



**CITY OF PORT ST. LUCIE
UTILITY SYSTEMS DEPARTMENT**

UTILITY STANDARDS MANUAL

**2015 EDITION
(Effective 06/01/15)**

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21

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1 **PREFACE**

2
3 The design and construction standards set forth in this manual and all subsequent supplemental
4 standards, herein after referred to as the **Utility Standards**, are the minimum City of Port St.
5 Lucie Utility Systems Department (PSLUSD) requirements. It is the intent that utility standards
6 and the standard construction details shall be applicable in all cases where the utilities being
7 constructed will be connected to water, wastewater and/or reclaimed water facilities owned by
8 the PSLUSD. These requirements do not apply to individual single family dwellings connecting
9 to existing PSLUSD facilities.

10
11 All utility projects, whether privately or publicly owned, shall be constructed in accordance with
12 the utility standards. Any supplemental standards adopted by the PSLUSD will supersede the
13 standards adopted in this manual. If there is a conflict between the standards included in this
14 manual and any supplemental standards, the requirements of the latest supplemental standards
15 will take precedence.

16
17 The Engineer-of-Record (EOR) shall be responsible for assuring that the design details, notes,
18 and requirements presented herein meet all local, state and federal government regulations. If a
19 provision of the utility standards is in conflict with the requirements of any state agency or local
20 government having primary jurisdiction, the more stringent requirements shall prevail.

21
22 The minimum requirements of the utility standards shall not be modified excepting when unique
23 circumstances exist, the public health and safety is not adversely affected, and written approval
24 has been obtained from the Utility Director or designee. Any proposed modification to the
25 minimum requirements must be substantiated by an engineering report prepared by a
26 Professional Engineer licensed in Florida, which would indicate compliance with the intent of
27 the utility standards.

28
29 In case of a disagreement in the interpretation of any provision of this manual, or the
30 supplemental standards, the decision of the Utility Director shall prevail.

31 PSLUSD reserves the right to impose additional field requirements not addressed in the utility
32 standards, when those requirements will improve the integrity of the utility system.

33
34 The terms “shall” and “must” are used when the requirement is mandatory. Other terms such as,
35 “recommended” and “preferred” indicate desirable procedures or methods, with deviations
36 subject to individual consideration.

37
38 The latest revision of regulations, codes, standards and technical publications referenced in the
39 utility standards shall be used.

40
41 Copies of the PSLUSD “Utility Standards Manual”, Supplemental Standards, Standard Details,
42 Applications, Standard Documents and forms may be downloaded from the PSLUSD website at
43 www.cityofpsl.com.

44
45 All submittals to the PSLUSD shall be in both paper and electronic formats and include the
46 PSLUSD project name and number. File naming can be found on the City’s website.

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5 **CHAPTER I**
6 **APPLICATION PROCESS**

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8
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10
11
12 **A. GENERAL**

13 1. In order to obtain utility services from the City of Port St. Lucie, the property owner must
14 make an Application for Service to the PSLUSD. A completed Application for Service must be
15 submitted with the fee and other items noted on the application form. The application form can
16 be downloaded from the PSLUSD website www.cityofpsl.com.

17 2. Applications for services requested by firms, partnerships, associations and corporations shall
18 be tendered only by their duly authorized agents and the official title of the agent shall be shown
19 on the application. Failure to submit all the required information shall result in a rejection of the
20 application, which will then be returned to the owner or designated agent.

21 3. Within thirty days of acceptance of the completed Application for Service, including fees and
22 applicable plans, the PSLUSD will provide review comments to the applicant. The applicant
23 shall address the comments and submit construction plans, if applicable, to the PSLUSD for
24 review.

25
26 **B. SITE PLANS**

27 The following information shall be included with the site plan when submitted to the PSLUSD
28 for approval:

- 29 1. Location and size of existing water and wastewater facilities, which are available to serve
30 the proposed project.
- 31 2. Approximate location of proposed on-site and off-site water and wastewater mains.
- 32 3. The proposed service line, location of the interceptor and area(s) reserved for future
33 interceptors; this is not required in case of interceptors for barber shops and beauty
34 salons.
- 35 4. Location of any existing or proposed well and septic tank system.
- 36 5. Location of nearest fire hydrant within 1,000 feet of property.
- 37 6. Location of any public wells within 1,000 feet of property. The City's Wellfield
38 Protection Ordinance restricts certain uses and development within the zone of
39 protection. Confirmation shall be provided that the project is not within the zone of
40 protection, either by a statement on the plan or in a separate document.
- 41 7. Right-of-way, easements and lot lines and pertinent easement information, showing
42 Official Record Book and page number.
- 43 8. Project Phasing shall be shown. (Once approved, re-phasing shall not be permitted).

44
45 **C. CONSTRUCTION PLANS**

46 1. All construction plans require review by the PSLUSD. A full set of plans shall be submitted
47 by the applicant together with the completed PSLUSD forms for Water and/or Wastewater
48 Design Information (with first set only), and applicable fees. Plans shall be prepared on 24" x
49 36" sheets utilizing the following scales:

- 1 a. 1" = 50' horizontal or larger for water, wastewater and reclaimed water lines
2 b. 1" = 5' vertical or larger for gravity wastewater profile sheets
3 c. 1" = 10' or larger for pump station site plans
4 Drawings submitted on other size sheets or at other scales shall be returned without review.
5 Detailed drawings shall be provided for areas with poor legibility. For clarity, utility plans may
6 be required on separate sheets (not combined with paving and drainage).
7
8 2. The construction plans shall be in compliance with the design, specifications and construction
9 standards included in this document and shall be sealed and signed by a Professional Engineer
10 licensed in the State of Florida. The engineer shall submit the design report, calculations and
11 other pertinent information required in Section H, Chapter II, along with the construction plans.
12
13 3. Construction plans shall include the following:
14
15 a. Cover sheet with the name of project, developer and engineer; detailed location map with
16 street names and legal description; PSLUSD standards and details utilized (indicate effective
17 date); an index and a revision block.
18
19 b. A revision block on all construction plans
20
21 c. A north arrow and scale.
22
23 d. Phase lines and match lines must be clearly delineated with no overlapping.
24
25 e. A base line with stationing and offsets from permanent structures.
26
27 f. Elevations shall be referenced to the North American Vertical Datum of 1988 (NAVD 88).
28 The location and elevation of at least one NAVD 88 benchmark shall be indicated.
29
30 g. Rights-of-way, all existing and proposed easements, lot lines, and the Official Record Book
31 and page number, if applicable.
32
33 h. Lot and block numbers, if applicable.
34
35 i. Each lot, bay, and building; type of use and number of floors; each lot/bay shall have a
36 separate water service line with a meter or lockable shut off valve and an individual sanitary
37 sewer service cleanout .
38
39 j. The proposed service line, location of the interceptor and area(s) reserved for future
40 interceptors; this is not required in case of interceptors for barber shops and beauty salons.
41
42 k. Driveway locations for all developments.
43
44 l. Existing and proposed water, wastewater and reclaimed water mains and easements; proposed
45 mains shall be in City owned road rights-of-way or utility easements.
46
47 m. Size, length and type of material used to construct all mains and casings.
48
49 n. Distance of mains from buildings or structures within 20 feet of the main.

- 1 o. Storm sewers including yard drains.
2
- 3 p. The location (station and off sets) of all facilities and appurtenances shall be clearly labeled
4 (pipe, valves, fire hydrants, fire sprinkler lines, water meters, fittings, sampling points, manholes,
5 service lines, power lines, fiber, pull boxes, splice boxes, etc.) with associated elevations, sizes,
6 types, composition, and slopes. All manholes, fire hydrants, sample points, and valves shall be
7 numerically identified.
8
- 9 q. The point of service for water, sewer and electrical power for pump stations shall be labeled as
10 Point of Service or “P.O.S.”.
11
- 12 r. Separation between water mains, gravity sewer, force mains, reclaimed water mains and storm
13 sewers.
14
- 15 s. Elevations of conflicting pipes shall be shown to indicate top and bottom pipe elevations.
16
- 17 t. Field verified data (sizes, materials, elevations and locations) for existing utilities including but
18 not limited to water mains, force mains, gravity sewers, storm sewers, reclaimed water mains,
19 electric, gas, fiber optic, and telephone.
20
- 21 u. All paved non-asphalt surfaces (pavers, stamped concrete, etc.) proposed over PSLUSD
22 owned facilities shall be identified on plans. The PSLUSD shall not be responsible for the
23 restoration of any landscaping, aesthetic or structural features, and surfaces in the event of
24 damage during maintenance of its water and wastewater facilities.
25
- 26 v. The plan view and profile of gravity sewer indicating the length and slope of pipe between the
27 manholes; elevation of each manhole rim and inverts; location and elevation of connection to
28 existing sewage collection system or proposed pump station; finished grade elevation; and
29 elevation of water, storm sewer and reclaimed water lines crossing the sanitary sewer.
30
- 31 w. Facilities with interceptors shall be individually identified and metered; the type, capacity and
32 location of interceptors shall be indicated.
33
- 34 x. The details indicated hereunder shall be provided if a wastewater pump station is proposed.
35
- 36 (1) A plan and section view of the pump station with dimensions and size of the wet well,
37 showing the placement of all components and clearances; elevation of wet-well bottom, top and
38 at ground adjacent to wet-well; elevation of all influent inverts; elevation of emergency off
39 (back-up), pump off, lead pump on, lag pump on and high water alarm levels; pump information
40 including model, impeller diameter, horse power, motor speed, operating point, operating
41 voltage, and control panel.
42
- 43 (2) A detailed site plan drawn to scale for the pump station including all applicable structures,
44 components and appurtenances such as wet-well, valve vault, telemetry, generator, fuel tank,
45 odor control equipment; water service and reduced pressure principle backflow prevention
46 assembly; gravity sewer, manhole and pressure main; landscaping and irrigation system; control
47 panel, auxiliary electrical enclosure, and all buried electrical conduit including electrical service
48 to control panel, as applicable; concrete and gravel areas; easements; fence; and access driveway.

1 Proposed grade elevations shall be indicated on the site plan in the proximity of the pump
2 station.

3
4 y. The PSLUSD Standard Detail (www.cityofpsl.com) shall be utilized, but do not have to be
5 included in the construction plans submitted for review. If the standard details are included in the
6 construction plans, the detail sheets shall not be reduced in scale. If the standard details are not
7 included in the construction plans, the contractor and EOR shall ensure that a copy of the Utility
8 Standards Manual, including Standard Details, is available at the project at all times.

9
10 z. After the initial PSLUSD plan submittal, all revisions shall be noted in revision block on cover
11 sheet and clouded on corresponding plan sheets.

12
13 aa. Landscaping plans shall be submitted for the project as indicated in D. below.

14
15 5. The PSLUSD will notify the applicant when the construction and landscape plans are in
16 compliance with the utility standards, however, the plans will not be approved until the Utility
17 Service Agreement has been executed, all fees are paid and a Construction Permit/Approval is
18 issued by the PSLUSD.

19
20 6. No changes shall be made to the approved plans after a Construction Permit/Approval has
21 been issued without specific concurrence of the PSLUSD in writing. Revisions which directly or
22 indirectly impact utility design void the plan approval; such revisions include but not limited to
23 changes in use from retail to restaurant, adding or deleting bays in buildings, site plan changes
24 and changes from single family homes to multiple family homes. Revised plans are required for
25 approval and are subject to new plan review fees

26 27 **D. LANDSCAPE PLANS**

28
29 Landscape plans shall be submitted for the project indicating the location of landscape areas,
30 perimeter walls, foundations, berms, tree wells, fences, gates, signs, decorative rocks, sculpture,
31 fountains, and any other features that may influence the location of water/wastewater/reclaimed
32 water facilities; also, existing and proposed water/wastewater/reclaimed facilities, and right-of-
33 way, lot lines and pertinent easement information, showing Official Record Book and page
34 number, shall be included. The plans shall include and confirm to the following standard notes:

35
36 1. All landscaping within PSLUSD utility easements and within ten (10) feet of PSLUSD
37 infrastructure shall comply with Chapter 153 of the City's Code of Ordinances and PSLUSD
38 Utility Standards.

39
40 2. No landscaping shall be planted in such a manner as to adversely affect utility installation,
41 operation, or maintenance.

42
43 3. No landscaping other than sod grasses may be planted within a 5' radius maintenance area of
44 any PSLUSD appurtenance such as water meters, backflow devices, fire hydrants, sanitary sewer
45 cleanouts, and manholes, air release valves, etc. Trees shall not be planted within ten (10) feet of
46 any PSLUSD infrastructure. All measurements are from outside to outside, not centerline to
47 centerline. Example: outside of pipe to nearest point on tree trunk.

1 **E. UTILITY SERVICE AGREEMENT**
2

3 1. When the Application for Service and construction plans have been completed satisfactorily,
4 the applicant/property owner is required to enter into a Utility Service Agreement with PSLUSD.
5 The agreement shall be binding on the applicant/property owner, successors and assigns.
6

7 2. The Utility Service Agreement shall detail the terms, conditions and responsibilities of the
8 applicant/property owner, including but not limited to warranty of all work and equipment for
9 the project.
10

11 3. If utility construction has not been initiated within one year of execution of the utility service
12 agreement or inspections by the PSLUSD indicate that utility construction activity has not
13 occurred for a period of 12 months, a re-approval of the project is required. For re-approval of
14 project by the PSLUSD, construction plans shall be revised to meet the current standards and
15 submitted with the appropriate charges/fees; also, an amendment to the utility service agreement
16 may be required.
17

18 4. The applicant shall pay all required charges and fees prior to execution of the Utility Service
19 Agreement by the PSLUSD. The “Guideline for Estimating New Commercial Project
20 Charges/Fees” can be obtained online at www.cityofpsl.
21
22

23 **F. CONSTRUCTION PERMITS**
24

25 1. A permit must be obtained from the PSLUSD prior to construction of water and wastewater
26 facilities, except utility facilities mentioned in 3 below. A completed application for a
27 construction permit shall be submitted on a PSLUSD form with a copy of the signed utility
28 service agreement and applicable charges and fees.
29

30 2. PSLUSD is authorized by the FDEP to independently regulate the construction of water
31 distribution mains of 12”or less in diameter, gravity wastewater collection systems of 12” or less
32 in diameter, wastewater force mains of 12” or less in diameter, and pump stations appurtenant to
33 such force mains. Construction of these projects is exempt from FDEP permit requirements.
34

35 3. Applications for FDEP permits for construction of mains larger than 12” and pump stations
36 appurtenant to such mains can be submitted concurrently with the construction plans; however,
37 PSLUSD will not sign the FDEP application form until PSLUSD has executed a Utility Service
38 Agreement, and approved the construction plans.
39
40
41
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1 **CHAPTER II**
2 **DESIGN, SPECIFICATIONS AND CONSTRUCTION STANDARDS**
3

4 **A. GENERAL**
5

6 1. The standards set forth in this manual are intended to provide a basis for design and
7 construction. Applicable federal, state and local laws and regulations should be considered
8 concurrently with this text. Any variation from these standards shall be specifically requested by
9 the Engineer of Record (EOR) and requires a written approval from the PSLUSD prior to
10 construction plan submittal. Approval of construction plans by the PSLUSD does not constitute
11 written approval of deviations from the utility standards.
12

13 2. All references to stainless steel shall refer to grade 316 unless otherwise noted.
14

15 3. Water, wastewater and reclaimed water lines shall not be constructed without first obtaining
16 an approval or permit, as applicable, from the PSLUSD.
17

18 4. All construction shall be in accordance with this manual, the City of Port St. Lucie Code of
19 Ordinances, and with all applicable Florida Department of Environmental Protection (FDEP)
20 rules and regulations. If any conflict exists between the standards, the more stringent governs, as
21 determined by the PSLUSD. Copies of City Code of Ordinances are available with the City
22 Clerk's office and can also be accessed online at www.cityofpsl.com. The FDEP rules are
23 available online at www.dep.state.fl.us.
24

25 5. Construction shall be in accordance with the utility standards in effect at the time the project
26 was approved by the PSLUSD and will not be subject to changes in the standards during the life
27 of the project. However, if utility construction has not been initiated within one year of execution
28 of the utility service agreement or inspections by the PSLUSD indicate that utility construction
29 activity has not occurred for a period of 12 months, a re-approval of the project is required.
30

31 6. Wastewater discharge shall be subject to Port St. Lucie wastewater system user rules in
32 accordance with the City of Port St. Lucie Code of Ordinances - Title VI.
33

34 7. All abandoned mains and service lines shall be removed or filled with cement grout. Asbestos
35 cement pipe (ACP) must be handled in compliance with applicable federal, state and local
36 regulations. All cutting, removal, and disposal of ACP shall be performed by a Florida licensed
37 Asbestos Abatement Contractor.
38

39 8. The design and construction of privately owned fire lines shall conform to the St. Lucie
40 County Fire District standards (www.slcfcd.com) pertaining to dedicated fire sprinkler systems;
41 the District has final jurisdiction on all hydrant and fire sprinkler line requirements. A plan
42 approved by the District is required to be submitted at the pre-construction meeting with any
43 revision that relocates a hydrant or a fire line connection.
44

45 9. Cross connection control shall be provided in compliance with City of Port St. Lucie Code of
46 Ordinances – Title VI and FDEP regulations.
47

1 10. Permits shall be obtained for sub-aqueous and aerial pipe crossings canals and other surface
2 waters from jurisdictional agencies and construction shall be in accordance with the permitted
3 plans and conditions.
4

5 **B. EASEMENTS/RESTRICTIONS/CONVEYANCE TO PSLUSD**
6

7 1. Water, wastewater and reclaimed water facilities shall be placed in a city owned right-of-way
8 (ROW) or utility easement. Placement of facilities on or adjacent to interior property lines or
9 between structures is discouraged but may be considered by the PSLUSD on a case-by-case
10 basis.
11

12 2. A minimum 10' wide easement is required adjacent to any non-city owned ROW for future
13 PSLUSD facilities.
14

15 3. Utility easements must be a minimum of 20' wide for gravity sewer and transmission mains. A
16 minimum of 10' wide easement shall be provided for standard pressure mains. For mains deeper
17 than 6', the easement shall be calculated using the equation: Easement = 1 + 1.5D, where D is
18 the depth from the finished grade to pipe invert.
19

20 4. Utility easements shall extend a minimum of 10' beyond a manhole and 7.5' beyond a
21 hydrant.
22

23 5. Structural landscape features such as rock, sculpture and tree wells; berms, signs, walls,
24 foundations, fences and gates, are not allowed in a utility easement but may be considered by
25 PSLUSD on a case-by-case basis.
26

27 6. The PSLUSD shall not be responsible for the restoration of any landscaping, aesthetic or
28 structural features, and surfaces in the event of damage during maintenance of its water and
29 wastewater facilities.
30

31 7. No landscaping shall be planted in a manner that would adversely affect utility installation,
32 operation and maintenance. Landscaping shall be in compliance with Chapter 153 of the City of
33 Port St. Lucie Code of Ordinances. Approved shrubs and ground cover listed in the Chapter 153
34 may be planted in the easement.
35

36 8. Minimum easements shall be provided for pump systems as follows:
37

- 38 a. Grinder system – 20' x 20'
 - 39 c. Duplex Lift station – 30' x 45'
 - 40 d. Triplex Lift station – 45' x 50'
- 41

42 Larger easements may be needed based on the site plan prepared by the EOR for the pump
43 station, as required under Section C.3.v. of Chapter I.
44

45 9. The developer/property owner shall convey easements and/or property essential to operation
46 of the utility at no cost to the city by fee simple deed. Conveyance may be needed for the
47 construction of water wells, mains, pump stations, storage tanks, etc.
48

1 10. Easements shall be submitted to the PSLUSD prior to any scheduling of leak testing. The
2 submittal shall be in PDF format. Once approved by the PSLUSD, the Applicant shall record the
3 easement in St. Lucie County, and provide the recording book and page on the as-builts. A copy
4 of the recorded easement shall be provided to the PSLUSD.
5

6 **C. SETBACK REQUIREMENTS**

7

8 All water, wastewater and reclaimed water facilities, which require an excavation with a depth
9 of 6' or less, as measured from the bottom of the excavation to finished grade, shall be installed
10 a minimum of 10' horizontally from any structures. This setback requirement also applies to
11 new structures being constructed in the vicinity of existing PSLUSD facilities. The 10'
12 horizontal setback shall be measured from the outside edge of the utility facilities to the nearest
13 part of the structure, including underground (e.g. footers) or above ground (e.g. roof overhangs)
14 features. In addition, the 10' setback applies only to mains skirting a single structure. Where
15 utility facilities deeper than 6' are installed adjacent to or between structures, setback shall be
16 calculated using the equation; $Setback = 1 + 1.5D$, where D is the depth from the finished grade
17 to bottom of the excavation.
18

19 **D. SEPARATION BETWEEN PSLUSD MAINS AND OTHER UTILITIES**

20

21 The minimum separation between PSLUSD mains and other utilities, as measured from the
22 outside of each pipe, shall be as follows:
23

- 24 1. Water mains shall be located a minimum of 10' from a gravity sewer, force main and
25 reclaimed water main. The vertical separation shall be at least 18" with the water main crossing
26 over the other pipes.
27
- 28 2. All PSLUSD pipes shall have a minimum horizontal separation of 5' from all other
29 underground utilities and a vertical separation of at least 18".
30
- 31 3. When gravity sewer is to be installed parallel to a drainage pipe greater than 15" in diameter, a
32 minimum horizontal separation of 15' shall be maintained. A greater separation may be required
33 for drainage pipes larger than 24" in diameter, as determined by PSLUSD.
34
- 35 4. When force main or reclaimed water main is to be installed parallel to a drainage pipe, a
36 minimum horizontal separation of 8' shall be maintained. A greater separation may be required
37 for drainage pipes larger than 48" in diameter.
38

39 **E. REPLACEMENT AND UPGRADING OF EXISTING FACILITIES**

40

- 41 1. Upon development or improvement of a property, the owner shall be required to replace any
42 existing onsite PSLUSD water and wastewater facilities constructed of asbestos cement (ACP) or
43 'transite' pipe, cast iron (CIP), vitrified clay (VCP) or any facilities that do not meet the
44 specifications of this manual within the proposed development, with currently approved
45 materials at no cost to PSLUSD. Replacement easements shall be shown on construction plans
46 and conveyed to the City in proper form.
47
- 48 2. When development or improvement of a property cause offsite drainage and/or road
49 improvements to be constructed, the property owner shall be required to replace any existing

1 ACP, CIP, VCP pipes or any pipe located within the road/drainage right-of-way or easements
2 that does not meet the utility standards. All such installations, whether planned or unplanned,
3 shall be subject to review by PSLUSD prior to actual commencement of any site/road work.
4

5 3. When a proposed project causes existing PSLUSD facilities to be hydraulically overloaded or
6 at risk of damage or contamination, the developer shall be required to upgrade and/or relocate the
7 facilities in compliance with the current utility standards.
8

9 4. In case of road surfacing and other improvements, adjustments shall be made to manholes,
10 valves, fire hydrants and other appurtenances, to meet the current utility standards at no
11 additional cost to the PSLUSD. The work shall be inspected by PSLUSD for compliance.
12

13 5. Developments with privately maintained water and wastewater utility systems may request
14 PSLUSD to accept ownership of the systems subject to the following conditions:
15

16 a. The property owner submits information regarding the system to the PSLUSD, including:
17

18 (1) As-built drawings of the system prepared by a Professional Land Surveyor, licensed in the
19 State of Florida.
20

21 (2) An engineering report with details on the condition of the system. The report shall be
22 prepared by a Professional Engineer, licensed in the State of Florida and shall contain results of
23 inspection and testing of the mains, appurtenances, structures and equipment.
24

25 b. The system is repaired or replaced to meet current utility standards by the property owner.
26

27 c. Utility easements are conveyed to PSLUSD.
28

29 d. PSLUSD is given access to perform inspections and testing to determine the condition of the
30 system and conformity to current utility standards.
31

32 **F. RELOCATION OF EXISTING FACILITIES**

33

34 Relocation of existing facilities shall conform to the design and construction standards of this
35 manual. All materials used in construction shall be on the PSLUSD Qualified Products List
36 (QPL). Design for relocation of existing facilities must provide for continuity of service to
37 existing customers as well as verification that the relocated facilities will not cause additional
38 operation and maintenance expense to PSLUSD.
39

40 **G. WASTEWATER QUALITY/PRETREATMENT REQUIREMENTS**

41

42 1. City of Port St. Lucie Code of Ordinances – Title VI, prohibits the discharge of commercial
43 and industrial wastewater into the city’s wastewater collection system if the wastewater contains
44 pollutants and contaminants that are:
45

46 a. Harmful to the operation of wastewater facilities,
47

48 b. Untreatable and will result in violation of city, state and federal standards,
49

49 c. Hazardous or harmful to the health and safety of city personnel and the general public.

- 1 2. Any wastewater that has the potential of causing the above adverse effects will require
2 treatment and/or disposal in compliance with the city, state and federal regulations.
3
- 4 3. Discharge of wastewater from commercial and industrial establishments may be allowed in
5 some cases if pretreatment is approved by FDEP and PSLUSD.
6
- 7 4. Interceptors are required for certain establishments specified in Section H.3.
8
- 9 5. All waste streams, other than domestic wastewater, shall be identified by the applicant. The
10 information regarding the quantity and quality shall be submitted to the PSLUSD with the
11 application for wastewater service.
12

13 **H. DESIGN OF WATER, WASTEWATER AND RECLAIMED WATER FACILITIES**

14
15 Water, wastewater and reclaimed water facilities shall be designed by a Professional Engineer
16 licensed in the State of Florida. It is recommended the Developer and EOR meet with the
17 PSLUSD staff to determine feasibility, conformance with the PSLUSD Master Plan and any
18 other special project requirements, prior to beginning of any design work on a project. In areas
19 where master plan facilities have not been constructed, the design of such facilities shall be
20 incorporated in the overall design of the project. A Master Plan for the development may be
21 required prior to the submittal of construction plans. Construction plans prepared without regard
22 to the PSLUSD requirements shall not be accepted for review.
23

24 The design criteria specified herein is applicable to PSLUSD facilities, including, potable water
25 mains, gravity sewer, wastewater pump stations, force mains, reclaimed water mains and
26 appurtenances, which fall within the service area of the PSLUSD. The criteria shall be used in
27 conjunction with the design guidelines and technical references required in FDEP regulations.
28 Deviations shall not be made without first receiving written approval from the PSLUSD; if
29 special circumstances or conditions necessitate deviation from the criteria, the EOR shall submit
30 documentation to show that deviation is based on good engineering practice and provide
31 reasonable assurance that public health and safety will not be compromised.
32
33

34 **1. DESIGN CRITERIA FOR WATER MAINS**

35
36 Water mains shall be designed in accordance with Chapter 62-555 of the Florida Administrative
37 Code (FAC), St. Lucie County Fire Department standards and provisions of this manual.
38

39 **a. Sizing:**

40
41 The EOR shall submit a report including the design and calculations for sizing of the water main,
42 on the basis of following considerations:

43 (1) The PSLUSD Master Plan
44

45 (2) The development Master Plan
46

47 (3) The mains shall be sized to provide at least maximum day domestic requirements plus fire
48 flow at residual pressures of not less than 20 psi at all points in the system.
49

1 (4) Domestic flows shall be based on 250 gallons per single-family dwelling unit, which equates
2 to one Equivalent Residential Connection (ERC); the ERC factors for residential, commercial
3 and institutional establishments.

4
5 (5) The velocity shall be less than 6 feet per second (fps) at peak hour.
6

7 (6) Distribution mains shall be at least 6" in residential areas. A 4" water main may be proposed
8 for non-hydrant lines serving cul-de-sacs where additional development will not occur. In non-
9 residential areas, distribution mains shall be a minimum of 8".

10
11 **b. Layout:**

12
13 (1) All developments may be required to extend water mains across existing or proposed streets,
14 whether public or private, for future extension of other developments. In order to facilitate
15 potable water service for all properties within the service area, the developer/owner shall extend
16 the water main along the full length of all fronting boundaries of the property, and may be
17 required to extend it through the property.
18

19 (2) Water mains shall be looped at all locations. A looped line shall have two separate branches
20 at least 500' apart with an isolation valve in between. Grid spacing shall not exceed
21 approximately 100 feet per inch of pipe diameter. Multiple feed lines may be required at the
22 discretion of PSLUSD.
23

24 A written approval must be obtained from the PSLUSD for dead-end water mains. Dead ends
25 shall be planned and located such that new or existing pavement will not have to be cut in the
26 future when the main is extended. In such instances, mains less than 16" shall end with a valve,
27 plug and a blow-off assembly; water mains 16" and larger shall end with a teed off fire hydrant,
28 inline valve and plug. Permanent dead ends shall be equipped with an automatic flushing valve.

29 (3) Water mains shall be located to maintain the minimum separation required in Section D and
30 the standard detail, unless a deviation is approved in writing by the PSLUSD. Separation less
31 than the minimum required in Chapter 62-555, FAC, shall not be permitted.
32

33 (4) Water mains shall not be placed in ditches, landscape buffers, wetlands, storm water
34 management areas or under sidewalks, concrete slabs and paved areas, unless specifically noted
35 on the plans and approved by the PSLUSD.
36

37 **c. Design Working Pressure** – Water mains shall be designed for a minimum working pressure
38 of 150 psi. The normal working pressure should be 60-80 psi and not less than 35 psi.
39

40 Where system water main pressures meet the minimum requirements but additional pressure is
41 desired by individual customers (such as for high-rise buildings), individual booster pumps may
42 be installed subject to approval by the PSLUSD. The engineer shall submit design information to
43 the PSLUSD to assure that the booster pump facilities will not adversely affect the pressures in
44 the utility mains and/or result in cross-connection. Appropriate features shall be incorporated in
45 the design to prevent a drop in pressure in the utility mains below 40 psi.
46

47 **d. Cover** – Water mains shall have a minimum cover of 36" and a maximum of 60", unless
48 otherwise approved by PSLUSD in writing.
49

1 **e. Valves:**

2
3 (1) Valves shall be designed to facilitate the isolation of each section of pipeline between
4 intersections of the grid system. The number and location of valves shall provide for flexibility
5 of operation and maintenance, while minimizing the number of customers out of service. In all
6 instances, effectiveness of placement shall be primary criteria in determining valve location.

