIDA

Sheet No.
C-15

BEFORE YOU DIG ! CALL SUNSHINE STATE ONE CALL OF FLORIDA AT LEAST TWO FULL BUSINESS DAYS BEFORE DIGGING OR DISTURBING EARTH
811 Know what's below. Call before you dig.