7
8 (2) Valves shall not be placed in curbs, gutters, sidewalks, parking spaces, and handicap ramps.

9
10 (3) Generally, the number of valves at an intersection shall be one less than the number of pipes
11 forming the intersection.

12
13 (4) Inline valves shall be installed for mains near each side of a canal crossing and/or major road
14 crossing.

15
16 (5) Valves shall be located at not more than 500' intervals in multi-family residential, industrial
17 and commercial districts and at not more than 800' intervals in single-family residential districts.
18 On transmission water mains less than or equal to 16" in diameter, valves shall be installed at a
19 maximum of 1000' intervals and at distribution branches. On transmission mains greater 16" in
20 diameter, valves shall be located at a maximum of 2500' intervals and at distribution branches.

21
22 (6) Air valves shall be placed at all canal crossings, high points and at other locations specified
23 by the PSLUSD. The EOR shall consult with the PSLUSD regarding the type of valve to be used
24 and its location. The valve shall be located inside a maintenance access structure as shown in the
25 PSLUSD standard details. Automatic valves shall not be used in situations where flooding of the
26 maintenance access structure may occur. Valves shall be sized per the manufacturer's
27 recommendations.

28
29 **f. Fire Hydrants and Fire Sprinkler Systems:**

30
31 (1) The St. Lucie County Fire District has final jurisdiction on all fire hydrants and fire sprinkler
32 line requirements. A written approval must be obtained from the Fire Chief and submitted to the
33 PSLUSD.

34
35 (2) Unless specifically provided in the Utility Service Agreement, all new fire hydrants shall be
36 owned and maintained by the PSLUSD.

37
38 (3) Hydrants shall be located so as to provide complete accessibility and minimize the possibility
39 of damage from vehicle, or injury to pedestrians. The following setbacks and clearance shall be
40 observed for fire hydrants:

41
42 (a) On or near side lot line

43 (b) No more than 15' from edge of pavement

44 (c) Clearance of 7.5' in front and sides and 4' to the rear

45 (d) No less than 2' from curb/edge of pavement/sidewalk

46 (e) No less than 3' from storm sewers

47 (f) No less than 6' from a gravity sewer, reclaimed water main or force main

48 (g) No less than 10' from wastewater pump stations and onsite sewage treatment and disposal
49 systems.

1 **g. Water Meters and Service Lines**

2
3 Water meters and service lines shall be sized by the EOR in accordance with AWWA Manual of
4 Water Supply Practices - M22. The size of the service line shall be a minimum of 2". The
5 location of meters and service lines shall be shown on the plans per the standard details and as
6 follows:

- 7
- 8 (1) Water service lines to each lot, parcel or building.
- 9
- 10 (2) All services lines after the meter shall be located on the property, outside of any easements.
- 11
- 12 (3) Water meters shall be located in accessible areas, outside of landscaping and pavement, a
13 minimum of 5' from buildings and electric transformers, adjacent to parking areas or roadways
14 and a minimum of 3' from the edge of pavement.
- 15
- 16 (4) Water meters shall not be located within 10' of wastewater and reclaimed water service lines.
- 17
- 18 (5) Each lot/bay shall have a separate water service line with a meter or lockable shut off valve.
19 A separate water meter shall be provided for businesses required to have an interceptor.
- 20
- 21 (6) Temporary and permanent water meters shall only be installed on City owned water mains.
- 22

23 **h. Cross Connection Control/Backflow Prevention:**

24
25 Cross connection control/backflow prevention shall be incorporated in the design of facilities, in
26 compliance with the City of Port St. Lucie Code of Ordinances – Title VI. The specifications are
27 included in Section J.5 of this Chapter and the approved backflow prevention assemblies are on
28 the Qualified Products List.

29
30 **i. Sampling Points:**

31
32 Bacteriological sampling points shall be located at the point of connection to existing water
33 main, at all dead ends, on the far side of all loops and no more than 1200' apart.

34
35 **2. DESIGN CRITERIA FOR GRAVITY SEWERS**

36
37 **a. General**

38
39 (1) The property owner of existing and proposed developments shall provide a gravity
40 wastewater collection system. A pump station will be used when connection to the PSLUSD
41 wastewater collection system is not possible due to the elevation or other constraints of the
42 receiving gravity sewer, as determined by the PSLUSD. The PSLUSD may require submittal of
43 an economic analysis by the EOR to compare the cost of gravity sewer versus a pump station
44 over a period of 30 years, including capital and maintenance costs.

45
46 (2) Gravity sewers shall be designed in accordance with Chapter 62-604, FAC, and provisions of
47 this manual.

1 **b. Size:**

- 2
- 3 (1) The size shall conform to the Master Plan for the development.
- 4
- 5 (2) The minimum allowable size for a gravity sewer, other than a service connection, shall be 8".
- 6
- 7 (3) Lateral sewers shall be designed with capacities of not less than four times the average flow.
- 8 Trunk lines shall have capacities of not less than 2.5 times the average flow.
- 9
- 10 (4) The minimum service pipe size shall be 6" in diameter.

11

12 **c. Layout:**

- 13
- 14 (1) In order to facilitate wastewater service for all properties within the PSLUSD service area,
- 15 wastewater gravity sewers shall be extended by the developer/owner along the full length of all
- 16 fronting boundaries of a property and through the property.
- 17
- 18 (2) All wastewater mains shall terminate with a manhole. In "phased" projects, pavement must
- 19 be in place over stub-out runs a minimum of 5' past the end manhole.

20

21 **d. Slope:**

- 22
- 23 (1) All gravity wastewater lines shall be designed with hydraulic slopes sufficient to give mean
- 24 velocities, when flowing full or half full, of not less than 2 fps and not more than 5 fps, based on
- 25 Manning's formula using an "n" value of 0.013. The upsizing of sewers to reduce slopes will not
- 26 be permitted unless justified by calculated flows.
- 27
- 28 (2) The following minimum slopes will be used:

- 29
- | | |
|------------|-------|
| 30 (a) 8" | 0.40% |
| 31 (b) 10" | 0.28% |
| 32 (c) 12" | 0.22% |
- 33

34 **e. Cover**

35

36 The minimum cover over gravity sewers shall be 4'.

37

38 **f. Manholes:**

- 39
- 40 (1) Manholes shall be installed at the end of each sewer; at every change in grade, size, or
- 41 alignment; at all sewer intersections; and at distances not greater than 400' apart.
- 42
- 43 (2) Manholes shall be placed in accessible locations, preferably in pavement flush to the surface.
- 44 Manholes in roadway pavement shall not be located in low areas and wheel paths (i.e. structures
- 45 shall be located centered in the travel lane, crown of road, paved shoulder or off the pavement).
- 46 Manholes located in unpaved areas shall have the rim elevation 2" higher than the surrounding
- 47 ground and a concrete collar shall be placed around the manholes; the concrete shall be sloped
- 48 from the rim and taper out to the existing ground.
- 49

1 (3) Manholes shall not be placed in low-lying areas where storm water inflow may occur. The
2 manhole cover and frame shall prevent inflow of storm water and shall be on the Qualified
3 Products List.
4

5 (4) The design depth of the manhole from rim elevation to invert elevation shall be no less than
6 4.5' and no more than 20', unless specifically approved by the PSLUSD in writing.
7

8 (5) Standard manholes shall be provided with a minimum 0.1' drop in the invert.
9

10 (6) Where the drop in invert exceeds 0.1' but is less than 2', a channel shall be constructed to
11 prevent solids deposition in the manhole.
12

13 (7) An inside drop connection shall be provided when a sewer enters a manhole 2' or higher than
14 the main invert channel as shown in the standard detail.
15

16 (8) A collector service connection shall not be directed into a manhole.
17

18 **3. DESIGN CRITERIA FOR INTERCEPTORS**

19 **a. GENERAL**

20
21
22 (1) Interceptors shall be provided when, in the opinion of the Utility Director, they are necessary
23 for the pretreatment of wastewater containing excessive amounts of grease, oil, hair, lint, sand or
24 other solids and substances that are harmful or hazardous when discharged into wastewater
25 facilities.
26

27 (2) Interceptors are specifically required for establishments with food service, laundry, car wash,
28 services for repair or maintenance of vehicles/mechanical equipment, barber shops, beauty
29 salons, and animal care facilities. Interceptor may be required for institutional facilities and other
30 establishments based on the characteristics of the wastewater, past experience, field inspections,
31 maintenance records and operational issues. Separate plumbing shall be provided for the
32 wastewater to be treated through an interceptor (see example on page 26).
33

34 (3) An interceptor shall be provided in compliance with these requirements when an existing
35 establishment, listed in (2) above, is expanded or remodeled.
36

37 (4) Interceptors are not required for single-family homes and private dwelling units.
38

39 (5) Interceptors shall not be shared. Each business required to have an interceptor shall have its
40 own separate plumbing, interceptor and water meter (see example on page 27). When the same
41 establishment has multiple uses requiring an interceptor, such as an institutional facility with a
42 kitchen and laundry, each use shall be provided with separate plumbing and interceptor.
43

44 (6) Wastewater from toilets, urinals, showers, and other similar plumbing fixtures for human
45 waste shall not discharge into an interceptor for kitchen, laundry, animal care or facilities for
46 servicing vehicles/mechanical equipment (see example on page 28).
47

48 (7) Wastewater required to be treated in an interceptor shall enter the interceptor through an inlet
49 pipe only.

1
2 (8) All equipment and plumbing fixtures in a food service facility that may introduce fats, oil or
3 grease into the PSLUSD wastewater facilities must be connected through the grease interceptor,
4 including but not limited to:

5
6 (a) Scullery sinks (two or three compartment)

7
8 (b) Pots and pan sinks

9
10 (c) Floor drains in kitchen, walk-in coolers and washing areas (not including public restrooms).

11
12 (d) Pre wash sinks

13
14 (e) Dishwashers and other washing machines

15
16 (f) Automatic hood wash units

17
18 (g) Indoor garbage can washes

19
20 (9) Establishments with facilities for servicing of vehicles/mechanical equipment shall connect
21 all plumbing (other than the restroom) from the area where repairs and maintenance is being
22 performed into a sand/oil interceptor; this includes but is not limited to floor drains and hand
23 wash sinks. Engine oil, transmission oil, coolant, solvents, additives, brake fluid and any other
24 fluid collected in the process of servicing vehicles/mechanical equipment shall not be discharged
25 into the interceptor or other plumbing; the handling and disposal of these fluids shall be in
26 compliance with the FDEP and PSLUSD rules and regulations.

27
28 (10) Concrete interceptors shall be designed in accordance with ASTM C 890-91 (Re-approved
29 1999), Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional
30 Pre-cast Concrete Water and Wastewater Structures, for the appropriate loading.

31
32 (11) Grease, oil and sand interceptors shall be provided with an access manhole over the inlet
33 and outlet ends. Traffic rated lids shall be installed with manhole covers to finished grade.

34
35 (12) The wastewater collection system for commercial projects shall be designed to
36 accommodate the installation of interceptors for future uses and phases of the project (see
37 example on page 28). Construction plans submitted to the PSLUSD shall indicate areas reserved
38 for the placement of future interceptors. Physical property restrictions or lack of sewer gradient
39 shall not be a defense for failure to provide adequate interceptors.

40
41 (13) A sampling and inspection manhole may be required downstream of grease, oil and sand
42 interceptors.

43
44 **b. DESIGN CONSIDERATIONS**

45
46 Interceptors shall be designed by a Professional Engineer licensed in Florida, in accordance with
47 applicable building codes, state regulations and provisions of this manual. The design shall be
48 based on the characteristics of the wastewater and the peak flow rate. The EOR shall take into

1 consideration the specifications for interceptors in Section J.7 of this Chapter, the PSLUSD
2 standard details and the criteria indicated below.

3
4 **(1) Location (Not Applicable to Interceptors for Barber Shops & Beauty Salons)**

5
6 The site plan shall provide for area(s) conducive to the installation of an exterior, in-ground
7 interceptor for all spaces, bays or suites. Proper planning of areas for interceptors is particularly
8 essential when designing a new strip center, strip mall, plaza, shopping center or any other
9 commercial project where the type of tenancy is uncertain. The location shall be based on the
10 following criteria:

11
12 (a) Interceptors shall be located in proximity of the building and the sewer lateral to allow
13 gravity flow.

14
15 (b) Interceptors shall be located underground, outside building structures and shall not be
16 placed in any type of enclosure.

17
18 (c) Interceptors shall be located in grass/non-traffic areas, unless approved in writing by the
19 PSLUSD.

20
21 (d) Interceptors shall not be located in low areas subject to flooding. The site shall be sloped to
22 drain storm water away from the interceptor.

23
24 (e) Interceptors shall be located as to be easily accessible at all times for routine inspection,
25 cleaning and maintenance, and to pose no hazard to public health or safety. Interceptors shall not
26 be placed in parking spaces or sidewalks.

27
28 **(2) Size**

29
30 The PSLUSD will specify the minimum capacity and the type of interceptor that will be
31 required, based on the information submitted by the applicant and the EOR. The EOR may
32 specify a larger capacity.

33
34 **(3) Design Criteria**

35
36 The design criteria shall include but not be limited to the following, depending on the type of
37 facility:

38
39 **(a) Food Service Facilities –**

40
41 (i) The PSLUSD will specify size and type of interceptor based on the following category
42 of food service establishments:

43
44 1. Mobile food vendors – An under-the-sink grease trap may be used.

45
46 2. Limited food facilities - Food preparation on the premises is limited to hot dogs,
47 popcorn, coffee and soft drinks; food is served only with disposable utensils;
48 plumbing fixtures do not include a garbage grinder or dishwashing machine; and

1 the amount of grease is expected to be minimal. Examples: Ice cream and frozen
2 yogurt shops, concession stands, convenience stores.

3
4 An automatic grease removal unit may be used.

5
6 3. Full service facilities - Food preparation is not limited as in (3)(a)(i) 2. Examples:
7 Restaurants, cafeterias, butcher shops, institutional kitchen facilities, meat and
8 seafood markets.

9
10 A grease interceptor shall be provided in accordance with the standard detail and
11 as specified below.

12
13 (ii) A baffle is required, as shown in the detail, unless multiple tanks are used.

14
15 (iii) When the size specified by the PSLUSD is greater than 1250 gallons, the installation
16 of multiple tanks in series may be required.

17
18 (iv) When food wastes containing grease or oil are processed through a garbage disposal,
19 the waste from the garbage disposal shall be directed to a solids separator for separating
20 the solids before discharging into the grease interceptor (see example at the end of this
21 Section). A combination solids and grease interceptor may be installed if the effective
22 capacity of the interceptor is increased to accommodate the waste from the garbage
23 disposal.

24
25 **(b) Laundry Interceptor** - Interceptors for commercial laundries shall be equipped with a
26 wire basket or similar device removable for cleaning that prevents passage of solids ½” or larger
27 in size, strings, rags, buttons or other materials detrimental to the wastewater facilities.

28
29 **(c) Interceptor for car washes and facilities servicing vehicles/mechanical equipment** - All
30 such facilities shall install a combination sand and oil interceptor.

31
32 **(d) Interceptor for barber shops and beauty salons** – a hair interceptor shall be installed
33 under the sinks used for shampoo.

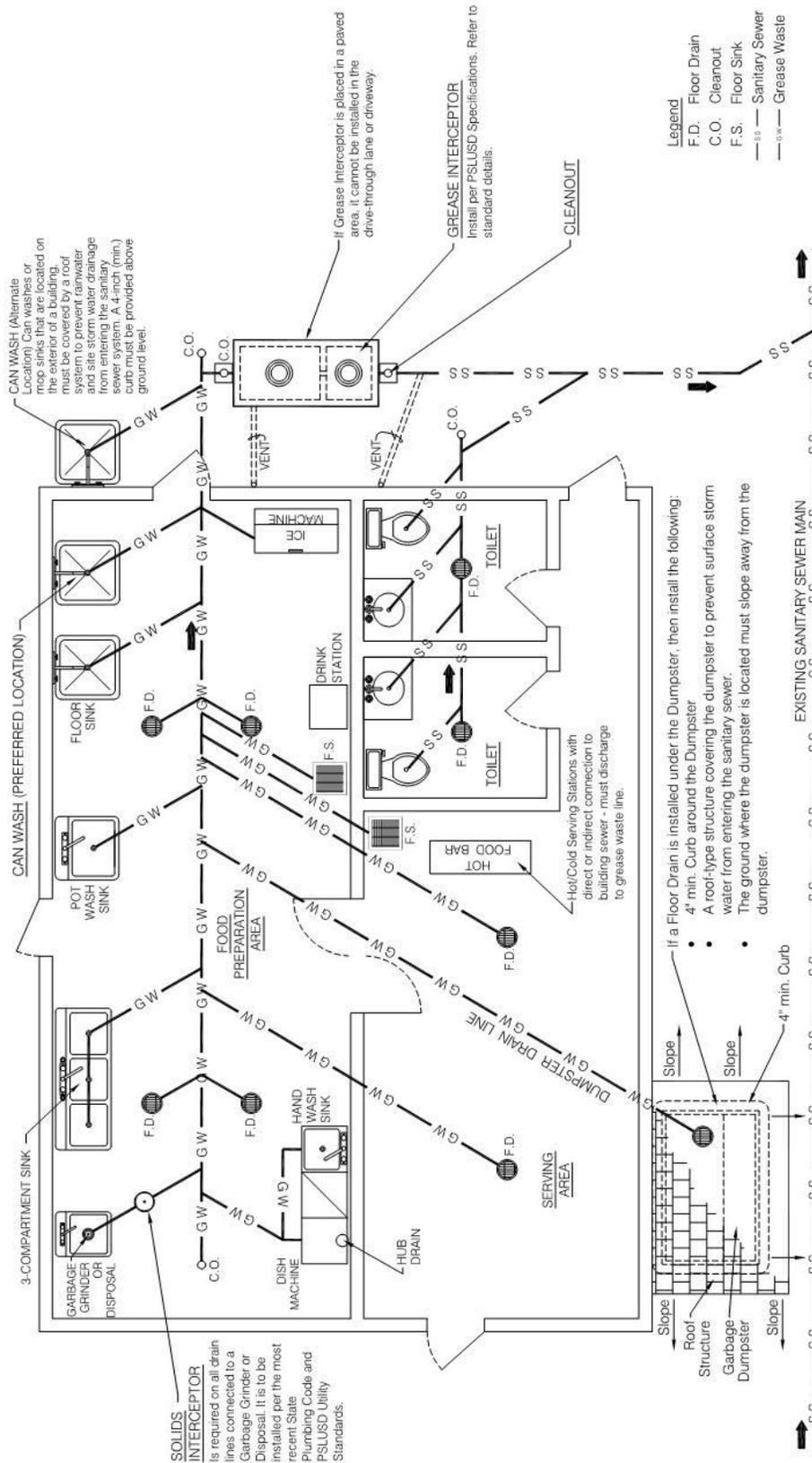
34
35 **(e) Interceptor for institutional facilities that include uses such as schools, child care,**
36 **adult congregate, assisted living, nursing homes, hospitals, labor camps, juvenile detention,**
37 **prisons, etc.** – When required by the PSLUSD, an interceptor for such facilities shall be
38 designed to remove rags, clothes, diapers, toys or other objects that would cause overflow of
39 sewage or damage to the PSLUSD wastewater facilities. Separate plumbing and interceptors
40 shall be provided for the human, kitchen and laundry wastes.

41
42 **(f) Interceptor for animal care facilities for housing, holding, hygiene or medical**
43 **treatment of animals, i.e. kennel, pet grooming, pet shop, shelter, hospital, etc.**- Such
44 facilities shall, as a minimum, install an interceptor for retention of hair; a combination hair and
45 solids interceptor may be needed depending upon the characteristics of the wastewater.

46
47 **c. SUBMITTAL**

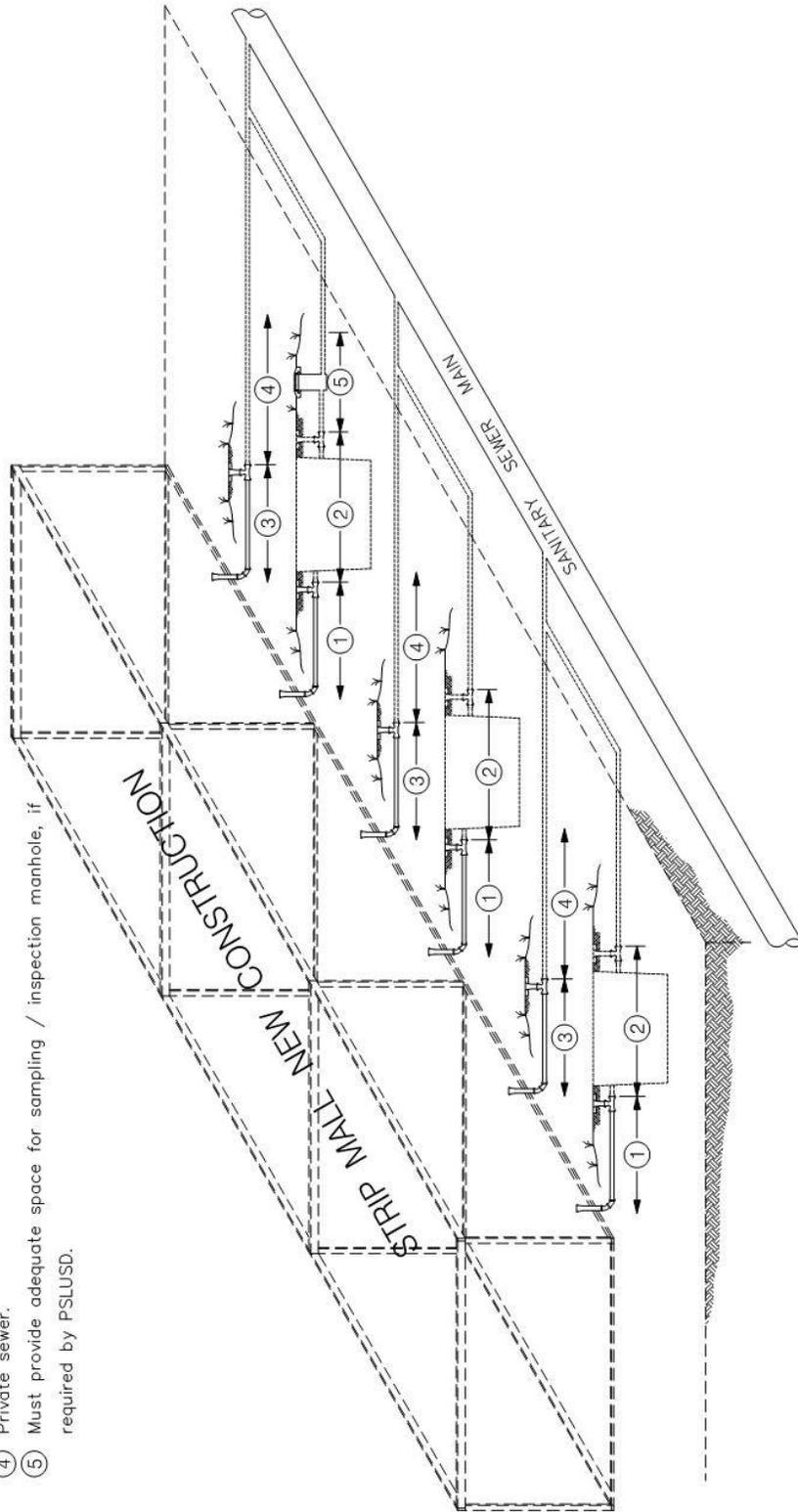
48
49 The following information shall be submitted by the EOR to the PSLUSD:

- 1
- 2 (1) A site plan showing the proposed service line, location of the interceptor and area(s) reserved
- 3 for future interceptors; this is not required in case of interceptors for barber shops and beauty
- 4 salons.
- 5
- 6 (2) A Grease Management Plan for food service establishments.
- 7
- 8 (3) Detailed calculations for the peak flow rate of commercial/industrial wastewater;
- 9
- 10 (4) Characteristics of all commercial/industrial wastewater from proposed and potential uses of
- 11 the project.
- 12
- 13 (5) A copy of the floor plan plumbing plan and plumbing configuration, as shown in the
- 14 examples on pages 26, 27, and 28.
- 15
- 16 (6) The capacity of the interceptor, manufacturer and model number shall be specified prior to
- 17 the preconstruction meeting. The interceptor shall be on the Qualified Product List or shop
- 18 drawings shall be submitted to the PSLUSD.
- 19
- 20
- 21
- 22
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- 47



**EXAMPLE
GREASE INTERCEPTOR
SITE PLAN
& PIPING LAYOUT**

- ① REQUIRED: Stub-out must be provided for future line to Interceptor.
- ② REQUIRED: Must provide adequate space to install future Interceptor.
- ③ Sanitary sewer stub-out.
- ④ Private sewer.
- ⑤ Must provide adequate space for sampling / inspection manhole, if required by PSLUSD.



**EXAMPLE
NEW CONSTRUCTION
- FLEX SPACE/STRIP MALL -
PLUMBING CONFIGURATION**

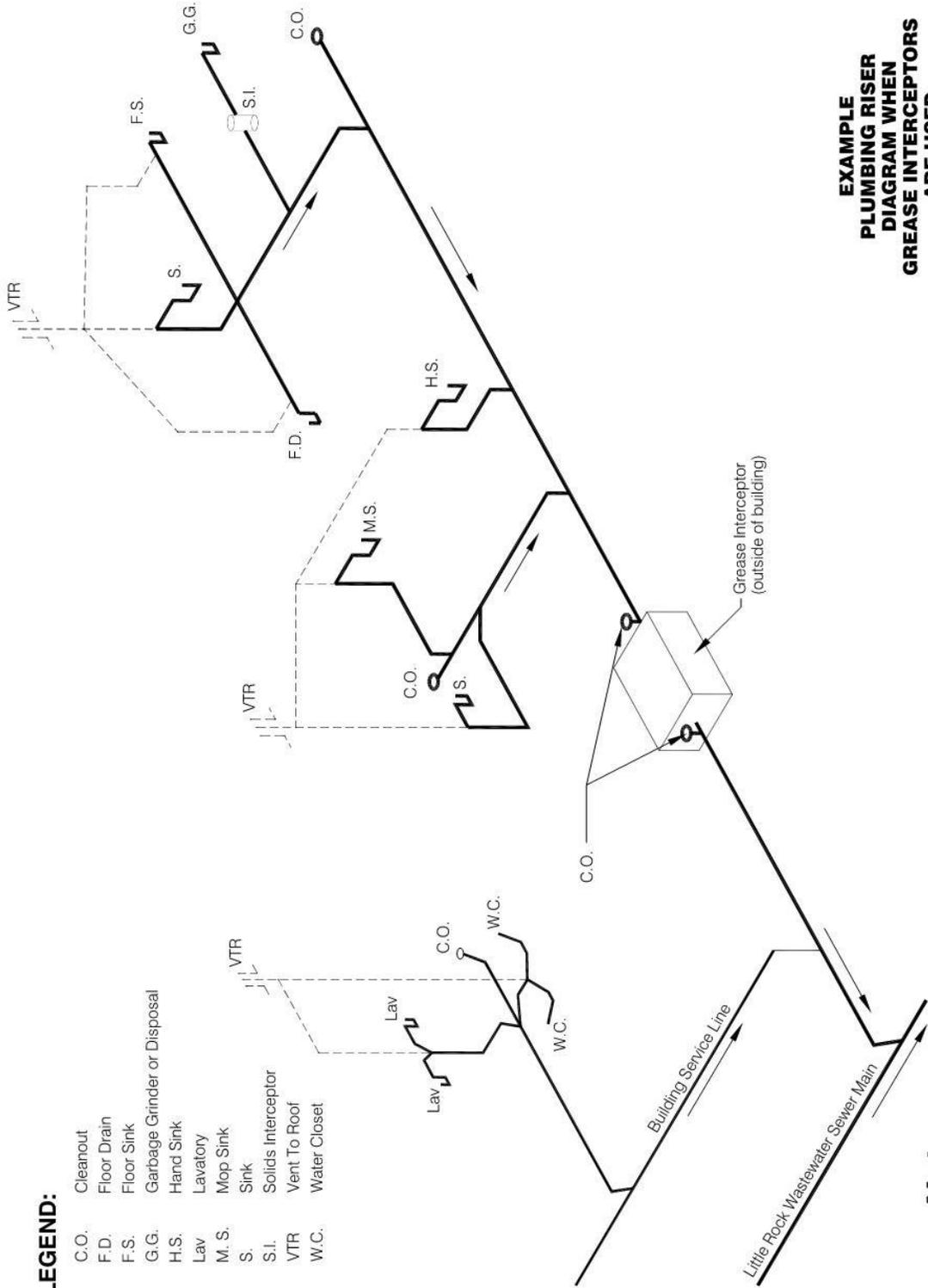
Notes

- If ② is an oil / grease / sand interceptor refer to Standard Detail for installation.

1
2
3
4
5
6

LEGEND:

C.O.	Cleanout
F.D.	Floor Drain
F.S.	Floor Sink
G.G.	Garbage Grinder or Disposal
H.S.	Hand Sink
Lav	Lavatory
M. S.	Mop Sink
S.	Sink
S.I.	Solids Interceptor
VTR	Vent To Roof
W.C.	Water Closet



**EXAMPLE
PLUMBING RISER
DIAGRAM WHEN
GREASE INTERCEPTORS
ARE USED**

Notes

- This EXAMPLE PLUMBING RISER DIAGRAM is intended for informational purposes only. It does not match the Example Grease Interceptor Site Plan

1 **4. DESIGN CRITERIA FOR WASTEWATER PUMP STATIONS**

2
3 **a. GENERAL**

4
5 (1) The property owner of existing and proposed developments shall provide a gravity
6 wastewater collection system. A pump station will be used only when connection to the
7 PSLUSD wastewater facilities is not possible due to elevation of the receiving gravity sewer.
8 The PSLUSD may require submittal of an economic analysis by the EOR to compare the cost of
9 gravity sewer versus a pump station over a period of 30 years, including capital and maintenance
10 costs.

11
12 (2) Pump stations shall be designed in accordance with Chapter 62-604, Florida Administrative
13 Code and provisions of this manual. The specifications for the various components (Section J.8)
14 and the PSLUSD standard details shall be used in conjunction with the design criteria specified
15 herein.

16
17 (3) All wastewater pump stations shall be owned, operated and maintained by the PSLUSD. An
18 exclusive utility easement shall be provided as required under Section B of this Chapter.

19
20 (4) Pump stations shall be designed for a 30-year useful life and shall conform to the PSLUSD
21 Master Plan. The PSLUSD shall have the right to require the design and construction of the
22 pump station to allow other properties to connect to the system.

23
24 (5) The developers/owners of adjoining properties shall coordinate to provide a common pump
25 station.

26
27 (6) Pump stations shall be designed and located so as to minimize the adverse effects resulting
28 from odor, noise and lighting. The installation of an odor control system may be required if a
29 long cycling time, or close proximity to occupied structures may create an odor problem.

30
31 (7) Pumps shall be designed, at a minimum, with capacity to handle the anticipated peak hourly
32 flow with one pump out of service.

33
34 (8) Electric power, which meets the voltage and phase requirements of the pump station, shall be
35 made available to the pump station site. All pumps shall be either 230 or 460 volts.

36
37 (9) Pump stations shall be protected from lightning and transient voltage surges. As a minimum,
38 stations shall be equipped with lightning arrestors, surge capacitors or similar protection devices
39 and phase protection.

40
41 (10) The potential for damage or interruption of operation because of flooding shall be
42 considered in the location of new pump stations. Pump stations shall be designed to stay fully
43 operational and accessible during a 25-year flood. The electrical and mechanical equipment shall
44 be protected from physical damage by a 100-year flood. Design shall include measures to
45 withstand floatation forces when empty.

46
47 (11) Pump stations shall be equipped with submersible pumps.

48
49 (12) Pump stations shall be equipped with an audible and visible high water level alarm.

1
2 (13) Water service shall be provided to the pump station site and protected with an approved
3 backflow prevention assembly.
4

5 (14) A fall through prevention system is required for the wet well access opening. The system
6 shall be installed by the manufacturer or by a contractor approved by the manufacturer.
7

8 (15) Explosion proof motors, lights, cables, conduits, switch boxes, and other electrical
9 equipment shall be used in areas where fire or explosion hazards may exist due to flammable
10 gases, vapors, or liquids, combustible dust or ignitable fibers or flyings. The electrical
11 components shall comply with the National Electrical Code requirements for Class I, Division I,
12 Group D locations.
13

14 **b. SUBMITTAL**
15

16 (1) Design report prepared by the Engineer of Record (EOR) must be submitted with the
17 following information:
18

19 (a) Construction plans as required under Section D, Chapter I.
20

21 (b) Calculations including, but not limited to:
22

23 (i) Average daily flow (ADF) and Peak Hourly Flow (PHF) - Average daily flow shall be
24 based on the type of use and the number of hours of operation. Engineering references,
25 historical flows or other acceptable methods may be used to determine ADF; the method
26 used shall be specified. The design average flow for facilities subject to seasonal high use
27 (e.g., recreational areas, resorts, campuses, industrial facilities) shall be based on the daily
28 average flow during the seasonal period.
29

30 (ii) A maximum storage retention time of 30 minutes.
31

32 (iii) ADF/PHF cycle / run times and starts per hour - Cycle time calculations for pump
33 starts between 2 and 10 per hour, not to exceed the manufacturer's recommendation.
34

35 (iv) Total dynamic head (TDH).
36

37 (v) Analysis of system pressure for current and future (30 year projection) conditions,
38 including highest and lowest system pressures.
39

40 (vi) Protection against floatation with a minimum safety factor of 1.1.
41

42 (vii) The size of the emergency power equipment based on capacity to start and maintain
43 the total rated operating capacity of the pump station. Electrical sizing calculations shall
44 assume loading based on the starting and full operation of pumps and all electrical
45 equipment associated with the pump station.
46

47 (c) The information listed on the Pumping Station Data Table (Table 2, pages 35-39),
48 including but not limited to the dimensions of wet well and valve vault, size of piping, pump
49 specifications, operating levels, and elevations. The table is intended to provide a basis for

1 design and construction. The EOR shall modify the information, as necessary, and provide
2 additional details not shown as may be required by applicable codes and standards. All changes
3 shall be clearly identified.

4
5 The Pumping Station Data Table and accompanying details can be downloaded from the
6 PSLUSD website at <http://www.cityofpsl.com>.

7
8 (d) Pump data including the performance curve, capacities and efficiency based on the
9 manufacturer's shop testing of like units. Curves shall be submitted in an 8 ½" x 11" format, at
10 as large a scale as practical. Curves shall be plotted from zero flow at the pump's shut off head to
11 the pump's capacity. The EOR shall plot the specific system design on the manufacturer's curve,
12 plotting from zero flow at the designed static head, to and through the selected pump
13 performance curve. Pump family curve tables are not acceptable.

14
15 (e) The availability of electric power compatible with the pump voltage and phase
16 requirements. The EOR shall address whether existing electrical service is adequate or will need
17 to be extended to the site. The details for extension of service shall be included.

18 19 **c. TYPE OF PUMP STATIONS & RELATED DESIGN CONSIDERATIONS**

20
21 The type of pump station required depends on the size of the project and whether the connection
22 is into a low-pressure sewer system or a force main. Table 1 and the details provided herein shall
23 be used as design criteria.

24 25 **(1) Grinder Station**

26
27 A grinder pump system is typically used for small projects with 7500 gallons per day (gpd) flow
28 or less. The requirements for single phase and three phase grinder systems are detailed below.

29
30 **(a) Single-Phase Duplex Grinder Station** consists of a dual pump system that operates on
31 230-volt, single-phase electrical power, with a 2 Horse Power (HP) motor. The single-phase
32 duplex system may be approved on a case-by-case basis by PSLUSD if the wastewater generated
33 by the project is limited to 1000 gpd and an interceptor is not required for the proposed use;
34 written approval must be obtained from the PSLUSD.

35
36 **(b) Three-Phase Duplex Grinder Station** consists of a dual pump system that operates on
37 230-volt three-phase electrical power with a 2, 3 or a 5 HP motor. The three-phase duplex system
38 may be used in commercial applications in accordance with Table 1.

39 40 **(c) Minimum Design Requirements**

41
42 (i) The wet well shall be 4' diameter fiberglass basin; depth shall be site specific and a
43 minimum of 6' deep.

44
45 (ii) The wet well shall have only one influent pipe.

46
47 (iii) A check valve and gate valve is required on the discharge line of each pump.
48

1 (iv) An emergency pump-out connection with a gate valve is required on the discharge
2 piping.

3
4 (v) A separate valve vault is required for grinder stations.

5
6 (vi) An approved generator receptacle shall be provided for connecting to a portable
7 generator during extended power failure.

8
9 (vii) A 10' x 45' unobstructed area for a vacuum truck within 10' of the wet well. The
10 slope of unobstructed area for the truck and access driveway shall not exceed 10%.

11 **NOTE: See Sample Location for Maintenance Truck**

12
13 **(2) Lift Stations**

14
15 (a) A lift station shall be designed for 230/460 volt, 3-phase, and 60-cycle electric service.
16 Each pump shall have a horsepower rating between 10 HP and 47 HP and a speed rating between
17 1700 and 1800 rpm. A lift station shall be provided in accordance with Table 1, when the project
18 does not meet the requirements of a grinder system or the constraints of the PSLUSD wastewater
19 collection system.

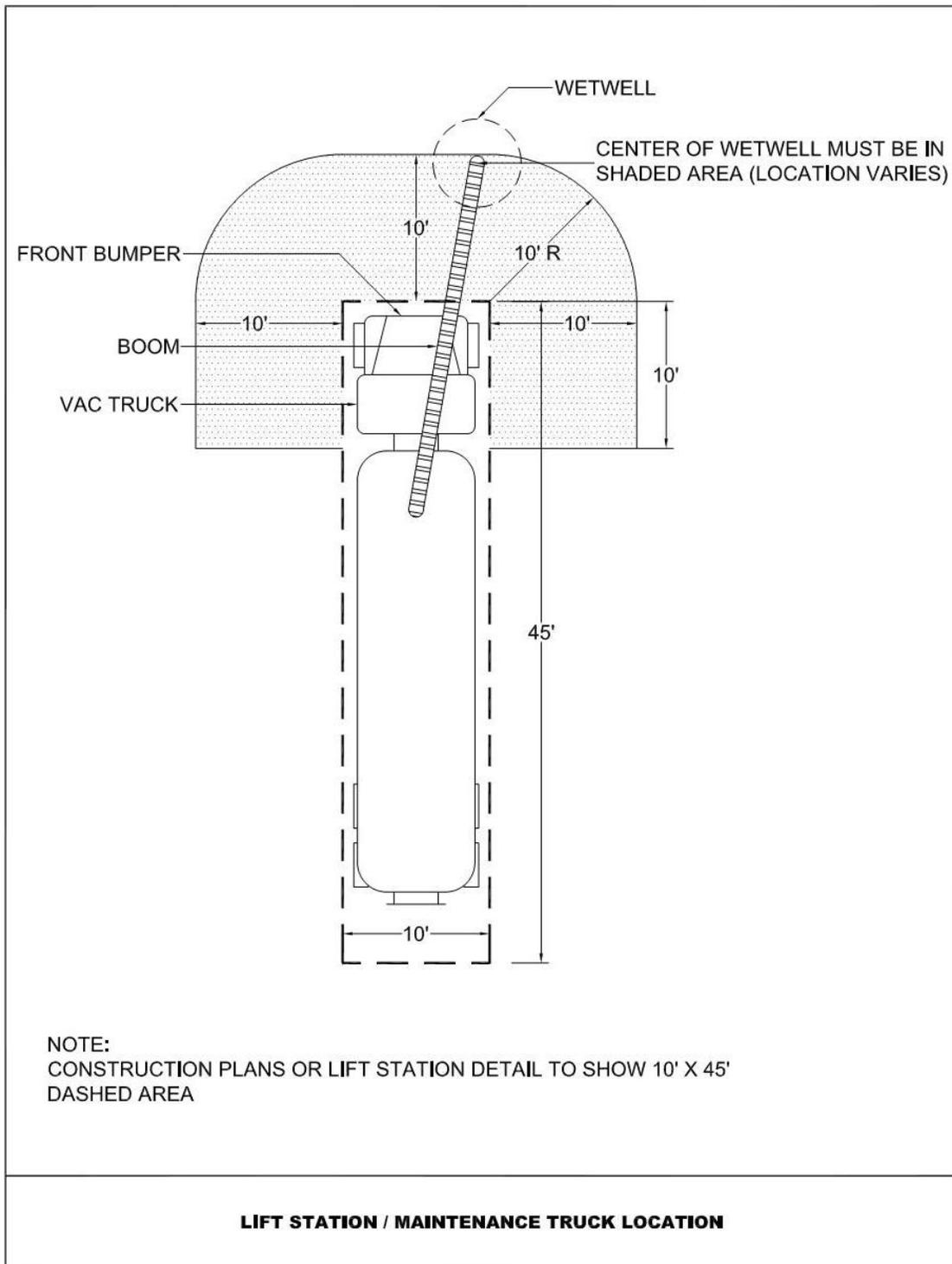
20
21 (b) Minimum Design Requirements:

22
23 (i) A duplex lift station shall be provided for projects with a flow of up to 250,000 gpd.
24 For projects over 250,000 gpd or peak flows over 700 gallons per minute (gpm), a triplex
25 lift station shall be provided.

26
27 (ii) In projects constructed in phases, master lift stations that will have minimal flows for
28 a considerable time shall be equipped with temporary impellers with reduced capacity,
29 though not less than 50% of a permanent pump. The installed electrical equipment, pump
30 housing and motor shall meet the ultimate flow condition. A second set of impellers for
31 full flow conditions will be required to be furnished prior to lift station start-up. The
32 selected pumps and electrical system must allow for a minimum of one impeller upgrade
33 in the future.

34
35 (iii) The station shall include a wet well, control valves, generator pad, telemetry system,
36 a 6' chain link fence with a lockable gate opening and a 10' x 45' unobstructed area for a
37 vacuum truck within 10' of the wet well.

38 **NOTE: See Sample Location for Maintenance Truck**



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(iv) The minimum diameter of the wet well shall be 8'; the depth of wet wells shall not exceed 25', unless approved in advance by the PSLUSD. The wet well and access cover shall be as per the specifications included in Section J.8 of this Chapter.

1 (v) A float control system shall be provided. The system shall be composed of a five float
2 system used in conjunction with various monitoring, indicator and logic control devices.
3 The floats shall have the capability to control several pumps and alarms, as well as
4 indicate levels using discrete set points. The float installation shall allow for multiple
5 operating ranges over a period of 30 years, as noted within the PSLUSD Master Plan
6 Model.

7
8 (vi) The wet well's operating water levels shall be arranged to insure pump operation
9 without cavitation and insure the gravity sewer system is not surcharged. The operating
10 levels for Pumps Off, Lead Pump On, Lag Pump On, High Water Level Alarm, and
11 backup relay system shall be established in increments as explained below.

12
13 (vii) The depth of the wet well shall be adequate to provide for the necessary incremental
14 set points of the floats, i.e. 6", 8", 10" and 12", without surcharging the influent line. The
15 High Water Alarm elevation shall be set at a minimum of 6" below the lowest influent
16 pipe invert elevation. The Pumps Off elevation shall be set so that the pumps are
17 completely submerged at all times; this shall be set above the manufacturer's
18 recommended submergence at all times. The highest float shall be used to control backup
19 relay system.

20
21 (viii) The valve assembly shall be designed per the PSLUSD standard detail. A plug
22 valve is required on the discharge line of each pump with a pressure gauge on the
23 discharge side of the plug valve. A check valve is required between the pump and plug
24 valve. An emergency pump connection device shall be provided and shall be a male
25 aluminum or bronze "Cam-loc" fitting with a dust cap and an isolation plug valve. A
26 stainless steel ball valve shall be provided on the dust cap.

27
28 (ix) The pump station site shall be well drained and graded to prevent flooding or inflow
29 of surface runoff after a storm event. The exterior top of the wet well shall be designed at
30 or above the 100 year/3-day flood elevation and shall not be below the crown elevation of
31 an adjacent roadway.

32
33 (x) Emergency pumping capability shall be provided for all lift stations. Stations that
34 receive flow from one or more pump stations through a force main, triplex stations and
35 pump stations discharging through pipes 12" or larger, shall provide for uninterrupted
36 pumping capabilities, including an in-place emergency generator. For other stations
37 emergency-pumping capability may be accomplished by connection of the station to at
38 least two independent utility substations or by providing an approved generator
39 receptacle and a portable generator. Such emergency standby system shall have sufficient
40 capacity to start up and maintain the total rated running capacity of the station. In-place
41 generators shall be equipped with an automatic transfer switch. The lift station site shall
42 include extension of the concrete driveway such that the emergency power system can be
43 operational on the driveway inside the fence and still allow access for operation and
44 maintenance of the wet well, control valves and control panel.

45
46 (xi) A telemetry and communication system shall be provided in accordance with the
47 specifications in Section J.8 of this Chapter. Extension of fiber optic cable may be
48 required when deemed necessary by the Utility Director.

1 **Table 1 - PUMP STATION DESIGN CRITERIA**

2

Design Basis	Low Pressure System		Force Main	
	7500 Max. *	7500 Max. *	7500 Max.	<= 250000 (Duplex) >250000 (Triplex)
ADF (gallons/day)	7500 Max. *	7500 Max. *	7500 Max.	<= 250000 (Duplex) >250000 (Triplex)
Type	Grinder	Grinder	Grinder	Lift Station
Size(HP)	2	3	5	10 -47
Voltage	230	230	230	230/460
Phase	Three	Three	Three	Three
Wetwell Diameter	4'	4'	4'	8'-12'
Wetwell Depth	6'-10'	Varies	Varies	Varies
Wetwell Material	Fiberglass	Fiberglass	Fiberglass	Concrete
Valve Vault		Inside Vault	Inside Vault	Above Ground No Vault
Easement (Min.)	20'x20'	20'x20'	20'x20'	Duplex -30'x45' Triplex -45'x50'

* Limited by capacity of the Low Pressure Sewer System

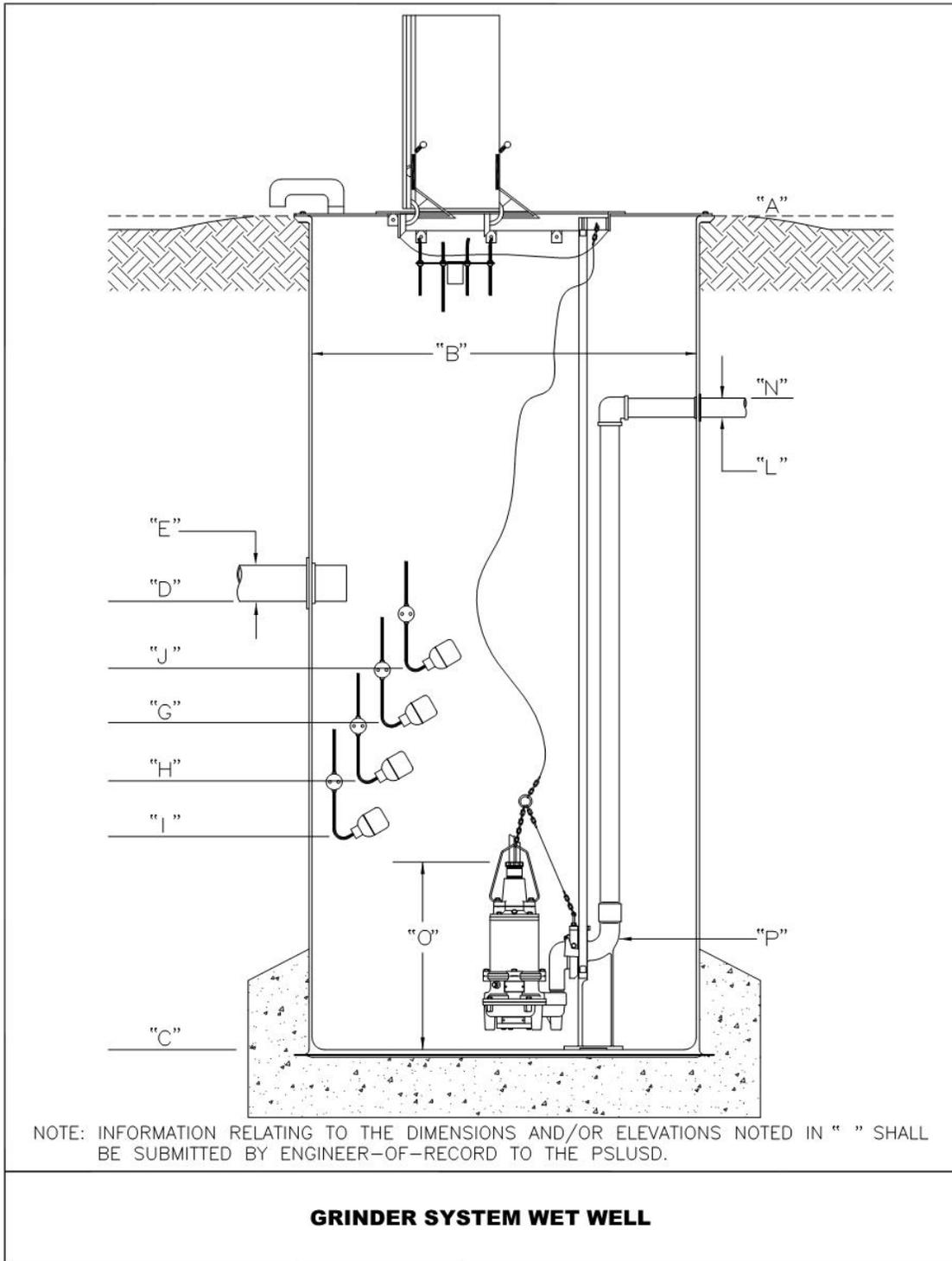
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PUMPING STATION DATA TABLE												PSLUSD Lift Station ID #					
Pump Model Number	WGL20 Mvrs Grinder	WG30H Mvrs Grinder	WG50H Mvrs Grinder	Flyvt Non-Clog	Flyvt Non-Clog	Flyvt Non-Clog	Flyvt Non-Clog	Flyvt Non-Clog	Flyvt Non-Clog	Soft Start		Flyvt Non-Clog	Flyvt Non-Clog				
										Flyvt Non-Clog	Flyvt Non-Clog						
Pump Manufacturer																	
Pump Type																	
Horse Power	2	3	5	10	10	15	20	30	47	47							
Impeller	5.5"	5.25"	5.5"														
Phase	3	3	3														
Voltage	230	230	230														
Cycles (Hz)	60	60	60														
RPM	3450	3450	3450														
Shut Off Head (ft)	105	105	120														
Best Efficiency Point Flow (gpm)	N/A	N/A	N/A														
Best Efficiency Point Head (ft)	N/A	N/A	N/A														
Pump Efficiency @ BEP Point (%)	N/A	N/A	N/A														
Run Out Flow (gpm)	40	97	95														
Run Out Head (ft)	20	28	60														
"A" Wet Well Rim Elevation (NAVD)																	
"B" Wet Well Diameter (ft)	4	4	4	8	8	8	8	12	12	12			12				
"C" Wet Well Bottom Elevation (NAVD)																	
"D" Influent Pipe Invert Elevation (NAVD)																	
"E" Influent Pipe Diameter (in)																	
"F" Lag Pump 2 On Elevation (Tri-plex only)																	
"G" Lag Pump On Elevation (NAVD)																	
"H" Lead Pump On Elevation (NAVD)																	
"I" Pumps Off Elevation (NAVD)																	
"J" Alarm Elevation (NAVD)																	
"K" Emergency Off Elevation (NAVD)																	
"L" Discharge Pipe Diameter (in)	2	3	3	6	6	6	8	8	8	8			8				
"M" Pump Out Diameter (in)	3	3	3	4	4	4	6	6	6	6			6				
"N" Discharge Pipe Elevation (NAVD)																	
"O" Pump Submergence (in)	23	34	34														
"P" Pump Discharge Diameter (in)	2	3	3														
"Q" C/L of wetwell to C/L of pump (in)	N/A	N/A	N/A														
"R" C/L of wetwell to C/L of pump bolts (in)	N/A	N/A	N/A														
"S" C/L of pump to C/L of pump (in)	20	22.75	22.75														
"T" Wet Well Hatch (in)	24	24	24														
"U" Wet Well Hatch (in)	36	36	36														
"V" Exterior Valve Vault (in)	N/A	40	40	N/A			N/A										
"W" Exterior Valve Vault (in)	N/A	50	50	N/A			N/A										
"X" Valve Vault Hatch (in)	N/A	30	30	N/A			N/A										
"Y" Valve Vault Hatch (in)	N/A	36	36	N/A			N/A										
"Z" C/L of Wet Well to Inside Edge of Hatch	N/A	N/A	N/A					0	0	0			0				

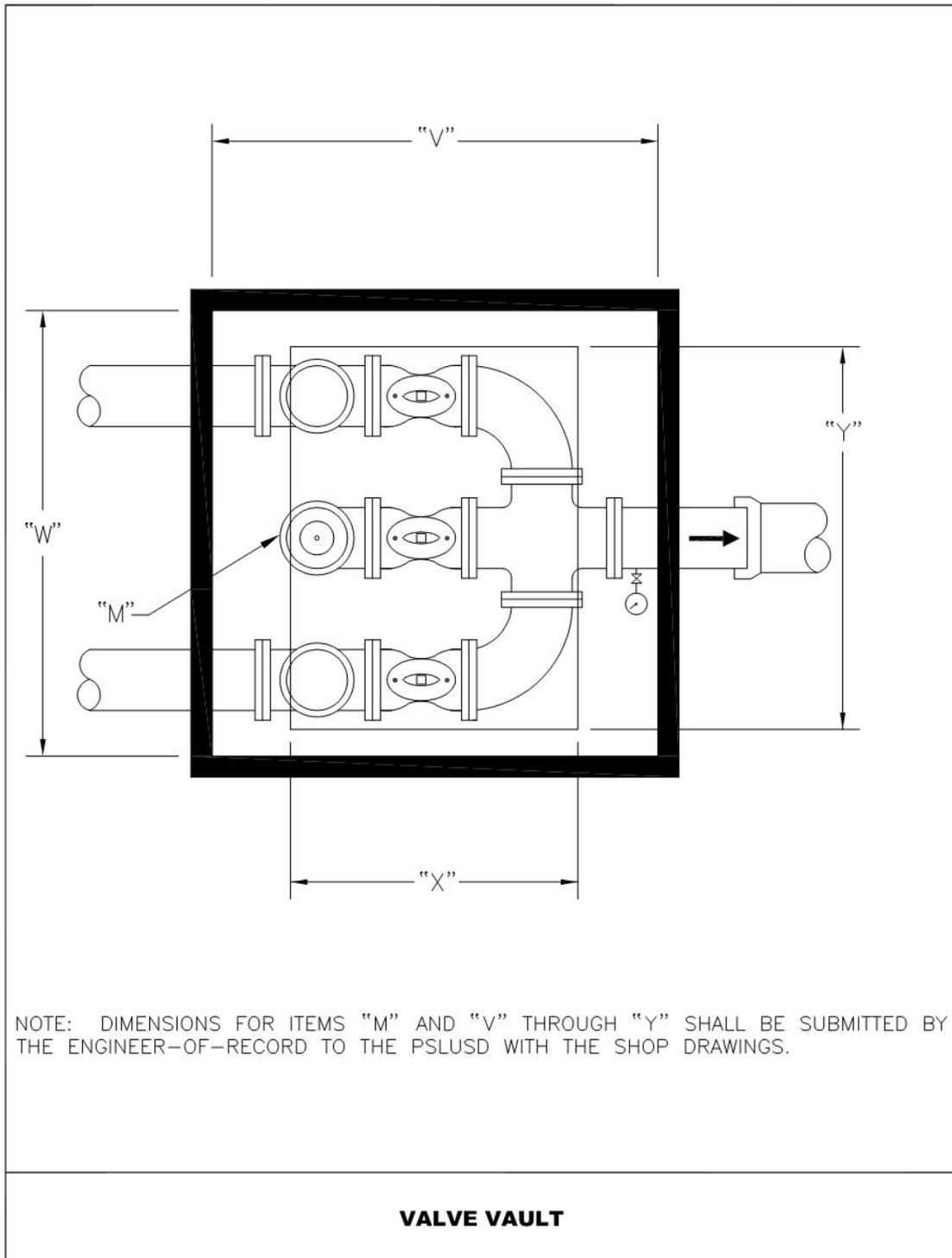
Pumping Station Data Table Notes

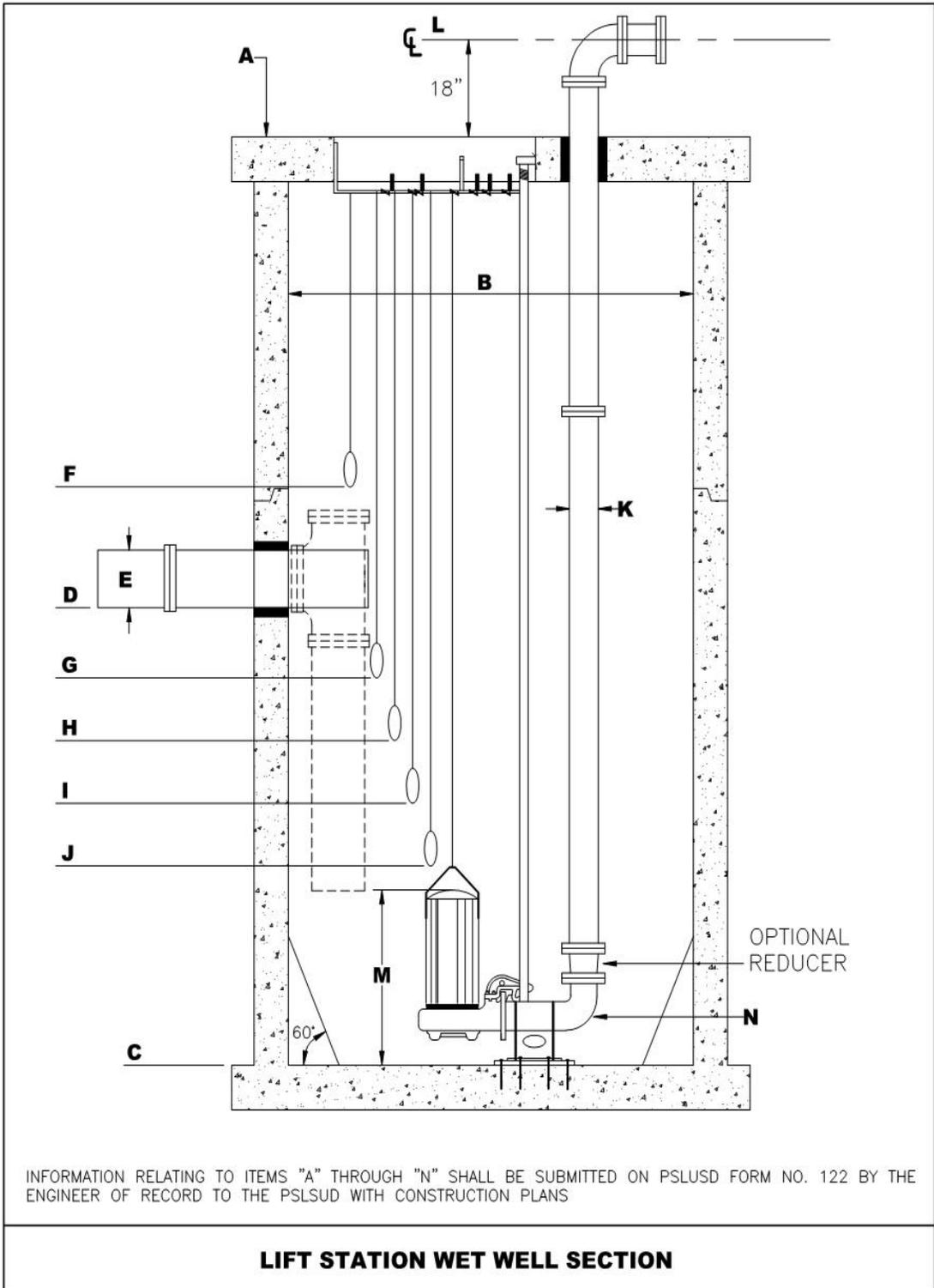
- The Engineer of Record (EOR) shall verify all dimensions shown and add or revise the specific pump information in the appropriate column as necessary, and provide additional details not shown as may be required by applicable codes and standards. All changes to these pages shall be clearly identified when submitting for approval.
- The EOR shall submit the information on this table to the PSLUSD for review and approval with all items filled in or revised for the specific pump model chosen.

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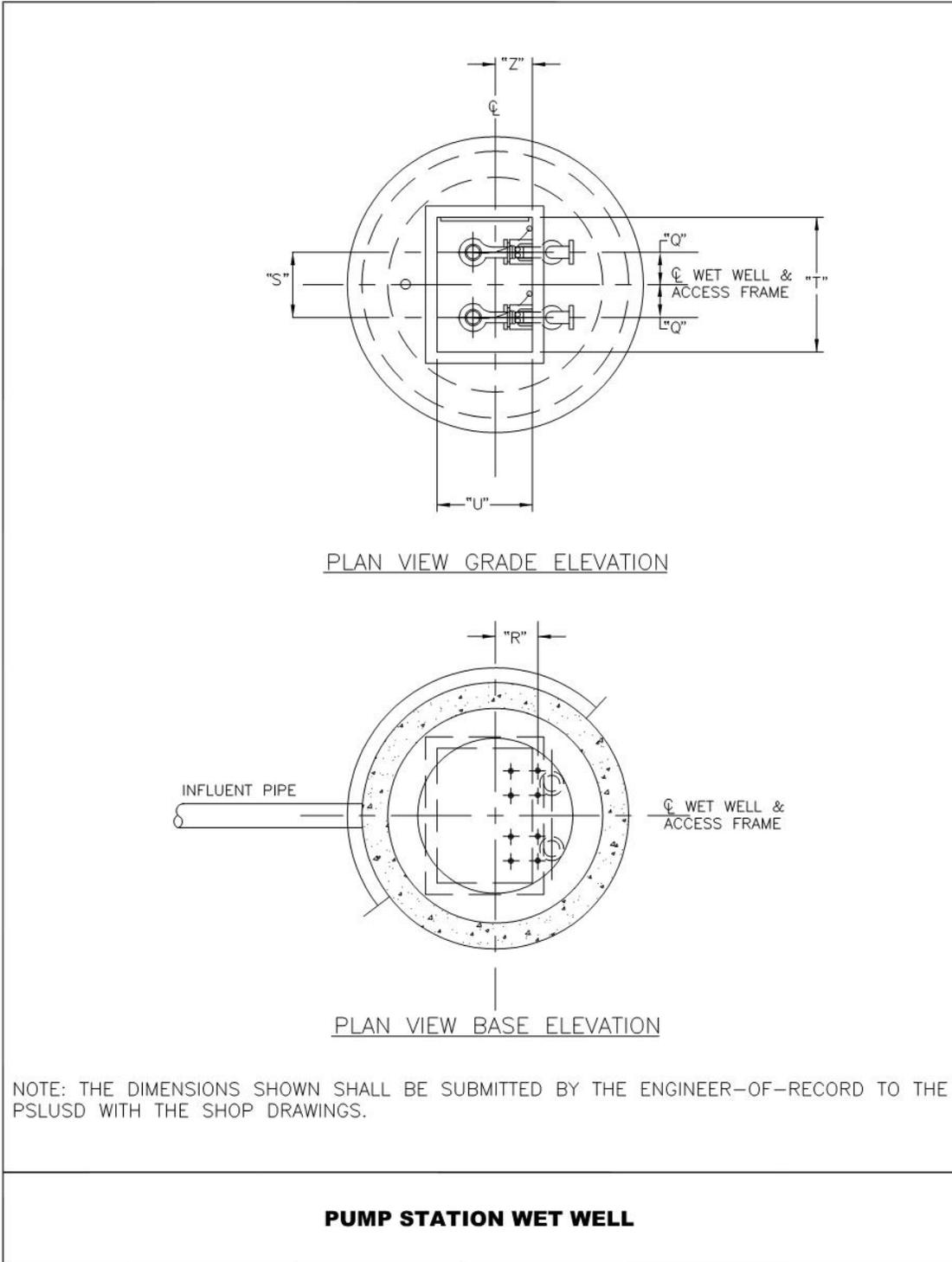


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1 **5. DESIGN CRITERIA FOR FORCE MAINS**

2
3 Force mains shall be designed in accordance with Chapter 62-604, Florida Administrative Code
4 and the criteria specified herein.

5
6 **a. Sizing:** The EOR shall clearly state the basis for design, which shall include-

7
8 (1) The PSLUSD Master Plan.

9
10 (2) The Master Plan for the development.

11
12 (3) Force mains shall generally not be less than 4” ID and with an ultimate design flow velocity
13 of no less than 2.0 fps nor greater than 5.0 fps. Force mains less than 4” in diameter or velocity
14 less than 2.0 fps may be approved by the PSLUSD on a case-by-case basis, if proper justification
15 is submitted by the EOR in writing.

16
17 **b. Layout:**

18
19 (1) In order to facilitate wastewater service for all properties within the service area, force mains
20 shall generally be extended along the full length of all fronting boundaries of a property by the
21 developer/owner.

22
23 (2) Force mains shall not be placed in ditches, landscape buffers, wetlands, and storm water
24 management areas.

25
26 (3) Separation from other mains and utilities shall be as in Section D of this Chapter.

27
28 **c. Cover:**

29
30 The minimum cover shall be 36” and a maximum of 72”.

31
32 **d. Valves:**

33
34 (1) Valves shall be designed to facilitate the isolation of each section of pipeline between
35 intersections of the grid system. The number and location of valves shall provide for flexibility
36 of operation and maintenance, while minimizing the number of customers out of service. In all
37 instances, effectiveness of placement shall be primary criteria in determining valve location.

38
39 (2) Valves shall not be placed in curbs, gutters, parking spaces, and handicap ramps.

40
41 (3) Generally, the number of valves at an intersection shall be one less than the number of pipes
42 forming the intersection.

43
44 (4) Valves shall be installed for mains near each side of a canal crossing and/or major road
45 crossing.

46
47 (5) On force mains less than or equal to 16” in diameter resilient seat gate valves shall be
48 installed at a maximum of 1000’ intervals and branches of intersecting force mains on tees and

1 wyes and at force main stubs. On force mains greater than 16", valves shall be located at a
2 maximum of 2500' intervals.

3
4 (6) Air valves shall be placed at all canal crossings, high points and at other locations specified
5 by the PSLUSD. The EOR shall consult with the PSLUSD regarding the type of valve to be used
6 and its location. For below ground installation the valve shall be located inside a maintenance
7 access structure as shown in the standard details. Valves shall be sized as per the manufacturer's
8 recommendation.

9 10 **6. DESIGN CRITERIA FOR LOW PRESSURE SEWER SYSTEMS**

11
12 a. LPSS shall be designed in accordance with the "Design and Specification Guidelines for Low
13 Pressure Sewer Systems", prepared by a Technical Advisory Committee for the State of Florida
14 Department of Environmental Protection (FDEP), and the PSLUSD utility standards.

15
16 b. Separation to other mains and utilities shall be as in Section D of this Chapter.

17
18 c. The minimum cover shall be 36" and a maximum of 72".

19 20 **7. DESIGN CRITERIA FOR RECLAIMED WATER MAINS**

21
22 a. Reclaimed water mains shall be designed in accordance with Chapter 62-610, Florida
23 Administrative Code and this manual.

24
25 b. In order to facilitate service for all properties within the service area, reclaimed water mains
26 shall generally be extended along the full length of all fronting boundaries of a property by the
27 developer/owner.

28
29 c. Separation to other mains and utilities shall be as in Section D of this Chapter.

30
31 d. The pipes shall be PVC and meet the specification outlined in Section J.4 of this Chapter.

32
33 e. The minimum cover shall be 36" and a maximum of 72".

34 35 **8. DESIGN CRITERIA FOR RECLAIMED WATER METERING STATIONS**

36
37 a. An engineering report and construction plans prepared by the EOR shall be submitted to the
38 PSLUSD for review and approval.

39
40 b. Design shall incorporate the requirements included in section J.10.

41 42 **I. QUALIFIED PRODUCT LIST (QPL)**

43
44 1. Products listed on the QPL have been approved by PSLUSD for use in the construction of
45 water, wastewater and reclaimed water facilities. Prior to the pre-construction meeting, the
46 contractor shall submit to PSLUSD a list of products and equipment to be installed circled on the
47 QPL. Any materials not listed in the QPL shall require submittal of shop drawings approved by
48 the EOR, and review by the PSLUSD prior to ordering the materials. Use of products on the
49 QPL will expedite the review and approval process and is, therefore, encouraged. If the applicant

1 prefers to use other products it is strongly suggested that a request be submitted to include such
2 products on the QPL.

3
4 2. The PSLUSD reviews new products through the Product Evaluation Committee (PEC). The
5 PEC provides technical information to the Utility Director regarding the inclusion or exclusion
6 of products on the Qualified Products List. The goals of the PEC are to:

7
8 a. Review and evaluate new and existing technologies and products for potential application in
9 the rehabilitation and expansion of the PSLUSD utility system.

10
11 b. Encourage standardization and interchangeability of parts/products.

12
13 c. Provide the Utility Director with technically sound information regarding new and existing
14 products.

15
16 3. The PEC consists of PSLUSD staff members and meets during the month of May and October
17 each year.

18
19 4. The New Product Review Application Package contains instructions on how to complete the
20 application form and list the necessary documentation required supporting the application. A
21 total of seven (7) copies of the completed application form, together with all the supporting
22 documentation, shall be submitted to the PEC Chairperson by April 1st for the May meeting and
23 September 1st for the October meeting. The New Product Review Application Package and
24 application form can be downloaded from the city website at
25 www.cityofpsl.com/utility/commercial-development/utility-commercial-development.html.

26
27 5. The product representative will be notified, in writing, that the New Product Review
28 Application has been received and whether it is administratively complete. If items are found to
29 be incomplete, the application will not be reviewed by the PEC until all sections of the
30 application are complete. Applications that are not properly completed and are not returned to
31 the PEC within 60 days of the notice of an incomplete application shall be considered void, and
32 the process must be started over.

33
34 6. An administratively complete application will be reviewed at the next scheduled meeting of
35 the PEC. The PEC shall present to the Utility Director all pertinent information related to the
36 product including performance, costs for labor and materials, comparison with currently
37 approved products, references from other users, spare parts availability, standardization, financial
38 stability of the manufacturer, etc.

39 7. The PEC may also review a previously approved product that is on the QPL and provide the
40 Utility Director with technically sound information for decision-making purposes. Prior to the
41 PEC meeting, the product representative will be notified of the PSLUSD's concern with the
42 product and will be offered an opportunity to meet with the PEC. The Utility Director may then
43 approve or disapprove the inclusion/exclusion of a product on the QPL.

44
45 8. The Utility Director may approve use of products for trial periods of up to five (5) years prior
46 to inclusion in the QPL. Products acquired for such trial periods may be provided free of charge
47 by the vendor or may be purchased sole source with the concurrence of the Utility Director. The
48 Utility Director may require that in order for a product to be used on a trial basis, a performance
49 bond be posted in the amount equal to all inclusive cost associated with the product's removal

1 and replacement. The Director may also cancel the use of the product at any time during the trial
2 period.

3
4 **J. MINIMUM TECHNICAL SPECIFICATIONS AND CONSTRUCTION STANDARDS**

5
6 This section includes the specification of materials; construction standards and contractor
7 responsibilities associated with the installation of water, wastewater and reclaimed water
8 facilities. These specifications relate to construction and installation work associated with the
9 following:

- 10
11 1. EARTHWORK, EXCAVATION, BACKFILL AND COMPACTION
12
13 2. JACK AND BORE
14
15 3. DIRECTIONAL BORING
16
17 4. PIPE AND FITTINGS
18
19 5. VALVES AND APPURTENANCES
20
21 6. GRAVITY SEWER
22
23 7. INTERCEPTORS
24
25 8. WASTEWATER PUMP STATIONS
26
27 9. PIPELINE CLEANING – POLYPIG METHOD
28
29 10. RECLAIMED WATER METERING STATION
30
31 11. CONDUIT AND PULL BOXES FOR FIBER OPTIC CABLE

32
33
34 **1. EARTHWORK, EXCAVATION, BACKFILL & COMPACTION**

35
36 **a. GENERAL**

37
38 The provisions set forth in this section shall be applicable to all underground water, wastewater
39 and reclaimed water main installations, unless deviations are approved in writing by the Engineer
40 of Record (EOR) and the PSLUSD.

41
42 (1) The contractor shall be responsible for furnishing of all labor, materials, equipment and
43 incidentals required to properly perform clearing, grubbing, filling of undeveloped rights-of-way
44 or corridors, excavation, backfill and compaction for all water, wastewater and reclaimed water
45 facilities, as shown on the approved plans and as specified herein. Imported material, provided
46 by the Contractor, shall be at no additional expense to the PSLUSD unless specifically stated.

47
48 (2) All excavations shall be properly shored, sheeted and braced or cut back at the proper slope
49 to provide safe working conditions, to prevent shifting of material, to prevent damage to

1 structures or other work, and to avoid delay to the work, all in compliance with the Occupational
2 Safety and Health Act (OSHA), the State of Florida Trench Safety Act, and under Section 107 of
3 the Contract Work Hours and Safety Standards Act. In all cases where a conflict exists in the
4 requirements of OSHA, the Florida Trench Safety Act, and these specifications, the requirements
5 that are more stringent shall prevail.
6

7 (3) The EOR or EOR's representative shall inspect the work as needed in order to comply with
8 the permit requirements, certify the project and ensure a quality constructed project. This may
9 include additional inspections other than scheduled inspections with the PSLUSD. The
10 Contractor shall provide appropriate notice to the EOR to allow time for scheduling. No work
11 shall be covered up, nor test results accepted unless witnessed by the EOR. Inspections by the
12 EOR shall not be performed in lieu of inspections required by the City, County or Federal
13 requirements.
14

15 **b. SUBMITTALS**

16
17 Contractor shall obtain necessary permits for any required dewatering activity in accordance with
18 the applicable governmental agencies. These permits must be submitted to the PSLUSD and
19 EOR prior to construction.
20

21 **c. MATERIALS**

22
23 (1) Fill and backfill material shall be clean, fine earth, granular shell, or sand, free of vegetation
24 or organic material. Material may be from onsite excavation or may be imported. The contractor
25 shall supply load tickets on every truck of fill, which identify and confirm the source of fill.
26

27 (2) Suitable materials for fills shall be classified as A-1, A-3 or A-2-4 in accordance with
28 AASHTO Designation M-145 and shall be free from vegetation and organic material. Not more
29 than 12 % by weight of fill material shall pass the No. 200 sieve, and no particle shall be larger
30 than 1" in diameter. The Contractor shall furnish all additional fill material required.

31 (3) Suitable material for fills to be placed in water shall be classified as A-1 or A-3 in accordance
32 with AASHTO Designation M-145.
33

34 (4) Unsuitable materials are classified as A-2-5, A-2-6, A-2-7, A-4, A-5, A-7 and A-8 in
35 accordance with AASHTO Designation M 145 or soils, which cannot be compacted to specified
36 percentage of maximum density.
37

38 All fill shall be placed with moisture content within 2% of the optimum moisture content.
39

40 **d. CLEARING, GRUBBING AND STRIPPING**

41
42 (1) All clearing work shall be done for the full width of the corridor area or right-of-way shown
43 on the approved plans.
44

45 (2) Existing vegetation including trees, roots and stumps shall be removed from the corridor
46 areas. Damage to trees or other items outside of the corridor area shall be prevented. If damage
47 occurs, the contractor shall be responsible for repairs or replacement. The contractor shall
48 dispose of all vegetation material and trash removed from the site to a permitted disposal facility
49

1 **e. FILLING & GRADING**
2

3 (1) Future roadway elevations are shown on the drawings when available from construction
4 plans on file with the Owner or proposed by others. These elevations shall be used as guides for
5 the filling and grading of the corridor.
6

7 (2) All filling and grading work shall be done to provide corridor access and suitable conditions
8 in preparation for utility pipeline construction.
9

10 **f. EXCAVATION**
11

12 (1) Unsuitable material shall be removed from the corridor area only as necessary for access and
13 pipeline construction
14

15 (2) The maximum amount of open excavation/trench permitted in any one location shall be the
16 length necessary to accommodate the amount of pipe installed in a single day. All excavation/
17 trenches shall be fully backfilled at the end of each day. Barricades and warning lights meeting
18 OSHA requirements shall be provided and maintained.
19

20 (a) **Trench Dimensions:** The minimum width of the excavation/ trench shall be equal to the
21 outside diameter of the pipe, plus the minimum necessary to obtain proper utility facility
22 excavation backfill and compaction requirements; the maximum width of trench, measured at the
23 top of the pipe, shall not exceed the outside pipe diameter plus two feet, unless otherwise shown
24 on the drawing details or approved by the EOR.
25

26 (b) **Trench Grade:** Standard trench grade shall be defined as the point of contact between the
27 utility facility and the soil. Excavation/ trench grade for utilities in rock or other non-cushioning
28 material shall be defined as 6" below the outside of the bottom of the utility, which 6" shall be
29 backfilled with extra utility bedding material. Excavation below trench grade shall be backfilled
30 to trench grade with granular material placed in appropriate lift thicknesses, compacted, and
31 meet density requirements stated herein.
32

33 (c) **Utility Bedding:** The bottom of the trench shall be shaped to provide firm bedding for the
34 utility facility/ pipe. The utility shall be firmly bedded in firm soil, or hand-shaped unyielding
35 material. The bedding shall be shaped so that the pipe will be in continuous contact therewith for
36 its full length and shall provide a minimum bottom segment support for the pipe equal to spring
37 line of the pipe or one-half of the outside diameter of the barrel. Special bedding may be
38 required, due to depth of cover, impact loadings, or other conditions.
39

40 (d) **Unsuitable Material Below Trench Grade:** Soil unsuitable for a proper foundation
41 encountered at or below trench grade, such as muck or other deleterious material, shall be
42 removed for the full width of the trench and to the depth required to reach suitable foundation
43 material, unless special design considerations receive prior approval from the PSLUSD and
44 EOR. Backfilling below trench grade shall be in compliance with the applicable provisions of
45 "Backfilling", with material as specified in Section g. - Backfill.
46

47 (e) **Extra Utility-Bedding Material:** When rock or other non-cushioning material is
48 encountered at trench grade, excavation shall be extended to six inches below the outside of the

1 bottom of the utility, and a cushion of granular material shall be provided. Utility-bedding
2 material shall be installed as specified in Section g. - Backfill.

3
4 (f) **Sheeting and Bracing:** In order to prevent damage to property, injury to persons, erosion,
5 cave-ins, or excessive trench widths, adequate sheeting and bracing shall be provided, as
6 required within these specifications, in accordance with accepted standard practice. When the
7 situation arises, sheeting and bracing shall be used as necessary to protect the integrity of the
8 road shoulder. Sheeting shall be removed when the trench has been backfilled to at least one-half
9 its depth, or when removal would not endanger the construction of adjacent structures. Upon
10 written approval from the EOR and the City, to eliminate excessive trench width or other
11 damage, sheeting, bracing, or shoring shall be left in place and the top cut off at an elevation of
12 5.0 feet below finished grade or 1.0' above top pipe whichever is less, unless otherwise directed.
13 All sheeting and bracing will be in accordance with OSHA and the Florida Trench Safety Act.

14
15 (g) **Excavated Material:** Suitable material to be used for backfill shall be neatly and safely
16 deposited at the sides of the excavations/ trenches where space is available. The contractor will
17 make every effort to segregate any and all unsuitable material and isolate it from the clean fill
18 intended for backfilling. Whenever possible, excavated material near a roadway should be
19 deposited on the right-of-way side of the trench away from the travel-way. Where temporary
20 stockpiling of excavated material is required, the Contractor shall be responsible for transporting
21 the material to and from the stockpile site. No excavated material shall be placed within roadside
22 swales for longer than that days work.

23
24 (h) **Excess Fill Material:** Clean excess fill shall be the property of the City. The Contractor shall
25 deliver and stockpile this material to areas designated by the City, within the City limits.

26 Resale of excavated material on the project site will not be permitted.

27
28 (i) **Material Disposal:** Unsuitable fill material or cleared and grubbed material resulting from
29 the utility installation shall be removed from the work site and disposed of at location(s) secured
30 by the Contractor, and in accordance with the agency having jurisdiction.

31
32 (j) **Borrow:** Should there be insufficient satisfactory material from the excavations to meet the
33 requirements for fill material, borrow shall be obtained from pits secured by the Contractor. All
34 borrow shall meet the provisions of these specifications.

35
36 (k) **Dewatering:**

37
38 (i) Utilities shall be laid "in the dry", unless otherwise approved in writing by the
39 PSLUSD and EOR. The contractor, at no direct cost to the PSLUSD, shall perform all
40 dewatering activity required for facilities to meet PSLUSD Standards. Dewatering
41 systems shall be utilized in accordance with good standard practice and must be efficient
42 enough to lower the water level in advance of the excavation and maintain it continuously
43 to keep the trench bottom and sides firm and dry.

44
45 (ii) Trench excavations shall be dewatered by using the well point system, sumps with
46 pumps or other method(s), as approved by the EOR. If the material encountered at trench
47 grade is suitable for the passage of water without destroying the sides or utility
48 foundation of the trench, sumps with pumps may be provided.

1 (iii) Discharge from dewatering shall be disposed of in such a manner that it will not
2 interfere with normal drainage of the area in which the work is being performed, create a
3 public nuisance, or cause flooding. All discharge shall be in accordance with SFWMD
4 issued permits. The operations shall not cause damage to any portion of the work
5 completed, or in progress, or to the surface of streets, or to private property. Prior to
6 construction the EOR and applicable regulatory agencies, shall approve the proposed
7 dewatering method(s) and schedule. Additionally, where private property will be
8 involved, the contractor shall obtain advance permission from the property owner.
9

10 (l) **Obstructions:** It shall be the contractor's responsibility to become acquainted with existing
11 conditions and to locate structures and utilities along the proposed utility alignment in order to
12 avoid conflicts. Where actual conflicts are unavoidable, work shall be coordinated with the
13 facility owner and performed so as to minimize any adverse impact on the use of affected
14 property. All affected utilities shall be notified prior to excavation in their vicinity.
15

16 **g. BACKFILL**

17
18 (1) **General:**

19
20 (a) Backfill of all excavations shall be conducted as promptly as the work permits, but not until
21 completion of the following:
22

23 (i) Completion of construction below finish grade.

24 (ii) Inspection, testing, approval and recording locations of underground utilities.

25 (iii) Removal of shoring, and bracing, and backfilling of voids with satisfactory materials.
26

27 (iv) Removal of trash and debris.
28

29 (v) Permanent or temporary horizontal bracing which is in place on horizontally
30 supported walls.
31

32
33 (b) Backfilling shall be divided into two specified areas:
34

35 (i) Trench grade to a point 12" above the top of the utility, shall be referred to as initial
36 backfill
37

38 (ii) From the top of the pipe to the bottom of the sub-grade if under pavement, or profile
39 grade if the pipe is not under pavement shall be referred to as final backfill
40

41
42 (c) Where encasements or other below grade concrete work have been installed, backfilling
43 shall not proceed until the concrete has obtained sufficient strength to support the backfill load.
44

45 (d) All restraints and conflicts shall not be backfilled until approved by the PSLUSD.
46
47

1 (2) **Initial Pipe Backfill:** No pipe backfill shall be placed until approved in writing by the City.
2 Backfill material shall be carefully placed and tamped around the lower half (spring line) of the
3 utility. Backfilling shall be carefully continued until the fill is 12” above
4 the top of the utility in layers not exceeding 12” (un-compacted thickness), using the best
5 available material from the excavation, if approved. The material shall be lowered to within two
6 feet above the top of the previously compacted lift before it is allowed to fall. Initial backfill
7 shall exclude organic matter and or deleterious material, stones, or rock fragments larger than
8 one inch for PVC pipe. Compaction of each lift shall be equal to 98 % of maximum density as
9 determined by AASHTO T-180.

10
11 (3) **Final Pipe Backfill:** The remainder of the trench, above initial backfill shall be backfilled
12 and compacted in layers not exceeding 12” (un-compacted thickness), per lift. Compaction of
13 each lift shall be equal to 98 % of maximum density as determined by AASHTO T- 180.

14
15 (4) **Structure Backfill:** Prior to backfill, all structures shall have one foot increments marked in
16 spray paint on a minimum of one side; lines and footage must be visible from outside of the
17 excavation. Backfill material shall be carefully placed and tamped around the structure with the
18 first lift of material starting at the bottom of the structure. Backfilling shall be continued in layers
19 not exceeding 12” (un-compacted thickness). Backfilling shall be continued until the fill is at
20 plan grade. The material shall be lowered to within two feet above the top of the previously
21 compacted lift before it is allowed to fall. Backfill shall exclude organic matter and or deleterious
22 material, stones, or rock fragments larger than one inch. Compaction of each lift shall be equal to
23 98% of maximum density as determined by AASHTO T-180.

24
25 (5) **Shoulder Restoration:** All shoulder restoration shall be in accordance with the applicable
26 permit requirements of the agency having jurisdiction. In excavated locations outside a
27 2(horizontal) to 1(vertical) slope downward from the shoulder line or the back of the curb,
28 backfill (initial and final) shall be compacted to a density equal to 98% of maximum density, as
29 determined by AASHTO T-180.

30
31 (6) **Non-Structural Backfill:** When approved in writing by the EOR and PSLUSD, non-
32 structural backfill can be used and compacted to a density of 95% of maximum density as
33 determined by AASHTO T-180.

34 35 **h. COMPACTION**

36
37 (1) **Compaction Methods:** Specified compaction shall be accomplished using accepted standard
38 methods (powered tampers, vibrators, etc.), with the exception that the initial backfill below 12”
39 over top of pipe shall be compacted by hand-operated tamping devices. Flooding with water to
40 consolidate backfill is not acceptable.

41 42 (2) **Density Tests:**

43
44 (a) Density tests for determination of the above-specified compaction shall be made by a
45 testing laboratory selected by the PSLUSD and the EOR. If any test results are unsatisfactory to
46 the City or the EOR, the contractor shall re-excavate, re-compact the backfill, and retest, at his
47 expense until the desired compaction is obtained. Additional compaction tests shall be made to
48 each side of an unsatisfactory test, as directed, to determine the extent of re-excavation and re-

1 compaction necessary. All costs associated with additional testing required to verify that all
2 specifications have been met shall be borne by the contractor.

3
4 (b) Acceptance Density Testing for Pipe: The first lift of testing shall start with the bedding
5 material under the utility pipe for all gravity sewer main. The PSLUSD or the EOR may require
6 density under the pipe for all pressure pipe. All bedding material shall have passing density
7 tests prior to installation of utilities. All density testing shall be completed with a Nuclear
8 Density Gauge or Drive Cylinder Method per ASTM D-2397. The second lift of testing shall
9 be along the sides of the pipe, after the first lift of backfill is placed. A lift of backfill shall be
10 considered passing when the criteria of the lift being firm, unyielding, and passing a density test
11 using the appropriate proctor is met as determined by the Geotechnical Engineering Firm. No
12 backfill for the subsequent lift shall be placed until such time as the underlying lift has met
13 acceptance criteria. "Stepping, Sloping, or digging down" to take density tests on an underlying
14 lift of backfill is prohibited. Each lift of backfill is to be placed and meet acceptance criteria prior
15 to any portion of the subsequent lift of backfill material being placed in the excavation/trench.

16
17 (c) Acceptance Density Testing for Structures: (interceptors, man holes, wet wells, valve
18 vaults, etc.): The first lift of testing shall start below the bottom center of the structure, prior to
19 placement. All density testing shall be completed with a Nuclear Density Gauge or Drive
20 Cylinder Method per ASTM D-2397. The Drive Cylinder Method (ASTM D-2937) may be used
21 if approved in writing by the EOR and PSLUSD in certain cases. A lift of backfill shall be
22 considered passing when the criteria of the lift being firm, unyielding, and passing a density test
23 using the appropriate proctor is met. No backfill for the subsequent lift shall be placed until such
24 time as the underlying lift has met acceptance criteria. "Stepping, Sloping, or digging down" to
25 take density tests on an underlying lift of backfill is prohibited. Each lift of backfill is to be
26 placed and meet acceptance criteria prior to any portion of the subsequent lift of backfill material
27 being placed in the excavation/trench.

28
29 NOTE: If the question of accuracy of moisture levels arises due to any given lift being yielding
30 or "pumping". A Calcium Carbonate Moisture Test (Speedy) shall be performed to determine if
31 actual moisture levels are within the acceptable limits established by the proctor test. Any soils
32 that appear soft, pumping or otherwise yielding as determined by the EOR, PSLUSD or testing
33 laboratory personnel will not be considered to have met the compaction specifications stated
34 herein.

35
36 (d) A signed and sealed density logbook, on 8.5 x 11" paper, with all densities graphed, equal
37 to that accepted by FDOT, shall be submitted to the PSLUSD with the as-built plans seven days
38 prior to final inspection. Copies of the density test reports and proctor, shall be submitted to the
39 PSLUSD within 7 calendar days of the test taken in the field. An electronic copy in PDF format
40 shall be submitted.

41
42 (e) No more than 2 tests over 100% will be accepted on any given section of testing. If results
43 over 100% continue, a new proctor shall be taken.

44
45 (3) **Location of Density Tests for Pipe:** Density tests for determination of the specified densities
46 shall be made on each individual section of trench backfilled and compacted during each work
47 day's production or every 200', whichever is less. At least three density tests shall be taken
48 under each roadway cut, per lift of backfill. Test locations shall be staggered and random as

1 determined by the testing lab. Additional test locations may be requested by the EOR or
2 PSLUSD.

3
4 **(4) Location of Density Tests for Structures:** Density tests for determination of the specified
5 densities shall be made on each individual lift of backfill with, two tests per lift, randomly
6 chosen around the structure. One test shall be within two feet of structure walls, and the second
7 test shall cover the remaining excavation backfill for the structure. A lift of backfill shall be
8 considered passing when the criteria of the lift being firm, unyielding, and passing a density test
9 using the appropriate proctor is met. No backfill for the subsequent lift shall be placed until such
10 time as the underlying lift has met acceptance criteria.

11
12 **(5) Submittal of Density Test Results:** Density test results shall be submitted to the PSLUSD
13 no later than 7 calendar days after the field test is taken. The inspections required for items noted
14 below shall not be scheduled until such time as the density test results have been approved by the
15 PSLUSD.

- 16
17 (a) Pressure/leak testing
18 (b) Concrete pad formwork/rebar placement
19 (c) Installation of manholes
20 (d) Infiltration/Exfiltration test
21 (e) Deflection test
22 (f) Installation of lift station/grinder structures/valve vaults

23
24
25 **See examples of density log books and blank forms on our website.**

26 27 28 29 **2. JACK AND BORE**

30 **a. GENERAL**

31
32 (1) The contractor shall be responsible for furnishing of all labor, materials, equipment and
33 incidentals required to complete the jack and bore installations as shown on the approved plans
34 and as specified herein.

35
36 (2) The provision of this section shall be the minimum standards for the installation of casing
37 pipe by the jack and bore method. Other types of trenchless methods may be acceptable and
38 encouraged if the specific method is at least equal to the performance of typical jack and bores.

39 40 **b. CASING PIPE MATERIALS**

41
42 (1) Casings shall be steel pipe conforming to the requirements of ASTM Designation A-139. The
43 minimum casing pipe size and wall thickness shall be as shown on the approved plans. For sizes
44 not included therein, or for special design considerations, approval shall be obtained from the
45 Engineer of Record (EOR) and PSLUSD.

46
47 (2) For crossing of state roads, casing materials and installation shall conform to FDOT
48 Standards, latest edition.

1
2
3
4 **c. CARRIER PIPES**
5

6 (1) Water, wastewater and reclaimed water carrier pipes to be installed within the specified
7 casings shall be equipped with restrained joint connections.
8

9 (2) Pipe and fittings shall comply with the applicable provisions of these standards.
10

11 **d. CASING INSULATORS**
12

13 (1) Non-corrosive casing insulators shall be used.
14

15 (2) The casing runner height shall be large enough so that it does not interfere with the pipe-
16 restrained joints.
17

18 (3) Stainless steel nuts and bolts shall be used.
19

20 (4) Installation and spacing of casing insulators shall be as required by the manufacturer.
21

22 **e. INSTALLATION**
23

24 (1) Casing pipes crossing under roadways/railroads shall be located at suitable approved
25 alignments in order to eliminate possible conflict with existing or future utilities and structures,
26 with a minimum 36" depth of cover between the top of the casing pipe and the surface of the
27 roadway. For casing pipe crossings under roadways/railroads, the contractor shall comply with
28 the regulations of jurisdictional authority in regard to design, specifications, and construction.
29 Casing installations shall be as specified in the Florida Department of Transportation, "Utility
30 Accommodation Guide", and for railroads the American Railway Engineering Association.
31

32 (2) The jack and bore operations shall be conducted simultaneously with continuous installation,
33 until the casing pipe is in final position. Correct line and grade shall be carefully maintained.
34 Add-on sections of casing pipe shall be full-ring welded to the preceding length, developing
35 watertight total pipe strength joints. The casing installation shall produce no upheaval,
36 settlement, cracking, movement, or distortion of the existing roadbed or other facilities.
37 Following placement of the carrier pipe within the steel casing, end link seals are to be installed
38 at each open end. Said end link seals shall be suitable for restraining the external earth load,
39 while allowing internal drainage.
40

41 (3) Casing pipe holes shall be mechanically bored through the soil by a cutting head on a
42 continuous auger mounted inside the pipe. The distance between the leading end of the first
43 auger section and the leading end of the casing shall be as necessary to maintain a solid plug of
44 spoil material inside the forward portion of the casing.
45

46 (4) The casing pipe shall be adequately protected to prevent crushing or other damage under
47 jacking pressures. Backstops shall be provided for adequately distributing the jack thrust without
48 causing deformation of the soil or other damage. Should the casing pipe be damaged, such
49 damaged portion not in the hole shall be replaced; however, if installed, the encasement pipe

1 shall be abandoned in place, grouted full, and suitably plugged, and an alternate installation
2 made. An alternate installation will also be required if the casing alignment or elevation
3 substantially deviates from the plan locations, and results in the installation being unusable, as
4 determined by the PSLUSD and EOR.

5
6 (5) Required jack and bore pits or shafts shall be excavated and maintained to the minimum
7 dimensions necessary to perform the operation. Said excavations shall be adequately barricaded,
8 sheeted, braced and dewatered, as required, in accordance with the applicable portions of Section
9 J.1 of this Chapter - "Earthwork, Excavation, Backfill and Compaction" and applicable
10 regulations/specifications. The pits will normally be no closer than 5' from the edge of
11 pavement, with the permitting agency having final determination of the required setback
12 distance.

13 **3. DIRECTIONAL BORING**

14 **a. GENERAL**

15
16
17
18 (1) Portions of pressure mains shall be installed by the directional boring method within the
19 limits indicated on the approved plans and as specified herein. Generally, as a minimum, the
20 pressure main is to be located within the road right-of-way or easement and shall be installed by
21 directional boring. Piping not designated for installation by a specific method may be installed
22 by open trench or directional boring, as approved by the Engineer of Record (EOR) and the
23 PSLUSD.

24
25 (2) The contractor shall be responsible for furnishing of all labor, materials, equipment and
26 incidentals required to perform trenchless installation of pressure mains, as shown on the
27 approved plans and as specified herein.

28
29 (3) The contractor is required to bring to the attention of the EOR any known design
30 discrepancies with actual tunneling methods that the contractor will be performing, no later than
31 the pre-construction meeting.

32 **b. CONTRACTOR'S EXPERIENCE**

33
34
35 (1) The contractor must demonstrate expertise in trenchless methods by providing a list of ten
36 utility references for which similar work has been performed in the last two years. The name and
37 telephone number of the references shall be included so contact can be made to verify the
38 contractor's capability. Also, the contractor must provide documentation showing successful
39 completion of the projects used for reference. Conventional trenching experience is not sufficient
40 to demonstrate expertise in trenchless methods.

41
42 (2) All supervisory personnel must be adequately trained and will have at least four years
43 experience in directional boring. The contractor will have to submit the names and resumes of all
44 supervisory field personnel prior to construction. In order to save time the contractor may wish to
45 provide multiple experienced directional boring crews.

46 **c. SUBMITTALS**

1 (1) Technical data must be submitted for equipment including clay slurry material, method of
2 installation with working drawings, and proposed sequence of construction for approval by the
3 EOR and PSLUSD.
4

5 (2) Prior to approval for directional boring, the contractor must submit the names of supervisory
6 field personnel and historical information of directional boring experience. In addition, the
7 contractor must submit for approval nameplate data for the drilling equipment, mobile spoils
8 removal unit, and Material Safety Data Sheets (MSDS) information for the drilling slurry
9 compounds.
10

11 **d. INSTALLATION**

12

13 (1) Installation shall be in accordance with APWA publication “Trenchless Technology
14 Applications in Public Works” and in a trenchless manner producing continuous bores.
15

16 (2) The tunneling system shall be remotely steerable and permit electronic monitoring of tunnel
17 depth and location. Accurate placement of pipe within a ± 2 ” window is required both
18 horizontally and vertically. Turning capability of 90° is required. Continuous monitoring of the
19 boring head is required, including across open water if necessary.
20

21 (3) The directional boring contractor will be required to submit certification, by a Professional
22 Engineer and a Professional Land Surveyor licensed in the State of Florida, that the directional
23 boring has been performed in accordance with the approved plans, and provide signed and sealed
24 as-built drawings of the installation.
25

26 (4) Tunneling must be performed by a fluid-cutting process (high pressure-low volume) utilizing
27 a liquid clay, i.e. bentonite. Liquid clay type colloidal drilling fluid shall consist of at least 10%
28 high-grade, carefully processed bentonite to consolidate cuttings of the soil, to seal the walls of
29 the hole, and to furnish lubrication for subsequent removal of cuttings. In addition, the clay fluid
30 must be totally inert and contain no environmental risk.
31

32 (5) The contractor must have a mobile vacuum spoils recovery vehicle on-site to remove the
33 drilling spoils from the access pits. The spoils must then be transported from the job site for
34 proper disposal. Under no circumstances will the drilling spoils be permitted to be disposed of
35 into sanitary or storm sewers, public or private drainage systems, and surface waters.
36

37 (6) Mechanical, pneumatic, or water-jetting methods will be considered unacceptable. After an
38 initial bore has been completed, a reamer will be installed at the termination pit and the pipe will
39 be pulled back to the starting pit. The reamer must also be capable of discharging liquid clay to
40 facilitate the installation of the pipe into a stabilized and lubricated tunnel. Upon completion of
41 boring and pipe installation, the contractor will remove all spoils from the starting and
42 termination pits. All pits will be restored to their original condition.
43

44 **e. RESTORATION OF PAVED, IMPROVED & UNIMPROVED AREAS**

45

46 The shoulders, ditches, banks and slopes of roads and railroads crossed and paralleled shall be
47 restored to their former condition and properly sodded to prevent erosion. Restoration shall be as
48 required by the jurisdictional authority and as specified within the contract documents. Road and

1 railroad crossings and parallel installations are to be continuously maintained until completion of
2 the work.

3 4 5 **4. PIPE AND FITTINGS** 6

7 **a. GENERAL** 8

9 (1) The contractor shall be responsible for furnishing of all labor, materials, equipment and
10 incidentals required to install and complete, all pipeline and fittings as shown on the approved
11 plans and in accordance with the design, specifications and construction standards incorporated
12 in this manual.

13
14 (2) All pipe and fittings shall be clearly marked with the name or trademark of the manufacturer,
15 the batch number, the location of the plant, strength designation, and standards as applicable.
16

17 (3) All pipe, fittings, valves appurtenances and linings for potable water facilities shall be in
18 conformance with ANSI/NSF Standard 61-Drinking Water System Components – Health
19 Effects.
20

21 **b. RELATED SECTIONS** 22

23 (1) Earthwork, Excavation, Backfill and Compaction (Section J.1, Chapter II)

24 (2) Jack and Bore (Section J.2, Chapter II)

25 (3) Directional Boring (Section J.3, Chapter II)

26 (4) Valves and Appurtenances (Section J.5, Chapter II)
27

28 **c. PIPE AND FITTINGS** 29

30 **(1) Ductile Iron** 31

32 Use of Ductile Iron Pipe (DIP) is not permitted excepting in limited special circumstances where
33 PVC and HDPE do not meet the design requirements. The EOR shall submit justification for the
34 use of DIP to PSLUSD, for review and approval.
35

36 **(a) Pipe:** 37

38 (i) DIP shall conform to ANSI/AWWA C151/A21.51.
39

40 (ii) All above ground pipe shall be flanged and shall conform to ANSI/AWWA
41 C115/A21.15. Flanges shall be threaded unless otherwise noted. Flanges shall be flat
42 faced unless they are mating up to existing raised flanges.
43

44 (iii) The EOR shall specify the pressure class rating and special thickness class rating of
45 the pipe for the prevalent conditions.
46
47
48
49

1 **(b) Fittings:**

2
3 (i) DIP fittings for buried pipe shall conform to ANSI /AWWA C153/A21.53.

4
5 (ii) All above ground fittings for flanged pipe must conform to ANSI/AWWA
6 C110/A21.10 or C153/A21.53, with a minimum pressure rating of 150. Gaskets shall be
7 full face, 1/8" thick, cloth-inserted rubber and furnished in Buna-N rubber suitable for
8 sewage and water service, rated for pressure class 150. Bolts and nuts for flanges shall be
9 Type 316 stainless steel conforming to ASTM A-193, Grade B&M for bolts, and ASTM
10 A-194, Grade M for nuts. Washers shall be provided for each nut and shall be of same
11 material as the nuts.

12
13 **(c) Joints:**

14
15 (i) All buried joints at fittings must be restrained with mechanical joints.

16
17 (ii) "Push On" and mechanical joints shall be in accordance with ANSI /AWWA
18 C111/A21.11.

19
20 (iii) Restrained joint assemblies with mechanical joint pipe shall be approved restraining
21 devices (QPL).

22
23 **(d) Coatings and Linings:**

24
25 (i) Buried ductile iron pipe and fittings for water facilities shall receive an exterior
26 asphaltic coating as specified in ANSI/AWWA C151/A21.51. The pipe shall be cement
27 mortar lined and sealed with a coat of asphaltic material, in accordance ANSI/ AWWA
28 C104/A21.4.

29
30 (ii) For wastewater and reclaimed water facilities, ductile iron pipe and fittings shall be
31 cement mortar and epoxy lined and a bituminous coating applied on the exterior, in
32 accordance with the manufacturer's recommendations.

33
34 (iii) Machined surfaces shall be cleaned and coated with a suitable rust-preventive
35 coating at the shop immediately after being machined.

36
37 (iv) Ductile iron pipe exposed to the atmosphere and all above ground applications shall
38 be cleaned and given a new inhibitive primer coat at the place of manufacturer. The
39 prime coat shall be compatible with the finish coat of alkyd enamel. Minimum primer
40 dry-film thickness shall be 3 mils. A field prime coat shall be applied in areas where the
41 initial prime coat is damaged in the field. After installation, all above ground ductile iron
42 piping shall receive two or more coats of a high grade, gloss or semi gloss alkyd enamel
43 coating. Each coat shall have a minimum dry thickness of 3 mils. All related piping shall
44 be the same color.

45
46 **(e) Special Exterior Protection for Corrosion:**

47
48 (i) When specifically required, extra protection shall be provided for underground cast or
49 ductile iron pipe and fittings within areas of severe corrosive conditions. This shall be

1 accomplished by the installation of polyethylene encasement as per AWWA C105,
2 through the area of concern. Soil-test evaluation to determine the necessity for extra
3 protection in suspect areas shall be as set forth in ANSI Standard A21.5.
4

5 (ii) If a ductile iron pipe crosses another pipe with cathode protection, it shall be
6 protected for a distance of 20' on each side of the crossing; also, protection shall be
7 provided when the ductile iron pipe is laid parallel to and within 10'.
8

9 **(2) Polyvinyl Chloride (PVC): Water, Wastewater and Reclaimed Water Pressure Mains**

10 **(a) Pipe:**

11
12
13 (i) PVC pipe must meet requirements as set forth in AWWA C900 and C905 and potable
14 water pipe must bear the National Sanitation Foundation seal. Provisions must be made
15 for contraction and expansion at each joint with a rubber ring and integral thickened bell
16 as part of each joint. Pipe and fitting must be assembled with nontoxic lubricant.
17

18 (ii) Water mains shall be blue, wastewater mains shall be green and reclaimed water
19 mains shall be purple.
20

21 (iii) The Dimension Ration (DR) and Pressure Rating shall be C900, DR-18 (Pressure
22 class 235) for 4" to 12" pipe and C 905, DR-18 (Pressure rating 235) for 14" to 24" pipe.
23

24 **(b) Joints:** Connections for pipe 2" or greater in diameter shall be rubber compression ring-
25 type. Pipe shall be extruded with integral thickened wall bells without increase in dimension
26 ration (DR). Rubber ring gaskets shall consist of synthetic compounds meeting the requirements
27 of ASTM Designation D869 and suitable for the designated service.
28

29 **(c) Fittings:** Ductile iron fittings shall be used on all PVC C900 & C905 mains. Fittings shall
30 conform to AWWA/ANSI C153/A21.53.06 with a minimum pressure rating of 350 psi. Fittings
31 shall be coated as specified under c.(1) (d) Coating & Linings for DIP.
32
33

34 **(3) PVC: Gravity Sewer**

35
36 PVC pipe and fittings for gravity sewer as well as service lines shall, as a minimum, conform to
37 ASTM D-3034, SDR 26 and meet requirements of ASTM D-3212 on joints for sewer pipe using
38 flexible elastomeric seals. For depths greater than 15', the pipe, joints and fittings shall meet the
39 specifications for pressure mains.
40

41 **(4) PVC: Low Pressure Mains**

42
43 **(a) Pipe:** PVC pipe for low-pressure mains, as a minimum, must meet requirements set forth in
44 ASTM D2241 with an SDR-21 and pressure rating of 200 psi. Fittings shall be of the same type
45 of material used for the pipeline.
46

47 **(b) Fittings:** Fittings shall be manufactured in one piece of injection molded PVC meeting
48 ASTM D-1784, class 200.
49

1 (c) **Joints:** Pipe shall have push-on type joints with integral wall bell. Bell shall be a gasket
2 joint conforming to ASTM D-3139 with gaskets conforming to ASTM F477. Push joint or
3 mechanical joint ductile iron fittings meeting AWWA C153 may be allowed as an alternative
4 when PVC sizes are not available, as approved by the PLSUD.

5 **(5) Polyethylene Tubing (up to 3" diameter)**
6

7 **(a) Pipe:**
8

9 Polyethylene tubing shall conform to AWWA C901, Standard Code Designation PE 3608;
10 Pressure Class 200 Dimension Ratio (DR) 9 for water use and Pressure Class 160, Dimension
11 Ratio (DR) 11 for sanitary use.
12

13 **(b) Joints:** Joints for polyethylene tubing shall be of the compression type utilizing a totally
14 confined grip seal and coupling nut. Stainless steel tube stiffener inserts shall also be used for
15 tubing services.
16

17 **(c) Fittings:** All fittings and stops to be high quality water works brass. No PVC fittings or
18 adapters will be permitted. Fittings shall be brass or bronze, equipped with compression-type
19 connectors.
20

21 **(6) High Density Polyethylene Pressure Pipe over 3" Diameter OD**
22

23 **(a) Pipe and Fittings**
24

25 Pipe supplied under this specification shall have a nominal Ductile Iron Pipe Size OD (Outside
26 Diameter) unless otherwise specified. The pipe and fittings shall conform to AWWA C906,
27 Standard Code Designation PE 3408. The SDR (Standard Dimension Ratio) and the pressure
28 rating of the pipe and fittings materials shall be as specified by the EOR. As a minimum, the
29 materials shall be Pressure Class 200 Dimension Ratio (DR) 9 for water use and Pressure Class
30 160, Dimension Ratio (DR) 11 for sanitary use.
31

32 **(b) Joining:**
33

34 (i) Sections of polyethylene pipe should be joined into continuous lengths on the job site
35 above ground. The joining method shall be the butt fusion method and shall be performed
36 in strict accordance with the pipe manufacturer's recommendations. The butt fusion
37 equipment used in the joining procedures should be capable of meeting all conditions
38 recommended by the pipe manufacturer, including but not limited to temperature
39 requirements of 500° F, alignment, and 150 psi interfacial fusion pressure.
40

41 (ii) Butt fusion joining shall be 100% efficient offering a joint weld strength equal to or
42 greater than the tensile strength of the pipe. Socket fusion shall not be used. Extrusion
43 welding or hot gas welding of HDPE shall not be used for pressure pipe applications or in
44 fabrications where shear or structural strength is important. Flanges, unions, grooved-
45 couplers, transition fittings and some mechanical couplers may be used to mechanically
46 connect HDPE pipe without butt fusion.
47

48 **d. INSTALLATION (Pressure Pipe)**
49

1 The installation standards detailed below apply only to pressure pipe - water mains, force mains,
2 low-pressure sewer mains and reclaimed water mains. **The installation of gravity sewers is**
3 **covered in Section J.6 of this Chapter.**

4
5 **(1) Existing PSLUSD Facilities and Other Utilities**
6

7 (a) Contractor is required to verify location of existing PSLUSD facilities, service lines and
8 other utilities (telephone, gas, electric, cable, etc.) prior to beginning of construction, whether
9 shown in the construction drawings or not. Any discrepancies between the construction drawings
10 and field conditions shall be brought to the attention of the EOR prior to construction.
11 Construction shall not be initiated if the discrepancy may result in non-compliance with utility
12 standards; the EOR shall obtain prior written approval from PSLUSD.

13
14 (b) Any damage to existing utilities or services shall be repaired immediately in coordination
15 with the utility, with all repair costs being incurred by the contractor.

16
17 (2) Piping and fittings shall be installed in accordance with these standards and in general with
18 the manufacturer's recommendations for the applicable service.

19
20 (3) Piping shall be installed along straight line and grade between fittings, or other defined
21 points, unless other definite lines of alignment deflection or grade change have been established.
22 Modification to approved alignment or grade during construction shall not be made without prior
23 approval from the EOR and PSLUSD.

24
25 (4) The standard minimum cover for utility mains shall be 36" and a maximum of 72".

26
27 (5) Utility crossing signs may be required along the pipe alignment at each side of the canal,
28 waterway, storm water retention area, etc. and shall be approved by PSLUSD and agency having
29 jurisdiction over the water body.

30
31 (6) All piping shall be laid in a clean dry trench on line and grade. All valves and vertical
32 appurtenances shall be plumb.

33
34 (7) Materials shall be cleaned and maintained clean, with all coatings protected from damage.
35 The interior of the pipe shall be free of dirt and debris, and when work is not in progress all open
36 ends shall be plugged with an approved device.

37
38 (8) Pipe and fittings, and other items shall be inspected prior to installation and any items
39 showing a fracture or any other defect shall be rejected. Additionally, any pipe or fitting which
40 has received a severe blow that may have caused an incipient fracture may be salvaged by
41 cutting off the impacted section 12" past the damage, providing the remaining pipe is sound.
42 Discoloration of PVC due to exposure to the sun may result in pipe rejection.

43
44 (9) Underground piping shall not be driven to grade by striking it. After the pipe has been
45 properly bedded, enough compacted backfill shall be placed to hold the utility in correct
46 alignment. Precautions shall be taken to prevent flotation when necessary.

47
48 (10) Joining shall be by the manufacturer's approved method and shall not require undue force to
49 accomplish full satisfactory seating and assembly. Connections at structures shall be cut

1 accurately and worked into place without forcing and shall align with the connecting point.
2 Flanged joints shall be made tight, but with care taken to prevent undue strain upon equipment or
3 other items. Suitable flange filler rings shall be installed where required to provide suitable
4 joints. The installation shall be permanently watertight with no visible leakage at joints,
5 connections and other locations, under operational or testing conditions. Material that in jointing
6 does not remain completely seated and/or watertight shall be rejected.

7 (11) Pipe Restraints:
8

9 Underground pressure piping systems shall be securely anchored by acceptable means at all tees,
10 plugs, caps, bends and valves, and at all other locations where unbalanced forces exist or as
11 directed by PSLUSD, EOR and as specified herein.
12

13 (a) All pressure pipes at fittings shall be restrained by appropriate restraint devices meeting
14 requirements of UNI-B-13 for PVC pipe and Ductile Iron Pipe Research Association for ductile
15 iron pipe, and be UL listed. The criteria for establishing required pipe restraint lengths are
16 specified in the standard details.
17

18 (b) Approved pipe restraint devices that are on the QPL shall be used. Shop drawings shall
19 specify the particular system to be utilized and no substitutions will be allowed after approval
20 without re-submittal of shop drawings to the PSLUSD for written approval.
21

22 (c) All bends, tees, crosses, reducers, valves and dead ends shall be restrained through an
23 approved means of mechanical joint restraint. Any line terminated as a construction phase that is
24 a known future extension, shall have a plugged valve placed at the end, and restrained with
25 approved mechanical joint restraint.
26

27 (d) Restrained joints shall be installed in accordance with manufacturer's recommendations and
28 PSLUSD Standards. Every pipe joint that is required to be restrained shall be inspected by the
29 PSLUSD and EOR prior to the contractor backfilling the restrained joint.
30

31 (12) Exposed systems shall be supported as necessary to hold the piping and appurtenances in a
32 firm, substantial manner to the required alignment and grade, with no undue piping stresses
33 transmitted to equipment or other items. Aboveground pipe outside of buildings shall be
34 supported on concrete supports or pre-manufactured adjustable pipe supports.
35

36 (13) In case of conflict between various installation requirements the more stringent one shall
37 apply.
38

39 (14) Installation of pipe and testing shall be performed in the presence of the PSLUSD and EOR.
40

41 (15) Pipeline joint deflections shall not exceed what is recommended in the Uni-Bell Handbook
42 of PVC Pipe or 75% of the manufacturer's maximum allowable deflection, whichever is more
43 stringent.
44

45 **(16) Ductile Iron Pipe:** Installation shall be performed in accordance with the applicable
46 provisions of AWWA Standard C600 and the manufacturer's recommendations.
47

48 **(17) Polyvinyl Chloride Pipe:**
49

1 **(a) Water, Sewer, and Reclaimed Water Mains (C900& 905)** - Installation shall be
2 performed in accordance with the applicable provisions of AWWA 605, ASTM D-2774,
3 AWWA Manual M23 and the manufacturer's recommendations. Lubrication used for pipe and
4 fitting joints shall be nontoxic.

5 **(b) Low Pressure Mains (SDR-21)** - Installation shall be performed in accordance with the
6 applicable provisions of ASTM D-2774, Uni-Bell B-3 for PVC pressure sewer pipe and with the
7 manufacturer's recommendations. If there are conflicts in installation methods, the more
8 stringent installation criteria shall apply.

9
10 **(18) HDPE:** Construction and installation shall be performed in compliance with the
11 manufacturer's guidelines and the standards included in this document.

12
13 **(19) Service Connections:**

14
15 **(a) Residential Water Service Connections (Water Main):** Connections to water mains shall
16 be made by installing service saddles or tees. A corporation stop shall be placed at the saddle or
17 fitting, with the service line extended to the R.O.W./easement/property line perpendicular to said
18 line, and terminating with a curb stop pending meter installation.

19
20 **(b) Non-Residential Water Service Connections (Water Main):** Connections to water mains
21 shall be made by installing service saddles. A gate valve shall be placed at the saddle or fitting,
22 with the service line extended to the R.O.W./easement/property line perpendicular to said line,
23 and terminating with a riser and an angle valve, above ground in grass areas, pending meter
24 installation.

25
26 **(c) Residential Wastewater Service Connections (Low-Pressure Main):** Connection to low
27 pressure mains will be made by use of a tapping sleeve, valve, and check valve with the service
28 line extended to the R.O.W./easement/property line perpendicular to said line, terminating with a
29 cap. Schedule 80 PVC is the only pipe acceptable to tap for threads.

30
31 **(d) Non-Residential Wastewater Service Connections (Low-Pressure Main):** Connection to
32 low-pressure mains will be made by use of a tapping sleeve, valve, gate valve, and check valve,
33 with the service line extended to the R.O.W./easement/property line, perpendicular to said line,
34 and terminating with a cap. Schedule 80 PVC is the only pipe acceptable to tap for threads.

35
36 **(e) Services Crossing under Roadways** shall be pushed, moled or installed by the jack and
37 bore method. Jetting shall not be used. No open cutting of roads for service lines will be allowed.
38 The service line shall have a minimum cover of 30" with slight grade sloping away from the
39 water main or low-pressure main. The service shall be enclosed within a casing pipe. Casing pipe
40 shall be at least schedule 40 PVC.

41
42 **(20) Locating Devices:**

43
44 **(a) Locator Wire** - The locator wire is required to be installed on all PSLUSD facilities except
45 gravity sewers. All pressure mains and water service lines shall be marked by use of an approved
46 solid copper locator wire per the QPL. The wire shall be installed on the top of the pipe and
47 attached or looped at each pipe bell. The wire shall be inserted into a curb stop box at each valve
48 and blow off pad. The wire shall be looped into the valve box where the pump out is located on
49 all grinders. The loops shall be a minimum of 10" long.

1
2 **(b) Marking Tape** – A marking tape shall be placed in the trench above all PSLUSD facilities
3 12”-18” below grade.

4
5 (i) Marking tape shall be minimum 6” wide.

6
7 (ii) Marking tape shall be per the QPL, as specified, with "CAUTION PSLUSD MAIN CALL
8 BEFORE DIGGING (772) 873-6400" printed every 3’ in black letters.

9
10 (iii) The tape shall be a dielectric, polyolefin film tape that is tear resistant, and corrosion
11 resistant. The tape shall be constructed using material and ink colors, which will not change
12 when exposed to acids and other destructive substances commonly found in the soil.

13
14 **(c) Marker Balls** - Service Connections for water mains, gravity sewer and low pressure mains
15 shall be provided with an electronic marker ball, placed directly above the end of the pipe at the
16 R.O.W./easement/property line. Marker balls with tie down straps shall be placed on fittings at
17 service termination points, service connection points on all pressure mains, stub outs for future
18 construction, buried abandon valves, and all vertical and horizontal deflections. The marker balls
19 shall be installed in accordance with the manufacturers requirements and be capable of operating
20 at a depth of 6’ below the ground surface. The marker balls shall have separate and unique
21 frequencies for water, wastewater and reclaimed water service connections.

22 23 24 **5. VALVES AND APPURTENANCES**

25 26 27 **a. GENERAL**

28
29 (1) The contractor shall be responsible for the proper location and installation of valves and
30 appurtenances for utility pipeline construction, as shown on the approved plans and as specified
31 herein.

32
33 (2) Materials shall include, but not be limited to, the following:

- 34
- 35 (a) Gate Valves
- 36 (b) Butterfly Valves
- 37 (c) Ball Valves
- 38 (d) Plug Valves
- 39 (e) Valve Boxes
- 40 (f) Extension Stem for Valve Operator
- 41 (g) Check Valves
- 42 (h) Air Release Valves
- 43 (i) Corporation Stops and Curb Stops
- 44 (j) Service Saddles
- 45 (k) Water Meters
- 46 (l) Water Meter Boxes
- 47 (m) Tapping Valves and Sleeves
- 48 (n) Backflow Prevention Assemblies
- 49 (o) Fire Hydrant Assembly

1 (3) All equipment and appurtenances shall be of the size shown on the approved plans and all
2 equipment of the same type shall be from one manufacturer.

3
4 (4) All equipment and appurtenances shall have the name of the manufacturer, the size and the
5 design working pressure either cast in raised letters or on a stainless steel plate.

6
7 (7) Coating conforming to ANSI/AWWA C550 shall be applied to the interior surfaces of valves
8 and appurtenances that will be in contact with water.

9
10 (8) One 5' (min) valve key (wrench) shall be provided per project.

11
12 **b. INSTALLATION**

13
14 Valves and appurtenances shall be installed in accordance with the manufacturer's
15 recommendations for the applicable service. Approved restraint devices shall be used as detailed
16 in Section J.4d (11) – Pipe Restraints of this Chapter.

17
18 **c. REFLECTIVE PAVEMENT MARKERS**

19
20 (1) Reflective Pavement Markers (RPM) marking locations of valves, blow offs, etc. shall be
21 placed 6" from edge of pavement in the event the plans do not call for roadway striping, and 8"
22 from edge of pavement in the event the plans call for roadway striping to be placed.

23
24 (2) All fire hydrants shall be marked with a blue RPM placed in the center of the travel lane
25 closest to the hydrant, outside of the crosswalk.

26
27 (3) RPMs shall NOT be placed in crosswalks. If RPM placement falls within the crosswalk, it
28 shall be placed outside of crosswalk as close to valve or hydrant location as possible.

29
30 **d. INLINE VALVES**

31
32 **(1) General**

33
34 (a) Valves shall be carefully inspected, opened wide, and then tightly closed; all the various
35 nuts and bolts thereon shall be tested for tightness. Special care shall be taken to prevent joint
36 materials, stones or other substances from becoming lodged in the valve seat. Valves, unless
37 otherwise required, shall be set with their stems vertically above the centerline of the pipe. Any
38 valve that does not operate correctly shall be adjusted to operate properly or removed and
39 replaced.

40
41 (b) Buried valves shall be installed vertically where depth of cover permits. Where depth of
42 cover does not permit vertical installation, side operators shall be used if approved in writing by
43 PSLUSD. The operating nut shall be between 24"- 30" below final grade. Extension stems shall
44 be provided on all buried valves when the operating nut is deeper than 30" below the final grade.

45
46 (c) Valves shall open left (counterclockwise).

47
48 **(2) Gate Valves (GV)**

1 (a) Valves 2" and larger shall be gray or ductile iron body, conforming to AWWA C509 or
2 C515, with mechanical joints or flanged ends, and shall be equipped with a 2" square gray or
3 ductile iron wrench nut.
4

5 (b) The stem shall be non-rising type for underground and outside screw-and-yoke rising type
6 for above ground installation.
7

8 (c) Gate valves shall be resilient wedge type and meet the following provisions:
9

10 (i) The wedge shall be of ductile or gray iron, fully encapsulated with EPDM rubber,
11 including the glide path.
12

13 (ii) The gland flange shall be ductile iron for maximum strength.
14

15 (iii) Two upper stem seal O-rings, one above the thrust collar and one below, and a lower
16 stem seal o-ring shall be provided to assure the upper stem seals can be replaced with the
17 valve under full working pressure.
18

19 (iv) The stem material shall be 316 stainless steel with yield strength of 40,000 psi.
20

21 (v) Valve body, bonnet and gland flange shall have an electrostatic applied, fusion-
22 bonded epoxy coating internally and externally, a minimum of 8 mils thick. The coating
23 shall meet or exceed the requirements of the AWWA C550. Coating shall be applied at
24 the valve manufacturer's facilities.
25

26 (vi) All bolts, nuts and washers shall be stainless steel to limit exterior corrosion and
27 maintain fastener strength. Manufacturer shall use a lubricant listed on the QPL during
28 assembly of bolt and nut sets to prevent galling of similar metals.
29

30 (vii) Valves shall be rated for 250-psi working pressure. All valves shall have pressure
31 tests performed to the requirements of AWWA C509 or C515 specifications, as
32 applicable, prior to shipment from the manufacturer.
33

34 (viii) Valves shall be covered by a Manufacturer's 10 year Limited Warranty from date of
35 purchase by the end user and delivered within 30 days from receipt of purchase order.
36 The supplier will also provide laminated maintenance manuals in an appropriate level.
37

38 **(3) Butterfly Valves (BFV)** 39

40 (a) Butterfly valves shall be used at the discretion of the PSLUSD. Valves shall be cast or
41 ductile iron body; alloy cast iron or ductile iron disc; one-piece stainless steel shaft; short or long
42 body-type; with the valve class, shaft size, and other special requirements selected in accordance
43 with the specific design; and shall comply with the provisions of AWWA C504, "Rubber-Seated
44 Butterfly Valves".
45

46 (b) The valve disc shall be gray iron or ductile iron. The valve disc or valve body shall be fitted
47 with a resilient seat of synthetic rubber.
48

1 (c) Valves shall open counter clockwise. Actuators shall comply with AWWA C504 with 2”
2 square operating nut. Actuators shall be capable of developing torques listed in AWWA C504
3 for Class 150B valves. Valve actuators shall be traveling nut or worm gear type, fully field
4 adjustable stops so the actuator does not have to be disassembled for valve seat adjustment.
5

6 **(4) Ball Valves (BV)** 7

8 (a) Ball valves shall be limited to ¾” through 2” in size and shall have cast bronze or stainless
9 steel body, bronze tee head, stem with check, full round way opening and provisions for locking
10 in a closed position.
11

12 (b) Ball valves shall be used on all water and low pressure service lines ¾”-2” in size.
13

14 (c) Ball valves shall be designed to be fully open by a 90° turn of the operating handle and shall
15 be full port design with bi-directional sealing rated for 150 psi minimum working pressure.
16

17 (d) Valve ends may be threaded if Schedule 80 PVC is used and push-on restrained or solvent
18 welded ends may be used for other PVC.
19

20 **(5) Plug Valves (PV)** 21

22 (a) Plug valves may be used if approved in advance by PSLUSD in writing.
23

24 (b) All valves shall be cast or ductile iron or steel body, non-lubricated, eccentric-type, with
25 resilient faced plugs, and capable of drip-tight shutoff at the rated pressure when applied at either
26 port. Valve surfaces in contact with the plug face shall be 90% pure nickel. Operation of all
27 valves 10” and larger, and smaller sizes in exposed locations which require hand wheels or chain
28 wheels, shall be by approved gear actuators, equipped with position indicator and stop, and shall
29 be furnished by the valve manufacturer. Gear actuators for buried or submerged installations
30 shall be furnished with sealed enclosures. Valves shall be equipped with 2” actuating nuts, cast
31 iron hand wheels, or chain operators, with galvanized steel chains, as appropriate for the
32 installation and type of operator.
33

34 (c) Port areas of valves sized 3” through 24” shall be at least 80%, and 30” and larger at least
35 75% of full pipe area.
36

37 (d) Valves shall be non-lubricated and rated for 150 psi pressure differential acting in either
38 direction. At this differential the valve shall provide drip tight shutoff.
39

40 (e) The valves shall have a balanced plug to assure low torque and drip tight shutoff. Valves
41 shall be equipped with resilient plug facings to provide drip tight shutoff without use of sealing
42 lubrications. Even if small solids are trapped between the plug and seat, the resilient facing shall
43 provide tight shutoff and prevent seat damage.
44

45 (f) Plug valves shall have heavy-duty upper and lower guide bearings capable of resisting
46 corrosion and preventing binding. Bearings shall be stainless steel or bronze bushing.
47

48 **e. MISCELLANEOUS VALVES AND APPURTENANCES** 49

1 **(1) Valve Boxes**
2

3 (a) Units shall be adjustable, cast iron, two-piece screw-type with minimum interior diameter
4 of 5", with covers cast with the applicable inscription in legible lettering on the top -"SEWER",
5 "RE-CLAIM" or "WATER". Boxes shall be of heavy-duty construction for traffic loading.
6 Extension pieces, if required, shall be the manufacturer's standard screw-type for use with the
7 valve box. Bolt down covers shall be provided in all areas.
8

9 (b) The top side of valve box covers and the inside of the top section of the valve box shall be
10 painted blue for water mains, green for sewer mains and purple for reclaimed water mains. The
11 paint used shall be on the QPL.
12

13 (c) Valve boxes shall be provided with concrete base and valve nameplate with suitable
14 anchors for casting flush into concrete. Nameplate shall be 3" diameter bronze disk with 1/8"
15 high lettering. Information on disk shall be of specific valve type, size, direction and number of
16 turns, schematic of facilities. The brass disc shall be set into wet concrete to be flush with the
17 pad. Disc's that have been drilled in and set with epoxy will not be accepted. All water valve
18 locations to be marked by a blue RPM and wastewater valves by a green RPM.
19

20 (d) A valve box alignment device shall be used to eliminate the shifting of the valve box
21 against the operating nut.
22

23 (e) The tops of valve boxes shall be set to the required grade. Any valve box that becomes out
24 of alignment or is not to grade shall be dug out and adjusted.
25

26 (f) The valve box shall not transmit surface loads directly to either the pipe or valve. Care shall
27 be taken to prevent earth and other material from entering the valve boxes.
28

29 **(2) Extension Stem for Valve Operators**
30

31 Where the depth of the operating nut is more than 30", operating extensions shall be provided to
32 bring the operating nut to a point 24"-30" below finished grade. The extension shall be high
33 strength steel construction and permanently attached to the operating nut or handle on the valve.
34 Where extension stems are required within valve boxes, approved insert stem guides shall be
35 provided; also, a steel centering plate welded to the extension shall be provided.
36

37 **(3) Check Valves (CV)**
38

39 (a) Valves less than 2" (water) - Valves shall be bronze body and disc, swing check-type, with
40 removable inspection covers, and rated for 150 psi minimum working pressure.
41

42 (b) Valves (Low-Pressure Mains) - Valves shall be a brass or stainless steel check valve rated
43 for 150 psi. The check valve will provide a full-ported passageway when open. A non-metallic
44 hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom
45 to assure seating, even at a very low back pressure.
46

47 (c) Check valves 2" and larger shall conform to ANSI/AWWA C508, Standard for Swing
48 Check Valves and shall meet the following additional provisions:
49

1 (i) Valves shall be of the flanged type and shall be supplied with or without external lever
2 and weight or lever and stainless steel spring. A priming actuator may be supplied for
3 installations that require manual backflow to prime pumps, drain the line, and/or back
4 flush.

5
6 (ii) Valve bodies and bonnets shall be of ductile or gray iron meeting the requirements of
7 ASTM A536. The check valve shall be a clear waterway design as defined by AWWA
8 C508. The minimum working pressure rating shall be 250 psi.

9
10 (iii) Flanges shall be in compliance with ANSI/ASME B16.1 Class 125. Laying lengths
11 shall comply with ANSI/ASME B16.10.

12
13 (iv) All internal uncoated ferrous components and bolting shall be stainless steel. The
14 hinge and hinge pin shall be constructed of AISI 316 stainless steel. O-rings shall be used
15 to seal the hinge pin. Exterior bushing material shall be bronze.

16
17 (v) All exterior bolting shall be stainless steel.

18
19 (vi) All valves shall be covered by a manufacturer's 10 year Limited Warranty from date
20 of purchase by the end user, which shall include repair parts and reasonable labor costs.

21 22 **(4) Air Valves**

23
24 (a) Air valves for water facilities shall conform to AWWA C512 and be of single body
25 configuration. Valves shall be of gray cast iron or ductile iron body and cover, with stainless
26 steel float and trim, and rated for a minimum 150 psi working pressure. Combination valves shall
27 be used unless a different type of air valve is approved by PSLUSD based on recommendation of
28 the EOR. Air valves shall be equipped with an inflow prevention device when required by
29 PSLUSD.

30
31 (b) Air valves for wastewater facilities shall be of single body configuration and shall be
32 constructed with gray or ductile iron body and cover with stainless steel trim and float for a
33 minimum working pressure of 150 psi. Combination valves shall be used unless a different type
34 of air valve is required by PSLUSD based on recommendation of the EOR.

35 36 **(5) Corporation Stops and Curb Stops**

37
38 (a) Corporation and curb stops shall be required on all water services. The units shall be
39 manufactured from cast bronze or brass with machined fitting surfaces and, for sizes $\frac{3}{4}$ "-2", in
40 accordance with AWWA C800.

41
42 (b) Units shall be equipped with connections compatible with the connecting service pipe-
43 type; must have pack joint type connections for polyethylene tubing with locking collars and
44 stainless steel inserts.

45 46 **(6) Service Saddles**

1 Service saddles for PVC or ductile iron pipe shall conform to AWWA C800. Saddles shall be
2 double strap, stainless steel full circle type with a bronze body and epoxy lined. Sealing gaskets
3 shall be suitable for the applicable service.
4

5 **(7) Water Meters**

6

7 Water meters up to 2” in size shall be purchased from and installed by PSLUSD. . The property
8 owner shall be responsible for furnishing and installing the meter above 2” and shall obtain a
9 written approval from PSLUSD prior to installation. Shop drawings shall be submitted for the
10 proposed meter along with a certification of calibration. The meter shall meet the following
11 specifications:
12

13 (a) Turbine - The meter to be furnished shall be Class II, horizontal shaft, and shall meet the
14 requirements of AWWA C701, with particular reference to flow capacity, pressure loss,
15 accuracy, physical dimension and material construction.
16

17 (b) Compound – The meter shall comply with the requirements of AWWA C702 with
18 particular reference to flow capacity, pressure loss, accuracy, physical dimension and material
19 construction.
20

21 (c) The main case shall be of high-grade bronze containing not less than 75% copper and with
22 operating pressure test of 200 psi without leakage at gasket. The name of the manufacturer shall
23 be marked permanently on the lid of the register box. The serial number of the meter shall be
24 imprinted on the lid and on meter main case.
25

26 (d) The meter must be able to use a strainer without the additional piping up stream and down
27 stream to control accuracy of the meter; strainer will come with meter only upon request.
28

29 (e) The register shall be permanently hermetically sealed, magnetic drive, low torque
30 registration, straight reading, large numerals and no fogging type lens.
31

32 (f) The connection shall be flanged and shall come with companion flanges, gaskets, bolts and
33 nuts.
34

35 (g) Meters shall have an Encoder-Receiver-Transmitter device for automatic meter reading,
36 compatible with existing city system.
37

38 (h) Meters shall be NSF approved for potable water use.
39

40 **(8) Meter Boxes**

41

42 (a) Meter boxes shall be high-density polyethylene body with a solid cover.
43

44 (b) Meter boxes shall be the same type throughout the project.
45

46 **(9) Tapping Valves and Sleeves**

47

48 (a) Tapping valves shall have a ductile iron body that accommodates a full size shell cutter.
49

1 (b) Valves shall conform to the specifications set forth previously for the applicable service
2 conditions. Additionally, units shall be comparative with the connecting sleeve or saddle and
3 specially designed for wet tapping installation operations.
4

5 (c) When specified, tapping valves 4” through 12” shall have a ring cast with the body on its
6 flanged end to ensure proper alignment with suitable tapping sleeves. All other end
7 configurations shall be specified as mechanical joint (MJ).
8

9 (d) Tapping sleeves shall be split-type stainless steel or MJDI with flanged outlet for
10 connection to tapping valve. Carbon steel flanges are not allowed without written approval by
11 the EOR and PSLUSD.
12

13 **(10) Backflow Prevention Assemblies**

14
15 (a) Backflow prevention assemblies shall be manufactured and installed in full conformance
16 with the following standards:
17

18 (i) AWWA C510 – Standard for Double Check Valve Backflow Prevention
19 Assembly;

20
21 (ii) AWWA C511 – Standard for Reduced Pressure Principle Backflow Prevention
22

23 (iii) AWWA M14 – Recommended Practice for Backflow Prevention and Cross
24 Connection Control
25

26 (iv) Laboratory and field performance specifications of the Foundations for Cross
27 Connection Control and Hydraulic Research, University of Southern California.
28

29 (b) Final approval shall be based on a “Certificate of Approval” issued by an approved testing
30 laboratory certifying full compliance with above standards. Backflow prevention assemblies,
31 which have been fully tested and have been granted a certificate of approval by an approved
32 testing laboratory, may be used if listed on the QPL.
33

34 **(11) Fire Hydrant Assembly**

35 36 **(a) General**

37
38 (i) Fire hydrant assemblies shall include fire hydrant, spool pieces, gate valve, hydrant
39 extensions, valve extensions, valve box, concrete collars around valve box and hydrant,
40 tee at the main, necessary bends and fittings, restraining devices, and bedding material.
41

42 (ii) All hydrants shall be of the size and type specified and all hydrants shall be from one
43 manufacturer.
44

45 (iii) Hydrant extensions shall not be used unless specifically approved in writing by the
46 PSLUSD.
47

48 (iv) Fire hydrant adjustments and re-locations include all materials and labor that may be
49 required to complete adjustment and/or re-location to the PSLUSD specifications.

1
2 (v) Fire hydrants shall be connected to the main with a minimum 6" branch controlled by
3 an independent 6" gate valve. All pipe, valve and joints from the hydrant to the main
4 shall be restrained. Hydrants shall stand plumb and true and shall have nozzles parallel
5 with or at right angles to the curb or edge of pavement, with the pumper nozzle facing the
6 curb or edge of pavement. Hydrants shall be set to the established grade, with nozzles at
7 least 18" above the ground.

8
9 (vi) Fire hydrants shall be free of corrosion and all working parts shall be properly
10 lubricated. Hydrants shall be painted with an approved paint on the QPL. Hydrants
11 owned and maintained by PSLUSD shall be painted red. Private fire hydrants shall be
12 painted yellow.

13
14 (vii) Fire hydrants shall have a minimum of 10-year warranty from the manufacturer,
15 covering 100% of all parts and labor for repairs/replacement. The warranty shall become
16 effective on date of acceptance by PSLUSD.

17
18 (viii) One operating wrench for every ten fire hydrants shall be provided to PSLUSD.

19
20 **(b) Specifications**

21
22 Hydrants shall be Dry Barrel type and shall meet the following provisions:

23
24 (i) Shall conform to ANSI/AWWA C502.

25
26 (ii) Shall be listed by Underwriters Laboratory and approved by Factory Mutual for fire
27 line service. UL and FM trademarks shall be cast on the hydrant nozzle section.

28
29 (iii) A weather shield shall be provided to prevent dirt and corrosion from affecting the
30 operating mechanism. It will be marked with an arrow indicating the direction of opening
31 (counter-clockwise). Weather shields and nozzle cap nuts shall be 1½" pentagon shape.

32
33 (iv) Operating nut shall be 1½" pentagon shape and made of bronze. It shall utilize two
34 anti-friction washers, one above and one below the thrust collar. A bronze thrust nut shall
35 be used and secured without reverse threading and locked in place with a stainless
36 setscrew and plate.

37
38 (v) Hydrant bonnet, nozzle, standpipe, shoe sections and flanges shall be made of ductile
39 or gray iron. All caps and weather shields may be manufactured of cast or ductile iron.
40 Caps shall be provided with gaskets and cap threads shall be lubricated before delivery
41 with an anti-seize lubricant listed in the QPL.

42
43 (vi) Hydrant sections shall have an electrostatic applied, fusion bonded, epoxy coating
44 internally and externally. The coating shall meet or exceed the requirements of AWWA
45 C550. Coating shall be applied only at the valve manufacturer's facilities. New hydrants
46 shall be painted at the manufacturer's facility; field painting will not be accepted.
47

1 (vii) The standpipe shall be Bitumen coated internally and externally with a bury line
2 present below the break flange to indicate proper installation depth. Bury depth will be
3 clearly stenciled or cast on the standpipe section.
4

5 (viii) Rated working pressure shall be 250 psi; test pressure shall be 500 psi in both the
6 open and closed position. Independent testing shall certify fire hydrants have a maximum
7 head loss of 2.5 psi, when flowing at 1000 gpm through the 4½” nozzles. Tests will be
8 preformed as described in AWWA C502.
9

10 (ix) The hydrant main valve shall be 5¼” and true compression type, opening against and
11 closing with the pressure. It shall use EPDM seating material only. All working parts
12 shall be removable without excavation.
13

14 (x) The hydrant’s upper and lower stem, as well as its break coupling, internal pins and
15 clips, shall be manufactured of stainless steel or epoxy coated steel. External bolting shall
16 be manufactured of stainless steel. Manufacturer shall use a lubricant during assembly of
17 bolt and nut sets to prevent galling of similar metals.
18

19 (xi) All hydrants shall be of the traffic breakaway type and allow a 360° rotation to
20 position the pumper nozzle in the desired direction after installation. Undercut or
21 breakaway bolts will not be permitted.
22

23 (xii) Hydrants will consist of one 4½” NST pumper nozzle and two 2½” NST hose
24 nozzles. Each nozzle will be bronze and secured with a stainless steel set screw, for easy
25 maintenance and replacement should damage occur. Nozzles threaded into the nozzle
26 section shall be lubricated with a lubricant before delivery.
27

28 (xiii) Lubrication reservoir shall be cast as part of the bonnet, creating a watertight cavity
29 without the use of gaskets. A lubrication port shall be provided for lubrication, without
30 disassembly of the bonnet section. The reservoir shall be filled with NSF/FDA approved
31 food grade grease or oil, certified to contain no acetates, at the manufacturer’s facility.
32 The combination of two o-ring sets in the reservoir shall seal the cavity from contact with
33 water - one set on the interior and exterior of the thrust nut and the second set at the
34 bottom of the reservoir as a stem seal.
35

36 (xiv) Hydrants shall have two positive stops to prevent over travel of the operating rod -
37 one on the upper stem (stop nut) and/or one on the main valve (bottom stop). The main
38 valve shall not bottom out onto the shoe section.
39

40 (xv) The seat ring shall be bronze and threaded into a bronze drain ring. The drain ring
41 assembly shall be replaceable without removing the MJ shoe connection, thrust blocks or
42 restraints. The draining system shall be a sliding drain seal type. The drain mechanism
43 shall be completely closed after no more than four turns in the opening direction. The
44 drain channel shall be 360° with drain port outlets, bronze bushed on the exterior of the
45 hydrant, with a bronze plug.
46
47
48
49

1 **6. GRAVITY SEWER**

2
3 **a. GENERAL**

4
5 (1) The contractor shall be responsible for furnishing of all labor, materials, equipment, and
6 incidentals required for construction of gravity sewers and appurtenances as shown on the
7 approved plans and as specified herein.

8
9 (2) The contractor shall be responsible to ensure that all safety requirements are met.

10
11 (3) Materials shall include, but not limited to, the following:

- 12
13 (i) Gravity Wastewater Main
14 (ii) Wastewater Manholes
15 (iii) Services laterals and cleanouts

16
17 **b. SEWER**

18
19 **(1) Materials**

20
21 The pipe material, joints and fittings shall be as specified in Section J.4 of this Chapter and on
22 the QPL.

23
24 **(2) Installation**

25
26 (a) All sewer pipes shall be true to line and grade with bells facing upstream. The sections of
27 the pipe shall be so laid and fitted together that when complete, the sewer shall have a smooth
28 and uniform invert. All pipes shall be free from defects. Trenches shall be kept dry while the
29 pipe is being laid. Visible leakage, deflections, horizontal misalignment, non-constant slopes
30 between manholes, and sagging joints shall each be grounds for rejection of lines.

31
32 (b) Where navigable waterways are crossed, approved utility crossing signs shall be placed on
33 the pipe alignment at each side of the waterway.

34
35 (c) Special care shall be exercised in design and installation to provide adequate bedding for
36 the type of pipe used, taking into consideration trench width and depth, superimposed loadings
37 above grade, and the material below trench grade. Pipe loading capabilities shall be computed in
38 accordance with established design criteria and special supporting bedding or facilities shall be
39 provided as required by the Engineer of Record (EOR). Trenches and excavations shall be kept
40 dry while work is in progress. The pipe barrel shall be uniformly supported along its entire
41 length on undisturbed soil or bedding material.

42
43 (d) A collector service connection shall not be directed into a manhole.

44
45 (e) No service connection shall be made within 5' of any manhole. The allowable length of
46 PSLUSD owned service laterals shall be no more than 150'.

47
48 (f) Cleanouts shall be spaced a maximum of 75' apart. Cleanouts shall be shown on the plans at
49 the property/ROW line or other required locations to limit the PSLUSD maintenance and

1 ownership responsibility. Cleanouts ending the PSLUSD maintenance responsibility shall be
2 installed at a minimum of 3' from back of curb, edge of driveway/pavement. For cleanout
3 installations within a non-exclusive utility easement paralleling a road ROW, the cleanout shall
4 be located a maximum of 1½' from the right-of-way line.

5
6 (g) The service pipe lateral and required fittings shall extend to the property line, perpendicular
7 to said line, terminating with stoppered ends or fittings, as indicated. The exact location for each
8 installed service shall be marked by marker balls.

10 c. MANHOLES

11 (1) Materials

12
13
14
15 (a) Manhole interior shall be lined as detailed and specified by the manufacturer. The
16 minimum inside diameter of manholes shall be 48". Non-penetrating lift pin inserts shall be
17 installed by pre-cast Fabricator. Pre-cast reinforced manholes shall be in accordance with ASTM
18 C478, Class II, made with Type II acid resistant cement, shall attain a minimum compressive
19 strength of 4000 psi in 28 days. The liner system shall be cast integrally into the manhole, pre-
20 cast concrete surrounding it, with alignment/grade of channels/openings for connecting pipes
21 matching drawing requirements. Liner integrally formed bell gaskets shall comply with ASTM F
22 477 Standard Specification for Elastomeric Seal (Gaskets) for Joining Plastic Pipe. Installation of
23 pre-cast manholes shall comply with the details shown in the Construction Standards and in
24 accordance with the manufacturer's recommendations.

25
26 (b) Manhole frames and covers shall be ductile iron or gray cast iron traffic rated heavy duty
27 conforming to ASTM Designation A48, Class 30 and on the Qualified Product List. Covers shall
28 be marked with the word "SANITARY SEWER" in 2" raised letters. Frames and covers shall be
29 set to the correct finish grade elevation.

30
31 (c) The base slab and first ring of the pre-cast manhole shall be cast monolithically.

32
33 (d) Lift holes shall be grouted once the manhole is in place.

34 35 (2) Marking and Identification

36
37 Each manhole shall be marked on the inside and outside with the following information:

- 38
39 (a) Manufacturer's name or trademark
40 (b) Manufacturer's factory location
41 (c) Manufacturer's serial number
42 (d) Total manhole depth

43 44 (3) Installation

45
46 (a) Manholes shall be installed at the end of each sewer; at every change in grade, size, or
47 alignment; at all sewer intersections; and at distances not greater than 400' apart.

1 (b) Manholes shall be placed in accessible locations, preferably in pavement flush to the
2 surface. In unpaved areas, a concrete collar shall be poured around the top of the manhole, flush
3 with the cover and 2" above finished grade.

4 (c) Manholes shall be set according to approved construction plans and shall be pre-cast in
5 accordance with approved shop drawings, specifications, and construction standards.

6 (d) Manholes shall not be placed in low-lying areas where storm water inflow may occur. The
7 manhole cover and frame shall be water tight to prevent inflow of storm water and shall be on
8 the Qualified Product List (QPL).

9
10 (e) Certification from manufacturer stating that manufacturer has provided factory training to
11 the pre-cast fabricator, and that the pre-cast fabricator is approved by the liner manufacturer for
12 incorporation of manufacturer's liner into fabricator's pre-cast manhole product, shall be
13 required.

14
15 (f) All joints, including manhole sections and risers, shall be sealed using a bonding
16 compound that meets ASTM C-990-96, latest revision. Also, an approved external joint sealing
17 system may be applied on the outside of all joints. The application of sealants shall be in
18 accordance with standard detail WW-04.

19
20 (g) Fabricator shall provide on site guidance during manhole pipe connection and joint sealant
21 installation of first manhole. Upon completion of construction, contractor shall provide
22 certification from the fabricator stating that such field guidance was provided to the contractor.

23
24 (h) Concrete manhole exterior shall receive three (3) applications 3-5 mils each of a 100%
25 solids water base epoxy. The first coat is a primer followed by two (2) finish coats. Application
26 shall be by an approved applicator.

27
28 (i) All manholes shall require backfill compaction as specified in compaction specifications.

29 30 **(4) Tools**

31
32 One manhole lid removal hook/bar shall be provided per project.
33
34

35 **7. GREASE, OIL AND SAND INTERCEPTORS**

36 37 **a. GENERAL**

38
39 (1) The contractor shall be responsible for furnishing all labor, materials, equipment, and
40 incidentals required for installation of a grease, oil or sand interceptor as shown on the approved
41 plans. The installation shall comply with the standard detail and as specified herein.
42

43 (2) Installation of the interceptor and its components shall be performed by a licensed plumber or
44 septic tank contractor registered with the Florida Department of Health.

45
46 (3) Materials shall include the tank, baffle, lid, manhole covers, valve boxes, pipe, tees, elbows
47 and miscellaneous fittings and hardware.
48

1 **b. TANK**

2
3 (1) The tank shall be built of pre-cast concrete with a minimum of 4” thick walls and pre-cast
4 holes for the inlet/outlet pipes. The lid shall be at least 8” thick. Traffic lids shall meet the
5 specifications of ASTM C890-91, latest revision.

6
7 (2) The inlet and outlet holes shall have a prefabricated pipe boot with stainless steel clamp or
8 gasket.

9
10 (3) The inlet invert level shall be a minimum of 2½” above the water level.

11
12 (4) The liquid depth shall be at least 42”.

13
14 (5) A baffle shall be installed such that the first chamber shall have a minimum effective capacity
15 of ½ (one-half) to 2/3 (two-thirds) the total required effective capacity. The flow between the
16 two compartments shall be through an 8” diameter hole in the baffle; the hole shall be located
17 12” from the tank bottom for a grease interceptor and 16” to 20” for a sand/oil interceptor. A
18 baffle is not required if multiple interceptors are installed in series,

19
20 (6) A manhole shall be provided over each compartment for access to the inlet and outlet tees.

21
22 **c. INSTALLATION**

23
24 (1) All piping shall be a minimum of 4” PVC.

25
26 (2) The inlet and outlet tees shall be located no more than 4” from the end of the tank and shall
27 be in accordance with ASTM C923-98, latest revision, Standard Specification for Resilient
28 Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals. The inlet tee
29 shall extend no more than 24” below the water level for a grease interceptor. An inlet tee is not
30 required for sand/oil interceptors, however, if used it shall not extend more than 12” below the
31 water level. The outlet tee shall extend to within 8” of the bottom of the tank.

32
33 (3) The inlet and outlet tee shall be attached to the tank wall as per detail submitted by the EOR
34 and approved by PSLUSD.

35
36 (4) Inspection ports (two-way clean-outs) shall be installed on each end of the interceptor, which
37 are easily accessible for inspection/sampling.

38
39 (5) When the required effective capacity of the interceptor is greater than 1250 gallons, the
40 PSLUSD may require installation of multiple tanks in series. When multiple tanks are used there
41 shall be a minimum 4’ separation between tanks with the required inspection port installed in the
42 center.

43
44 (6) The manholes shall be brought to grade and fitted with covers.

45
46 (7) All joints, including mid-seams, risers and lids shall be sealed using a bonding compound
47 that meets ASTM C-990-96, latest revision.

1 (8) An approved external joint sealing system on the QPL may be applied to on the outside of all
2 joints.

3 4 **8. WASTEWATER PUMP STATIONS**

5 6 **a. GENERAL**

7
8 (1) These specifications are the minimum requirements for pump stations, including factory
9 testing of all materials, equipment and appurtenances, delivery and installation. The
10 manufacturer's recommendations, approved plans and standard details may contain additional
11 requirements pertinent to the installation including accessory and auxiliary equipment and
12 material types, which may not be specified herein.

13
14 (2) The specifications for "Grinder Pump Station" and "Lift Station" shall be used in conjunction
15 with Section G.4 of this Chapter - Design Criteria for Wastewater Pump Station.

16
17 (3) The pumps and appurtenances furnished shall be installed in accordance with the industry
18 standards and methods, as specified herein. All pumps shall be manufactured in accordance with
19 the Hydraulic Institute standards.

20
21 (4) In the event that it is impossible to conform to certain details of the specifications due to
22 different manufacturing techniques, a written justification shall be submitted for all non-
23 conforming aspects.

24
25 (5) Only components on the QPL shall be utilized.

26
27 (6) All equipment and materials furnished shall be new and the standard product of the
28 manufacturer.

29
30 (9) The use of stainless steel nuts and bolts, minimum grade 316, is required on all parts.

31
32 (10) When pump stations are located in areas where fire or explosion hazards may exist, the
33 electrical components (e.g. motors, lights, cables, conduits, switch boxes, control circuits, etc.)
34 shall comply with the National Electrical Code requirements for Class I, Division I, Group D
35 locations. The pumps and electrical components shall be certified as explosion proof by Factory
36 Mutual Approvals.

37 38 **b. SHOP TESTING**

39
40 Each pump shall be tested in the manufacturer's shop to demonstrate the proper operation of all
41 components. Testing shall also be conducted to determine overheating of bearings, motors or
42 other components.

43 44 **c. SUBMITTALS**

45
46 Contractor shall provide to the PSLUSD copies of shop drawings and factory test results. A
47 minimum of three (3) sets of shop drawings shall be submitted to the PSLUSD for review and
48 approval.

1 **(1) Grinder Pump System** - The following information shall be provided as a minimum:

2
3 (a) Dimensions and anchor bolt locations.

4 (b) Descriptive literature, bulletins, and/or catalogs of the equipment.

5
6 (c) A list of the manufacturer's recommended spare parts to be supplied in addition to those
7 specified herein under Section g. - Spare Parts; gaskets, packing, etc. shall be included and
8 bearings shall be listed by the manufacturer's item numbers only.

9
10 (d) Complete motor data.

11
12 (e) Copies of all factory test results.

13
14 (f) A certified Hydraulic Institute test curve from an identical pump including head, capacity,
15 brake horsepower, and pump efficiency for each pump type supplied.

16
17 **(2) Lift Station** – The submitted drawings and data shall be provided by the manufacturer,
18 including but not limited to the following:

19
20 (a) Information on wet well, pumps, discharge piping, valves, guide rail systems,
21 pressure gauges, access covers, control panel, electrical schematics and any other requirements
22 necessary to complete the lift station installation, including –

23
24 (i) Assembly drawings, nomenclature, and materials list

25 (ii) Outline dimensions and weights

26 (iii) Drawings, method of anchoring equipment, and piping connection details

27 (iv) Electric motors

28 (v) Name of manufacturer

29 (vi) Type, model and frame size

30 (vii) Motor horsepower

31 (viii) Full load speed

32 (ix) Construction

33 (x) Temperature rise and class of insulation

34 (xi) Service factor.

35 (xii) Voltage, frequency, number of phases

36 (xiii) Full load current

37 (xiv) Locked rotor current

38 (xv) Motor efficiencies at 1/2, 3/4, and full load

39 (xvi) Controls and Wiring Diagram

40 (xvii) Pump curves at listed RPM ("Family" curves are not acceptable)

41
42 (b) Drawings and descriptive information in sufficient detail to show the kind, size,
43 arrangement, and operation of component materials and devices; the external connections,
44 anchorages, and support required; and dimensions needed for installation and correlation with
45 other materials and equipment. All part numbers and catalog data required for ordering spares
46 and replacements shall be provided.

47
48 (c) The acceptance of drawings returned marked "REVIEWED" or "REVIEWED AS NOTED"
49 will not constitute a blanket approval of dimensions, quantities, and details of the materials,

1 equipment, device or items shown and does not relieve the contractor of responsibility for errors
2 or deviations from the requirements.

3
4 **d. MANUFACTURER’S QUALIFICATIONS**

5
6 Equipment and materials shall be furnished by a manufacturer fully experienced, reputable and
7 qualified in the manufacture of items to be installed.

8
9 **e. PRODUCT HANDLING**

10
11 (1) All equipment and parts shall be properly protected so that no damage or deterioration will
12 occur during a prolonged delay from the time of shipment until installation is completed and
13 ready for operation.

14
15 (2) Factory assembled parts and components shall not be dismantled for shipment unless
16 permission is received in writing from the EOR.

17
18 (3) Finished surfaces of all exposed pump openings shall be protected by wooden planks,
19 strongly built and securely bolted thereto. Finished iron or steel surfaces not painted shall be
20 properly protected to prevent rust and corrosion.

21
22 (4) After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and
23 proper care shall be taken to protect parts from entry of water during shipment, storage and
24 handling.

25
26 (5) Each box or package shall be properly marked to show its net weight in addition to its
27 contents.

28
29 **f. WARRANTY**

30
31 Pumps shall have a minimum of 5-year warranty from the manufacturer, covering 100% of all
32 parts and labor for repair/replacement. The warranty period shall commence at the time of pump
33 station acceptance by the PSLUSD.

34
35 **g. SPARE PARTS**

36
37 Spare parts to be furnished to the PSLUSD shall include:

38
39 (1) 1 full set of fuses for entire panel,

40
41 (2) 1 full set of fuses for disconnect (if fused), and

42
43 (3) 1 set of motor starters for a grinder pump station or 1 set of starter contacts for the lift station,
44 as applicable.

45
46 These items shall be turned over to the PSLUSD at the start-up inspection.

1 **h. FIELD QUALITY CONTROL**
2

3 The services of a qualified factory-trained manufacturer’s representative shall be provided to
4 assist the contractor in installation and start-up of the equipment specified under this section.
5 The manufacturer’s representative shall provide technical direction and assistance to the
6 contractor in general assembly of the equipment, connections, adjustments and testing. The
7 following work shall be performed by the contractor, as a minimum, under the technical
8 direction of the manufacturer’s service representative:
9

10 (1) Inspections and final adjustments.
11

12 (2) Operational and functional checks of controllers/starters and spare parts.
13

14 **i. PUMP STATION SPECIFICATIONS & INSTALLATION**
15

16 **(1) Grinder Pump Station**
17

18 A single manufacturer shall be responsible for supplying the entire grinder pump station
19 including but not limited to pumps, motors, wet well, valve vault, rail assembly, electrical
20 controls and appurtenances. The PSLUSD will make available to developer/contractor for
21 purchase the major components of the single-phase grinder system; all appurtenances and labor
22 required to complete the installation will be the responsibility of the developer/contractor.
23

24 **(a) Pumps**
25

26 (i) The pumps shall be totally submersible grinder type, designed to pump raw sewage.
27 The pumps shall be standard dimensions such that parts will be interchangeable between
28 like units. The same manufacturer shall supply all units.
29

30 (ii) The pumps shall be equipped with a rail and discharge connection assembly, which
31 will allow the removal of the pumps without the need for personnel to enter the wet well.
32

33 **(b) Valves & Piping**
34

35 (i) Pipes, fitting, valves and appurtenances shall meet the specifications included in
36 Sections J.4 and J.5 of this Chapter and must be approved by PSLUSD (QPL).
37

38 (ii) A heavy duty brass or stainless steel check valve, rated for 150 psi, shall be installed
39 in the discharge line at the point of connection to the main, as shown on the approved
40 plans and standard details.
41

42 (iii) Discharge piping shall be schedule 80 PVC.
43

44 (iv) For grinder pump stations with 3HP and 5HP pumps, a valve vault made of fiberglass
45 shall be provided as required in the design criteria and shown on the standard details. The
46 valve vault shall include a check and plug valve for the discharge line for each pump and
47 an emergency pump out connection with a 3”camlock. The lid and cover shall be made of
48 aluminum, capable of bearing a live load of 300 pounds per square foot.
49

1 **(c) Wet Well & Access Cover**
2

3 (i) The wet well shall be sized as specified in the approved plans and made of molded
4 reinforced polyester resin and fiberglass construction. The wet well shall have a
5 minimum wall thickness of 1/4". A 6" diameter inlet hub of the O-ring seal type shall be
6 provided for field installation of the lateral. Other wall penetrations for electrical conduits
7 and venting shall be provided.
8

9 (ii) The wet well manufacturer shall furnish wet well access covers and frames as shown
10 on the approved plans and PSLUSD standard details for the wet well. The cover shall be
11 made of aluminum, gasket sealed, with 316 stainless steel bolts used to secure the cover
12 to the wet well, and shall be capable of bearing 300 pounds per square foot live load.
13

14 (iii) An approved (QPL) safety net or grate shall be provided for fall prevention.
15

16 **(d) Pump Control System**
17

18 (i) A pump controller shall be provided for each grinder pump unit. The controller shall
19 automatically start and stop the pump and switch the lead and lag pump on each start-up.
20

21 (ii) The pump controller shall be the standard system of the manufacturer, as modified for
22 the proposed application.
23

24 (iii) The control panel shall consist of a lightning arrestor, a disconnect switch, a circuit
25 breaker and NEMA rated magnetic starter for each pump motor. A high level alarm and
26 pump shut-off shall be activated by a float type, low voltage liquid level control system.
27 Control switches shall provide means to operate each pump manually or automatically.
28

29 (iv) The electrical control equipment shall be mounted within a NEMA control panel
30 with all stainless steel hardware. The enclosure shall be U.L. listed as an assembly and
31 shall incorporate a removable back panel on which control components shall be mounted.
32 Back panel shall be secured to enclosure with collar studs. A high level and seal failure
33 alarm light shall be mounted on top of the control cabinet. The light shall be enclosed in a
34 red polycarbonate enclosure. The high level alarm float installed in the wet well shall
35 activate an exterior light and audible alarm. Seal failure alarm circuitry shall only be
36 provided if required to obtain manufacturers warranty.
37

38 (v) The enclosure shall be installed with stainless steel anchors imbedded a minimum of
39 2" into concrete.
40

41 **(e) Installation**
42

43 Installation shall be strictly in accordance with the manufacturer's instructions, PSLUSD
44 standard details and in the location shown on the approved plans. If the equipment requires an
45 arrangement or dimensions different from those shown on the approved plans or the standard
46 details, the EOR shall submit shop drawings, showing all necessary changes, to the PSLUSD for
47 review and approval,
48
49

1 **(2) Lift Station**

2
3 **(a) Wet Well**

4
5 (i) The base slab and the first ring of the pre-cast wet well shall be cast monolithically.

6
7 (ii) The holes for influent pipe and discharge pipes shall be pre-cast and have pre-
8 fabricated boots installed by the manufacturer of the wet well.

9
10 (iii) A liner shall be provided as a corrosion barrier by an approved manufacturer on the
11 QPL.

12
13 (iv) Installation of the lift station risers shall be in accordance with the manufacturer's
14 specifications.

15
16 (v) The exterior of the wet well shall receive three (3) applications
17 3-5 mils each of a 100% solid water based epoxy on the QPL. The first coat is a primer
18 followed by two (2) finish coats. The coatings shall be applied at the manufacturer's
19 facility; field application is not acceptable excepting for repairs and shall be conducted by
20 a factory representative.

21
22 (vi) Holes to accommodate pipe shall be pre-cast into the section at the manufacturer's
23 plant.

24
25 (vii) Any visible reinforcing wire, steel or honeycombs on pre-cast structures shall be
26 cause for rejection.

27
28 (viii) Interior of wet well shall be fitted with stainless steel (316) upper guide bar
29 brackets, cable holder, guide rails and grip eyelift cable.

30
31 (ix) The wet well shall have a concrete top and a pad lockable aluminum hatch cover and
32 frame with stainless steel hardware. The cover shall be sized and located to allow for
33 unobstructed vertical removal of all pumps and mixed flush valves and shall be capable
34 of supporting a 300 pounds per square foot static load. The cover shall have a pull-up
35 handle to open and have a locking safety handle to retain the covers in an open position.

36
37 (x) All access openings shall be fitted with a permanently installed fall through
38 prevention system that is easily retractable for access to the opening below. The fall
39 through prevention system shall consist of the following components:

- 40
41 1. A safety grate
42 2. All stainless steel 316 hardware
43 3. A permanently attached metal tag with the following information:
44 4. Name of the grate manufacturer
45 5. Identification of the grate material
46 6. Date of manufacture
47 7. Date of prototype test
48 8. Name of testing agency
49 9. Serial number
50

1 Installation shall be in accordance with the manufacturer's instructions.

2
3 **(b) Discharge Piping**
4

5 (i) Discharge piping from the pumps shall be installed in accordance with PSLUSD
6 standard details. Piping up to the plug valve shall be flanged, 316 stainless steel or ductile
7 iron pipe. Ductile iron pipe shall be Class 53 with interior epoxy lining, minimum 35
8 mils.

9
10 (ii) Each base elbow shall be secured to the concrete floor with stainless steel expansion
11 bolts and a stainless steel plate per PSLUSD standard details.

12
13 (iii) The pipes, valves, and fittings shall be coated as specified for exterior of wet well.

14
15 (iv) Check valves shall include external spring and lever.

16
17 (v) Shutoff valves shall be resilient plug valves.

18
19 (vi) An emergency pump connection device shall be provided and shall be a male
20 aluminum or bronze "Cam-loc" fitting with dust cap and an isolation plug valve. A
21 stainless steel ball valve shall be provided on the dust cap.

22
23 (vii) All fittings to have flange ends.

24
25 (viii) All hardware shall be grade 316, stainless steel.

26
27 (ix) An air release valve shall be provided with a vent into the wet well.

28
29 (x) An oil filled pressure gauge and a pressure transducer shall be provided in the
30 discharge pipe after the check valves. The gauge shall read in pounds per square inch,
31 with a range suitable for the required service. Gauge shall be equipped with diaphragms
32 (neoprene or stainless steel), or other suitable separating device, to preclude wastewater
33 from entering the mechanism.

34
35 **(c) Pumps**
36

37 (i) Pumps shall be non-clog, and mechanical seal submersible pumps.

38
39 (ii) The pump electrical conductor shall be continuous multi-conductor, copper cable (no
40 splices), in compliance with industry standard for load and resistance against sewage. The
41 conductor shall enter the pump through a heavy-duty entry assembly that shall be
42 provided with an internal grommet assembly to protect against leakage once secured and
43 must have a strain relief assembly as part of standard construction. The pump conductor
44 shall be the length required to properly connect the pump and panel, but in no case shall
45 be less than 40'.

46
47 (iii) Each pump shall be provided with a guide rail assembly designed so that each pump
48 automatically connects to the discharge piping when the pump is lowered into place. The

1 pump to guide rail assembly connection shall be non-sparking. The pumps shall be easily
2 removable for inspection and/or service.
3

4 (iv) Pumps shall have a tandem mechanical shaft seal system. Mechanical seals shall be
5 made of tungsten carbide or silicon carbide with a stainless steel case. Wearing rings
6 shall be abrasion resistant and shall be installed at the inlet side of the pump to provide
7 protection against wear to the impeller.
8

9 (v) The lifting handle shall be stainless steel and be large enough to hook the pump with a
10 standard assembly from a height of 20' and be equipped with a grip eye lifting cable and
11 tool.
12

13 (vi) The pumps with a size of 15 HP or greater shall be equipped with a moisture sensor
14 to detect seal failures. A visual signal with a manual override shall be used at the control
15 panel.
16

17 (vii) One pump shall be equipped with a utility approved mix flush system per the pump
18 manufacturer.
19

20 (viii) Pump motor shall be housed in an air-filled watertight casing and shall have Class F
21 insulated windings which shall be moisture resistant. The motor shall be Nema Design B
22 rated 155° C maximum and have a minimum 1.15 service-factor. Pump motors shall have
23 cooling characteristics suitable to permit continuous operation in a totally, partially, or
24 non-submerged condition. The pump shall be capable of running dry continuously in a
25 totally dry condition. Cable junction box and motor shall be separated by a stator-lead
26 sealing gland or terminal board which shall isolate motor from any water or solids
27 gaining access through pump cable
28

29 **(d) Motor Starter/Controller** 30

31 To extend the useful life of the pump station components including the pump and motors and
32 comply with the rules and regulations for electrical service and maximum allowable voltage
33 fluctuations, one of the following starter/controllers is required for each pump/motor based upon
34 the motor horsepower. The warranty shall include materials or workmanship, which do not
35 conform to these specifications.
36

37 **(i) Type “one” (MCC I):** 10 HP 230 VAC started across the line shall be protected at
38 300% of nameplate Full Load Amperage (FLA), using NEMA motor starters.
39

40 **(ii) Type “two” (MCC II):** 11 HP – 30 HP 480 VAC requires soft start device with
41 internal bypass protected at 200% of nameplate FLA.
42

43 **(iii) Type “three” (MCC III):** 31 HP and above 480 VAC requires a soft start device
44 with internal bypass or a variable frequency drive protected at 200% of motor nameplate
45 FLA.
46

47 **(iv) NEMA Motor Starters (MCC – I Only):** NEMA Magnetic Motor Starter with solid
48 state overload relay with life time coil warranty. Overload relay includes phase loss and
49 phase unbalance. Device must be manufactured to ensure full voltage is applied to coil

1 even at 85% of nominal eliminating contact chatter and premature contact failure. When
2 lower than acceptable voltages are applied the motor starter will not start or will break the
3 circuit to prevent contact chatter.
4

5 **(v) Soft Start Motor Starters (MCC – II Only):**
6

7 Reduced Voltage Solid State Motor Starters shall be severe duty rated with overload
8 protection, adjustable ramp times, and adjustable torque control and shall be ordered with
9 edge control option of automatic reset if desired. The starter shall offer adjustable kick
10 start control, soft stop control feature, which reduces water hammer through soft stop
11 control. The starter shall shut down at 110° C and have jam and stall detection and
12 protection features. Kick Start feature shall provide 0 to 550% full load current for a
13 duration of 0-2 seconds. Ramp up start, current limit start features are also required.
14 Device shall incorporate an internal by pass, shunting Silicon Controlled Rectifier (SCR)
15 after reaching full load.
16

17 **(vi) Solid-State Reduced Voltage Motor Control:**
18

19 1. The solid-state reduced voltage starter (soft starts) shall be UL and CSA listed
20 and bear the CE mark for compliance with applicable IEC and Eruo Norm
21 standards for solid state reduced voltage starters. The solid-state reduced voltage
22 starter shall be an integrated unit with power SCR's heat sink, logic board,
23 paralleling bypass contactor, and electronic overload relay enclosed in a shingle
24 molded housing. The SCR based power section shall consist of six (6) back-to-
25 back SCRs and shall be rated for a minimum peak inverse voltage (PIV) rating of
26 1600 volts. The starter shall be three-phase, 60 Hz, and rated for the HP, current,
27 and voltage as shown on the QPL. The following control function adjustments on
28 the device keypad are required:
29

- 30 a. Selectable Torque Ramp Start on Current Limit Start
- 31 b. Adjustable Kick Start Time, 0-2 seconds
- 32 c. Adjustable Kick Start torque, 0-85%
- 33 d. Adjustable Ramp Start Time, 0.5-180 seconds
- 34 e. Adjustable Initial Starting Ramp Torque, 0-85%
- 35 f. Adjustable Smooth Stop Ramp Time, 0-6 seconds
36

37 2. Enclosed units shall include a thermal magnetic circuit breaker or Motor
38 Circuit Protector (HMCP) for short circuit protection and quick disconnect means.
39 Starters with breakers/HMCPs are to be rated per UL508D with a withstand rating
40 of 65 kAIC rms. Control power shall be 24V DC as standard for safety and
41 reliability. Separate control terminals shall be provided for 24V DC power, logic
42 levels signals for permissive, start, jog forward, ramp start overload override and
43 electric reset. Control terminals shall be pull-apart for easy access and wiring.
44 Optional external interface circuitry shall include 120-volt relay logic interface
45 capability. A removable Customer Interface Module (CIM) shall be provided that
46 allows for full adjustment of control and protection functions through the use of
47 potentiometers and DIP (Dual in-line package) switches. Enclosure shall not be
48 less than 16 gauge steel. Type 12 enclosures shall be of welded construction with
49 gasketed heat sink and doors.

1
2 **(vii) Variable Frequency Drive (VFD) Controllers (MCC III Only):**
3

4 1. The Variable Frequency Drive shall be rated for input voltage. The variable
5 frequency drive shall be microprocessor-based control for three phase induction
6 motors. The VFDs shall be Pulse Width Modulated (PWM) design. Adjustable
7 current source VFDs are not acceptable. Insulated Gate Bipolar Transistor shall
8 be used in inverter section. Bipolar Junction Transistor, Gate Turn-Offs (GTO) or
9 Silicon Controlled Rectifiers (SCR) are not acceptable. The VFDs shall have
10 efficiency at full load speed that exceeds 97% for motors over 40 HP.
11

12 2. The system containing the VFDs shall comply with the 5% level of total
13 harmonic distortion of line voltage and the line current limits as defined in IEEE
14 519-1992. If the system cannot meet the harmonic levels with the VFD provided
15 with standard input line reactor or optional input isolation transformer, the VFD
16 manufacturer shall supply a multiple bridge rectifier AC to DC conversion section
17 with phase shifting transformer for all drives above 100 HP. Harmonic filters are
18 not acceptable above 100 HP. The device shall be capable of communicating
19 with PSLUSD approved programmable logic controller with optional Modbus
20 communication capability.
21
22

23 **(e) Controls**

24
25 **(i) Control Panel Builder**
26

27 1. The panel builder shall be experienced in the construction of lift station control
28 panels, shall have a UL approved shop, and shall be able to provide both a UL
29 508 label for the panel, and a UL label for service rated.
30

31 2. The panel builder shall warrant the panel for one (1) full year minimum from
32 the date of start-up.
33

34 3. The panel builder or qualified technical representative shall checkout and test
35 the panel as part of the lift station start-up with the PSLUSD and EOR.
36

37 **(ii) Panel Components**
38

39 The panel and panel components are specified in the PSLUSD standard details. Omission
40 of any component on the standard details does not relieve the contractor from furnishing
41 such components that would normally be required for wastewater pumping stations.
42

43 **(iii) Enclosure**
44

45 1. The EOR shall ensure the panel sizing is in accordance with the pump size of
46 the lift station.
47

48 2. The panel shall be of a NEMA, 3R construction (QPL) with a drip lip and have
49 the following features:

- a. Constructed of grade 316, stainless steel, 14 gauge with a # 3 polish on the exterior.
- b. All external hardware shall be stainless steel with piano hinge, three-point latch with roller fitting top and bottom and single handle with padlock fitting and stainless steel external parts.
- c. Drip shield to deflect water from the door, closed cell neoprene gasket on the door.
- d. Blank outer door with dead front inner door of 1/8" thick aluminum hinged on the left with the operators controls mounted on or projecting through it.
- e. Painted steel back mounting plate for heavy components.
- f. Aluminum enclosure 1/8" thick around the surge arrestor and surge capacitor with a 1/8" minimum, lexan cover for the ends of the arrestor and capacitor and the incoming line terminals to isolate the lightning arrestor and surge capacitor in case of failure and to provide protection for the operator from the live terminals if the breaker is open.
- g. The outer door is to have 9" x 11" painted steel or aluminum pocket for the log book, tack weld to the inside of door.
- h. Arms and latches shall hold both outer door and inner door in an open position; these must be sufficiently rigid and secure to hold doors open under windy weather conditions.
- i. Sliding locking bar to allow only main or emergency breaker to be closed. Bar shall be aluminum with stainless steel hardware.
- j. All hardware shall be grade 316, stainless steel.

(f) Telemetry

The contractor shall furnish and install the new radio telemetry equipment and programming as specified in the approved plans and in accordance with the PSLUSD standard details. Extension of fiber optic cable may be required when deemed necessary by the Utility Director. A single subcontractor shall be responsible for all hardware, software, system integration, programming, testing and startup.

(i) Components

The specifications for the components are as follows:

1. Remote Telemetry System

1 a. The Remote Telemetry shall be a microprocessor based Programmable Logic
2 Controller (PLC) and shall serve as an interface to accumulate, process, transmit,
3 and receive discrete and analog status and control messages between the RTU
4 base station and the remote RTU sites. Remote sites shall be 452.100 MHZ or
5 151.565 MHZ or fiber optic PLC depending on location.
6

7 b. The PLC shall be designed to operate in an industrial environment,-be capable
8 of operation in an ambient temperature range of 0-60° C, and a relative humidity
9 of 5%-95%, non-condensing. The PLC shall operate on supply voltages of 24
10 volts DC.
11

12 c. LED-type indicating lights shall be shall be provided as follows:
13

14
15
16 (1) READY; RUN; BATTERY LOW; MODBUS; ETH, Serial.
17

18 (2) Controller and accessory equipment shall be Modicon M340 PLC.
19

20 (3) All IEDs shall be powered with 24 vdc through a power supply capable of
21 float charging sealed Gel-Cell batteries and shall include AC Power
22 monitor with alarm output to the RTU loss of AC power. Batteries shall be
23 sized to provide 60 minutes of full load back up in the event of AC power
24 loss.
25

26 (4) Input/Output modules shall be wired to terminal strips.
27

28 **2. RTU Communication Interface** 29

30 a. The Radio Transceiver shall be complete Calamp Vipier SC series radio with
31 serial and Ethernet interface . The Radio transceiver shall include automatic
32 frequency, control, loop back, and SMART diagnostics. Radio enclosure shall
33 include RF shield. Radio transceiver shall be 5 watts at a frequency of 452.100
34 MHz or 151.565 MHz depending on location. Cisco IE 3000-4TC Ethernet switch
35 on required for locations with fiber optic communication.
36

37 b. The complete communications subsystem including interconnecting cables
38 shall contain lightning, surge, and transient protection.
39

40 c. Control panels shall be sized to accommodate the PLC, radio transceiver or
41 fiber optic switch, power supply, backup battery, and other ancillary equipment
42 related to the remote telemetry system, as well as all starters, soft starts, relays,
43 over current protection and Modicon TeSys T motor management system.
44

45 **3. Antenna and Tower Assembly:** 46

47 a. Antenna and tower assembly shall be installed in accordance with standard
48 details.
49

1 b. Antenna cable shall be ½” Heliax with LMR connectors, and protected in panel
2 with a Polyphaser surge protector.

3
4 **4. Surge Protection**

5
6 Surge Protection shall protect the 120 volts AC system, the ½” helix cable and
7 antenna subsystem.

8
9 **5. Electrical Transient Protection:**

10
11 All electrical and electronic elements shall be protected against damage due to
12 electrical transient induced in interconnecting lines from lightning discharges and
13 nearby electrical systems.

14
15 **6. Manufacturer’s Qualifications**

16
17 The company shall have at least five years experience in the design, development,
18 and manufacture of surge suppressors.

19
20 **7. Surge Suppressor**

21
22 a. Surge suppressors shall be located at:

23
24 (1) Any connections between AC power and electrical and electronic
25 equipment, including panels, assemblies, and field mounted analog
26 transmitters.

27
28 (2) The field, panel, or assembly connections of all analog signal circuits that
29 have any portion of the circuit extending outside of a protecting building.

30
31 b. Surge suppressor assemblies for 120 volt AC power supply connectors shall
32 be:

33
34 (1) Provided with two 3-terminal barrier terminal strips capable of accepting a
35 No.12 - AWWC solid or stranded copper wire. One terminal strip shall be
36 located on each end of the suppressor unit.

37
38 (2) Epoxy encapsulated within a nonflammable phenolic enclosure with
39 provision for mounting to interior or equipment racks, cabinets, or to the
40 exterior of freestanding equipment. Epoxy encapsulation shall be flame
41 retardant.

42
43 (3) Constructed as multistage devices. The first stage shall be a high-energy
44 metal oxide variator element. The second stage shall consist of fast-acting
45 high power bipolar silicon avalanche devices. First and second stages shall
46 be interconnected through a series air core inductor of sufficient current-
47 carrying capacity to permit a continuous operating current of 15 amperes.
48 Inductors having ferrous or other high permeability core materials are not
49 acceptable. Suppressor assemblies shall be the automatic recovery type.

1 c. Surge suppressors shall meet or exceed the following performance criteria
2 based on a test surge wave shape with an 8-microsecond rise time and a 20-
3 microsecond exponential delay time:
4

- 5 (1) Minimum Operating Voltage: 120 volts AC
- 6 (2) Maximum Breakdown Voltage: 150 volts AC
- 7 (3) Maximum Operating Current: 15 amps
- 8 (4) Peak First Stage Surge Current: 20,000 amps
- 9 (5) Maximum Second Stage Clamping Voltage: 350 volts
- 10 (6) Minimum Second Stage Clamping Voltage: 210 volts
- 11 (7) Ambient Temperature Range: -20° C to +85° C

12
13 d. Surge suppressors for analog signal connections shall:
14

- 15 (1) Have four lead devices with a threaded mounting/grounding stud.
- 16
- 17 (2) Have a circuit consisting of a 3 electrode gas tube and silicone avalanche
18 devices to clamp each line to the ground. High-energy gas tube and
19 silicone avalanche devices shall be separated by series impedance.
20
- 21 (3) Be epoxy encapsulated with a nonflammable phenolic enclosure. Epoxy
22 encapsulation shall be flame retardant.
23
- 24 (4) Limit line-to-ground and line-to-line voltage to 30 volts on 24 volts DC
25 circuits.
26
- 27 (5) Meet or exceed the following performance criteria based on a test surge
28 wave with 8-microsecond rise time and 20-microsecond exponential decay
29 time:
 - 30 (a) Recovery - Automatic
 - 31 (b) Peak Source Current - 10,000 amps
 - 32 (c) Pulse Lift Before Failure - 100 occurrences
 - 33 (d) Minimum Voltage Clamp Rating - 30 volts
 - 34 (e) Series Impedance - 24 ohms total
 - 35 (f) Temperature Range - -20° C to +85° C
 - 36 (g) Operating Voltage - Less than 30 volts DC
 - 37 (h) Operating Current - 4 to 20 mA DC
 - 38 (i) Resistance Line-to-Ground - Greater than 1 megohm
- 39

40 **8. Corrosion Protection**

41
42 All indoor and outdoor panels shall be fitted with vapor phase corrosion inhibitor
43 capsules. Capsules shall be labeled with the date of activation.
44

45 **9. Workstation Displays/Database**

46
47 The graphics screens shall match existing plant standard screens. The database
48 shall be configured for complete functionality including I/O driver, tag names,
49 alarm points, and printouts.

1 **10. Fabrication**
2

3 a. Cabinets and panel shall provide mounting for power supplies, control
4 equipment, input-output subsystems, panel mounted equipment and
5 appurtenances. Ample space shall be provided between equipment to facilitate
6 servicing and cooling.
7

8 b. The rack framework shall be stainless steel construction, 15/8" x 15/8", using
9 Powerstrut, Unistrut, or equal and/or angle to provide a rigid assembly. Racks
10 shall be of open, box-like framework with all frame supports welded and ground
11 smooth. Stainless steel straps shall be used for locating terminal blocks. The
12 terminal blocks shall be factory assembled on a miniature mounting channel and
13 the channel bolted to the stainless steel strap. Terminals shall be miniature screw
14 type unless otherwise required and shall be rated at least 300 volts, 20 amps, per
15 the QPL.
16

17 c. The terminals shall be marked vertically with a permanent, continuous marking
18 strip from top to bottom. One side of each terminal strip shall be reserved
19 exclusively for field incoming conductors. Common connections and jumpers
20 required for internal wiring shall not be made on the field side of the terminal
21 subject to the approval of the PSLUSD. A vendor's pre-engineered and
22 prefabricated wiring termination system will be acceptable.
23

24 d. Wiring shall comply with accepted standard instrumentation and electrical
25 practices and codes. For each pair of parallel terminal blocks, the field wiring
26 shall be between the blocks. Solder-less horseshoe (spade) connectors, with
27 insulating sleeves shall be used for connecting wires to terminal blocks.
28

29 e. All wiring shall be bundled and run open or enclosed in vented plastic wire
30 way, as required. All conductors run open shall be bundled and bound at regular
31 intervals, not exceeding 12", with nylon cable ties. Care shall be taken to separate
32 electronic signal, discrete signal, and power wiring. A copper ground bus shall be
33 installed the full length of each panel, interior panel wiring and field wiring shall
34 be tagged at all terminations with machine printed plastic sleeves. The wire
35 number shall be the ID number listed in the input/output schedules.
36

37 f. Wires shall be color coded as follows:
38

- Neutral - White
- Ground - Green
- Power - Red
- Signal - Black and White
- Control - Violet
- Special - Blue

39 g. Panels shall be provided with a main circuit breaker and a circuit breaker on
40 each individual branch circuit distributed from the panel. Main breaker and
41 branch breaker sizes shall be coordinated such that a fault in a branch circuit will
42 trip only the branch breaker, but not the main breaker.
43

1 h. Panels shall be provided with 120 volt duplex receptacles for service
2 equipment, and an internal fluorescent panel light with separate switch located on
3 dead front.
4

5 i. Provide separate 120 volt feeder circuit complete with circuit breaker and on/off
6 switch.
7

8 j. Panels shall be furnished with red laminated plastic warning signs in each
9 section. The sign shall be inscribed "WARNING - This Device is Connected to
10 Multiple Sources of Power". Letters shall be 1" high, white.
11

12 k. Panels shall have equipment racks mounted on a removable back plate (sub
13 panel) to permit withdrawal of the equipment for maintenance or adjustment.
14 Panels shall be designed to permit front access for all service and removal of
15 equipment. Front access panels shall be hinged, removable with common keyed
16 locking hardware. The interconnection between equipment and panel shall be by
17 means of flexible cables provided to permit withdrawal of the equipment from the
18 cabinet without disconnecting the plugs.

19 l. Panels shall be provided with separate 120 volt circuit and switch for area flood
20 light.
21

22
23 **11. Supplier's Qualifications:**
24

25 The system supplier shall be ISO 9000 certified, and regularly engaged in design,
26 construction, installation, and startup of SCADA RTU systems.
27

28 **(g) Wiring**
29

30 (i) All wiring shall be copper, AWG 14 minimum. Wires shall be color coded as follows:
31

<u>Controls</u>	Color
Ground	- Green
Grounded Neutral	- White
120 Volt Power	- Black
Control	- Red
24 Volt Control	- Blue

<u>Power</u>	<u>240Y/120</u>	<u>480Y/277</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

32
33
34 (ii) Different control wiring colors are acceptable if clearly identified. Power wiring shall
35 be kept separate from control wiring, and shall be identified by phase. The high leg shall
36 be the center terminal on the main breaker.
37

38 (iii) All wires shall be numbered with machine made plastic wrap around labels at both

1 ends.

2
3 (iv) All external connection and internal connections, where shown on the drawings, shall
4 be brought to the numbered terminals.

5
6 (v) Wiring shall be enclosed in panduct or equivalent wire ways and wiring between the
7 doors and the panel shall be enclosed in a spiral wrap or approved equal with sufficient
8 slack to allow full opening of the door.

9
10 (vi) Wiring shall be secured with screw-on tabs. Tabs with adhesives shall not be used.

11
12 (vii) All wiring shall be front accessible.

13
14 (viii) All conduits to be ultra-violet resistant PVC, Schedule 80 or stainless steel for
15 electrical use, as indicated in PLSUD standard details for control panels, and shall be of
16 2" minimum size.

17
18 **(h) Component Mounting**

19
20 (i) All components shall be securely mounted with stainless steel hardware. Self-tapping
21 screws are not acceptable.

22
23 (ii) All relay bases shall be front-mounted with screw terminals. No soldered connections
24 shall be used. All base terminals shall be numbered to correspond to relay numbers.
25 Where plug-in components are not firmly secured in bases, hold down clamps shall be
26 provided.

27
28 **(i) Identification**

29
30 (i) All components shall be identified in accordance with the schematic diagram, using
31 permanent nametags on the panel of laminated micarta or approved equal. The permanent
32 nametags shall be securely attached and in a position where they are clearly visible.

33
34 (ii) All operators' controls shall be provided with laminated micarta nametags attached
35 with stainless steel screws, with minimum lettering height of 1/8".

36
37 (iii) A laminated schematic drawing shall be attached to the inside of the outer door,
38 minimum size 11" x 17".

39
40 (iv) Attach a separate laminated label showing the following details:

41

	<u>PUMP</u>	<u>MOTOR</u>
1.	Brand	Horsepower
2.	Catalog number	Speed
3.	Impeller number and size	Voltage
4.	Design head	Full load amps
5.	G.P.M.	Catalog number
6.	Serial numbers	Serial numbers

1 **(j) Component Features**
2

3 **(i) Main and Emergency Breaker:** The panel shall include circuit breaker sized as
4 required for main power and emergency power disconnect. Breakers shall be mounted on
5 the sub panel with handles through inner door and shall include a mechanical interlock on
6 the handles to insure that only one breaker can be in the "ON" position at any one time.
7 Circuit breaker Ampacity Voltage and Interrupting Capacity shall be listed on the
8 construction drawings. Panel shall also include an externally mounted generator power
9 receptacle pre-wired to the emergency breaker.
10

11 **(ii) High Level Alarm System:** The panel shall include a vapor-proof red light mounted
12 on the top of the enclosure for high-level alarm visual indication and a weatherproof horn
13 mounted on the underside of the panel box. The alarm light and horn shall be pre-wired
14 to terminals to operate on a high-level control signal. An alarm silence push button
15 labeled "Alarm Silence" shall be mounted on the outside of the enclosure and pre-wired
16 to a relay which will silence the horn under all conditions, and automatically reset when
17 high level condition is corrected. The high level light shall have a flasher to pulse the red
18 external visual indicator light during a high level condition. The alarm light is to be
19 designed and positioned to provide an unobstructed access for changing light bulb.
20

21 **(iii) Elapsed Time Meters:** The panel shall include a non-resettable type elapsed time
22 meter for each starter mounted on the inner door to record the accumulated running time
23 of each pump. A totalizer to record running time of all pumps shall also be provided.
24

25 **(iv) Convenience Receptacle:** The panel shall have a Ground Fault Interrupter (GFI)
26 type convenience receptacle mounted on the inner door to provide plug-in 120 volt power
27 with ground fault protection.
28

29 **(v) Phase and Voltage Monitor Relay:**
30

31 1. The panel shall have a line voltage rated phase sequence and loss monitor relay.
32 The monitor relay shall be the adjustable type to be field set for nominal available
33 incoming voltage. The monitor relay will be pre-wired to take the control circuit
34 out of service if a phase is reversed, one or more phases are lost, or drops below
35 nominal voltage or if all three phases drop below nominal voltage.
36

37 2. The unit will automatically restore when normal conditions are restored.
38

39 3. Relay shall be the socket-mounted type.
40

41 **(vi) Seal Failure Indicator:** The panel shall have a seal failure (leak detector) indicator
42 pilot light for each pump, if applicable. These pilot lights shall be operated by moisture
43 sensing monitors that are signaled by probes supplied in each pump.
44

45 **(vii) Lightning Arrester/Surge Suppressor:** The panel shall have three-phase transient
46 voltage lightning arrester/surge suppressor protection. The suppressors shall be pre-wired
47 to the point of incoming line service.
48

49 **(viii) Float Control System:**

1
2 1. The panel shall have a five float control system, to activate the appropriate
3 controls. The floats shall have the capability to control several pumps and alarms,
4 as well as indicate levels, using discrete set points. Floats shall be used in
5 conjunction with various monitoring, indicating, and logic control devices. The
6 highest float shall operate a relay controlled backup system.

7
8 2. Each motor shall have a separate circuit breaker.

9
10 3. Each control cable from the wet well into the control panel shall be protected
11 by a suppressor.

12
13 4. Each alarm shall have a spare contact. The contacts shall be terminated on a
14 terminal strip for future use.

15
16 **(ix) Telemetry System:** The components shall include, but not be limited to, terminal
17 strip, relays, float switches, power supply (24 volt and 120 volt) and pilot lights.

18
19 **(x) Main Power Disconnect:** A service rated fused type circuit breaker shall be included,
20 sized as required for disconnecting main power to panel box and shall be housed in
21 separate stainless steel enclosure mounted behind main panel box as indicated on the
22 PSLUSD standard detail. Where required by the power company, an additional
23 disconnect will be provided prior to the meter.

24
25 **(k) Installation**

26
27 (i) Installation of piping and valves shall be in accordance with specifications in Sections
28 J.4 and J.5 of this Chapter.

29
30 (ii) All installations shall be performed in such a manner so that components are plumb
31 and true and aligned in such a manner that the station is fully operable and functional and
32 no additional maintenance or restorative action is required. All electrical installations
33 shall be performed by a licensed electrical contractor in accordance with prevailing codes
34 and licensing requirements and shall result in a fully functioning station meeting the full
35 intent of these specifications and the drawings.

36
37 (iii) The contractor shall install the required fence in a true and straight manner, construct
38 the required water service with a reduced pressure principle backflow prevention
39 assembly, construct the concrete driveway access, construct all necessary conduit and
40 electrical connections and all other appurtenances shown on the approved plans or
41 reflected within these specifications and PSLUSD standard details, to provide for a fully
42 functional installation.

43
44 (iv) The contractor should give particular attention to the following items during
45 installation of the lift station:

46
47 1. All guide rails shall be attached to access lid frame with approved bracket
48 assemblies. Intermediate guide rail supports shall be provided per manufacturer's

1 recommendations and at least every 10'. Guide rails shall be 316 stainless steel
2 piping.

3
4 2. Lifting rings for the wet well or valve vault shall be removed below the surface
5 and grouted flush to avoid tripping hazards. Exterior lifting holes shall be grouted
6 flush.

7
8 3. Concrete work is to be of a professional quality with nonskid finish.

9
10 4. All discharge elbows shall be level and plumb to ensure all guide rails will
11 work properly and that pumps can be removed easily and seat properly.

12
13 5. All adapter flanges shall be installed according to drawings to allow easy
14 removal of valves. All bolts shall be torqued according to the manufacturer's
15 recommendations.

16
17 6. The pedestal, control panel, and related components shall not be painted.

18
19 7. The lift station site, within the fenced area, shall be covered with # 57 stone, a
20 minimum of 6" and a maximum of 8" deep, over 2 ply 4 mil visqueen. The site
21 shall be graded for proper drainage to prevent inflow of storm water into the wet
22 well.

23
24 8. Modifications to an existing pumping station shall be completed in accordance
25 with these specifications and the details shown on the approved plans. This
26 includes all work, materials, and cleaning to provide a fully operational station in
27 a "Like-new" condition.

28
29 **(I) Generator**

30
31 (i) Where portable emergency power equipment is utilized, the generator shall be diesel
32 fuel powered, trailer mounted, and with sufficient capacity to run the pumps and all
33 electrical equipment at the pump station during a power failure.

34
35 (ii) The developer shall pay for the cost of the generator and related equipment, as
36 required in the Utility Service Agreement.

37
38
39 **9. PIPELINE CLEANING (Poly Pig Method)**

40
41 **a. GENERAL**

42
43 (1) The contractor shall provide supervision, labor, tools, material and equipment necessary to
44 clean all newly constructed mains, using an approved poly pig procedure. The contractor shall
45 provide and install all items required, including poly pigs, launching and retrieval devices and
46 test equipment, in accordance with the specifications incorporated herein and PSLUSD standard
47 details.

1 (2) The materials specified shall be constructed and installed in accordance with the best
2 practice and methods.

3
4 **b. CONTRACTOR QUALIFICATIONS**

5
6 (1) The materials and work specified herein shall be furnished and performed by firms fully
7 experienced, reputable, and qualified in pipeline cleaning with the poly pig method.

8
9 (2) Equipment shall be installed in accordance with manufacturer's recommendations by
10 personnel thoroughly trained, knowledgeable and experienced in the technology and procedures
11 required for the proper and safe "pigging" of the system.

12
13 **c. CONTRACTOR RESPONSIBILITIES**

14
15 **(1) Supervision**

16
17 There shall be on-site at all times during the work, one supervisor with experience in the
18 cleaning of utility mains utilizing the procedure outlined herein.

19
20 **(2) Proposed Method**

21
22 The method of cleaning shall be by use of bare swab type poly pigs with light-density open-cell
23 urethane foam body, base coated with urethane elastomer. The pigs shall have the
24 characteristics detailed below in section d.-Poly Pigs. A minimum of two pigs of a size 2” larger
25 than the diameter of the pipe shall be used for each main that is cleaned.

26
27 **(3) Cleaning & Testing:**

28
29 (a) Cleaning shall remove soil, debris, suspended or floating matter and other foreign material
30 from the pipe, without over abrading or over cleaning the interior walls of the pipe. PSLUSD
31 shall consider a pipe to be clean when a sample of approximately two gallons of water is swirled
32 and allowed to settle in a clean white five gallon bucket and there is no visible soil, debris,
33 suspended or floating matter or any other foreign material. This test shall be performed when the
34 water leaving the pipe appears to be clean for a minimum of two minutes.

35
36 (b) The pigging procedure will be repeated until the above mentioned test shows that the
37 cleaning is satisfactory.

38
39 **d. POLY PIGS**

40
41 (1) Poly pigs shall be constructed of blown elastomer polyurethane with an open cell
42 construction and a density equal to or suitable for use in the piping system being cleaned. Poly
43 pig configuration shall consist of a parabolic nose and a concave base. The pig shall be coated
44 with a resilient surface material that will maintain a peripheral seal and effectively clean the pipe
45 without over abrading or causing any damage to the interior wall.

46
47 (2) Poly pig characteristics shall include the ability to navigate through 90° and one hundred and
48 180° turns, bi-directional fittings, full port valves and comparable in-line appurtenances, reduce
49 its cross sectional area and restore itself to its original design configuration, be propelled by

1 applications of hydraulic and pneumatic pressure while maintaining its primary function as an
2 internal cleaning device of conduits. When in use, the pig must be able to undergo a reduction to
3 a minimum of 65% of the original cross sectional area and return to shape while maintaining the
4 sliding seal and ability to clean. Pigs shall be bi-directional and have the ability to negotiate
5 fittings, valves and other appurtenances.

6
7 **e. PERFORMANCE**
8

9 (1) Contractor will prepare, with assistance from the EOR, the design of the cleaning procedure
10 including the provision of:

11
12 (a) Selection of starting and ending points for the cleaning process.

13
14 (b) Evaluation of total volume of fluids to be used and the disposal and the source(s) of fluids.

15
16 (c) Mechanical or piping adaptation to the existing piping configuration.

17
18 (d) Coordination and scheduling of the cleaning process to include selection of the distances
19 and sizes of the piping to be cleaned as one procedure.

20
21 (e) Immediately available alternative procedures to be applied if the cleaning of the system
22 requires such remedial action.

23
24 (2) PSLUSD will not accept any utility mains that do not pass the cleanliness test required in
25 Section c.(3)(a) above.

26
27 **10. RECLAIMED WATER METERING STATIONS**
28

29 **a. GENERAL**
30

31 (1) The contractor shall be responsible for furnishing of all labor, materials, equipment and
32 incidentals required to install a complete and operational reclaimed water metering station as
33 shown on the approved plans, the PSLUSD standard details and as specified herein.

34
35 (2) These specifications are the minimum requirements regarding the equipment application;
36 furnishings, installation, delivery, shop and field-testing of all materials, equipment and
37 appurtenances for reclaimed water metering stations. The manufacturer's recommendations and
38 approved plans may contain additional requirements pertinent to the installation of equipment,
39 including accessory and auxiliary equipment and material types, which may not be specified
40 herein.

41
42 (3) Installation shall be completed in a manner that all components are plumb, true, properly
43 aligned, fully operable and functional, and no additional maintenance or restorative action is
44 required. Electrical work shall be performed by a licensed Electrical Contractor in accordance
45 with prevailing codes and licensing requirements. The fence, driveway and other features shall
46 be constructed in accordance with the approved plans and the PSLUSD standard details

47
48 (4) The specifications shall not be construed as requiring the contractor to utilize personnel
49 supplied by his assigned instrument manufacturer's organization, or any division thereof, to

1 accomplish the physical installation of any elements, instruments, accessories or assemblies
2 specified herein. However, the contractor shall employ installers who are skilled and experienced
3 in the installation and connection of all elements, instruments, accessories and assemblies.
4

5 (5) PSLUSD shall be provided with an exclusive easement around the metering station,
6 consistent with PSLUSD detail RW-01. Dedicated easements for ingress and egress shall also be
7 provided where necessary.
8

9 (6) Developer/Contractor shall pay for all costs associated with having electrical power designed
10 and installed to the metering facility. This shall include any and all fees or charges which may be
11 required and payable to Florida Power and Light Company (FPL).
12

13 (7) The operation of the metering station shall allow PSLUSD to control flow to a customer
14 based upon the following options of operational control:
15

- 16 (a) flow
- 17 (b) upstream pressure
- 18 (c) downstream pressure,
- 19 (d) daily volume and storage levels
20

21 The Engineer of Record (EOR) shall obtain written approval from the PSLUSD as to the specific
22 type of operational controls required.
23

24 **b. RELATED SECTIONS**

- 25
- 26 (1) Design Criteria for Reclaimed Water Mains (Section H.7, Chapter II)
- 27 (2) Pipe and Fittings (Section J.4, Chapter II)
- 28 (3) Valves and Appurtenances (Section J.5, Chapter II)
29

30 **c. CONTRACTOR'S QUALIFICATIONS**

- 31
- 32 (1) A contractor who is experienced, reputable and qualified in the installation of underground
33 and above ground utility lines and related appurtenances, as determined by the PSLUSD.
34
- 35 (2) A manufacturer who is experienced, reputable and qualified in the manufacture of items to be
36 installed /constructed shall furnish all equipment and materials, as determined by the PSLUSD.
37
- 38 (3) All materials, fittings and appurtenances intended for use in pressure pipe systems shall be
39 designed and constructed for a minimum working pressure of 150 psi unless otherwise specified.
40

41 **d. SUBMITTALS**

- 42
- 43 (1) The EOR must submit signed and sealed flow meter sizing calculations for review and
44 approval by PSLUSD.
45
- 46 (2) When selecting the electronic/hydraulic control valve, the EOR shall provide PSLUSD with a
47 copy of the cavitation analysis performed by the manufacturer, and any anti-cavitation device
48 recommendations, if necessary. PSLUSD retains the authority to request additional cavitation
49 analysis for varying scenarios. Additionally, should the use of an orifice plate be required by the

1 manufacturer, or if PSLUSD opts to use one instead of other anti-cavitation options
2 recommended by the manufacturer, the EOR must submit signed and sealed calculations to
3 PSLUSD for review to verify proper sizing and adjustment of hydraulic grade.
4

5 (3) A minimum of three (3) sets of shop drawings shall be submitted to PSLUSD and EOR for
6 review and/or approval. Each set of shop drawings shall be submitted as a complete bound
7 package (preferably 3-ring bound). Original stamps and signatures on each of the individual
8 components for each bound set shall be required from both the contractor as well as the EOR. No
9 copies of signatures/stamps shall be accepted. Each shop drawing submittal, whether it is the first
10 submittal to PSLUSD or subsequent revised submittal, must be accompanied with the "Shop
11 Drawing Review Form", which is available on PSLUSD website at
12 <http://www.cityofpsl.com/utility/commercial-development/utility-commercial-development.html>.
13

14 (4) Shop drawings shall include information on all above ground piping, piping
15 primer/intermediate/finished coats, above ground fittings, above ground valves, flow meter, all
16 telemetry hardware, interface between instruments, control panel, level detection components,
17 electronic/hydraulic control valves, pipe supports, pressure gauges, electrical schematics and any
18 other requirements necessary to complete the reclaimed water metering installation.

19 (5) Data shall include drawings and descriptive information in sufficient detail to show the kind,
20 size, arrangement, and operation of component materials and devices; the external connections,
21 anchorages, and support required; and dimensions needed for installation and correlation with
22 other materials and equipment. All part numbers and catalog data required for ordering spares
23 and replacements shall be provided.
24

25 (6) Data sheets for each component must be submitted together with a technical product brochure
26 or bulletin (this includes electronic indicator, manual set-point station, ultrasonic level controller,
27 RTU, panel enclosure and all other devices or equipment which will be used).
28

29 (7) The Instrumentation Systems Integrator (ISI) shall be per the Qualified Products List (QPL),
30 and shall submit to PSLUSD (through the EOR) detailed procedures to physically test each
31 Input/Output (I/O) that provides control and/or warnings such as alarms, level controls and
32 pressure & flow set-points. PSLUSD reserves the right to modify the testing procedures provided
33 by the ISI. Any modifications to the procedures by PSLUSD will be provided in writing to the
34 EOR.
35

36 (8) Drawings showing definite diagrams are required for every instrumentation loop system.
37 Drawings shall include electrical schematics, layout, wiring diagrams and a parts list for all
38 control circuits and within the control panel.
39

40 (9) The acceptance of drawings returned marked "REVIEWED" or "REVIEWED AS NOTED"
41 will not constitute a blanket approval of dimensions, quantities, and details of the materials,
42 equipment, device or items shown and does not relieve the contractor of any responsibility for
43 errors or deviations from the requirements.
44

45 (10) The EOR must submit to PSLUSD start-up documentation, initialized by the contractor, ISI
46 and the valve manufacturer, indicating that the hydraulic control valve and all associated
47 equipment have been installed correctly and operating per the manufacturer's specifications.
48

1 (11) The ISI shall submit to PSLUSD (through the EOR) any independent instrumentation
2 programs outside the PLC in hard copy format (i.e., storage level sensor, etc.).
3

4 **e. METERS**
5

6 (1) The flow meter shall be per the QPL and have a sealed indicator having a range determined
7 by the EOR and approved by the PSLUSD, or approved equal.
8

9 (2) The flow meter shall also be equipped with a transmitter per the QPL. The transmitter signal
10 output shall be in direct proportion to the flow through the meter and shall be converted to a two-
11 wire 4 to 20 mADC current output transmitted to a local display and the PLC.
12

13 (3) Meter shall be a velocity propeller type, magnetic drive, sealed housing, flanged tube meter
14 for 150 psi working pressure. It shall comply with the applicable provisions of AWWA, except
15 for the higher standard required in this specification. In the event of conflict, the specification
16 herein shall prevail. Meter shall be equipped with a six digit totalizer reading in units of gallons
17 and shall be accurate within $\pm 2\%$ of true flow within the manufacturer's specifications for flow
18 range, or an approved equal.

19 (4) Meter tube shall be fabricated steel pipe and use 150 lb AWWA Class "D" flat face steel
20 flanges. The internal and external of the meter tube and meter head shall be blasted to near white
21 metal and coated with 12-15 mils of fusion epoxy coating, applied by the fluidized bed method.
22 Meter tubes shall have a constant nominal inside diameter to offer minimum obstruction to the
23 flow and shall be furnished with four straightening vanes.
24

25 (5) Meter head shall be connected to the tube by means of a flanged, o-ring sealed connection
26 with stainless steel bolts. The meter head shall be designed for easy removal of water wetted
27 parts from the tube for inspection or repair without having to remove the complete tube. Water
28 wetted meter components that are permanently attached to the tube will not be accepted.
29

30 (6) Gear box shall be bronze, sealed and filled with a high-grade lubricant. The drive mechanism
31 shall be magnetically driven from the propeller, through a magnetic coupling and be isolated
32 from the water flow by means of an o-ring sealed housing. A rigid stainless steel vertical shaft is
33 required from the miter gear frame to the totalizer drive magnet; flexible cables will not be
34 accepted.
35

36 (7) Propeller shall utilize a water lubricated ceramic sleeve and spindle bearing system. The
37 stainless steel/ceramic spindle on which the propeller is mounted shall be parallel to the direction
38 of the water flow in the pipe. Dual ceramic thrust bearings shall be standard on the meter. Ball
39 bearings or other types of sleeve bearings will not be accepted. The propeller shall be a conical
40 shaped, three bladed, injection molded of thermoplastic material, resistant to normal water
41 corrosion and deformity due to high flow velocities. Propellers, which have been trimmed,
42 shaved or require varying change gears for the same size meters, will not be accepted.
43

44 (8) Transmitter shall be encased in a sealed housing conforming to NEMA standards for
45 weatherproof enclosures. It shall provide a solid state, optically coupled pulse output and a loop
46 powered current output to drive the associated instrument(s). The unit shall be per the QPL. The
47 standard 4-20 mADC sourcing type current output gives 4 mA output at zero flow and 20 mA
48 output at the maximum scale range selected by the EOR and approved by PSLUSD. The pulse
49 output (open collector transistor output) will be a minimum of 150 pulses per minute at the

1 maximum flow range of the instrument that the transmitter is controlling. The transmitter
2 enclosure shall be made from injection molded 20% glass filled engineered grade thermoplastic.
3 Transmitter shall attach directly to the propeller meter head with screws having holes for seal
4 wires and be protected with an o-ring seal.

5
6 (9) Transmitter output shall be in direct proportion to the flow through the meter at the above
7 pulse rate and current output. The unit shall be powered by an external 12-30 volts DC power
8 supply wired in a loop with the current output. The 4-20 mA DC output shall not change or
9 require any field adjustments with the varying voltage of the power supply.

10
11 (10) Indicator-Totalizer shall have a full 4" diameter indicator dial and shall be equipped with a
12 six digit, straight reading type totalizer with black numbers on white wheels. The totalizer shall
13 read in units of gallons and shall have a test hand to check the accuracy of the indicator. The
14 indicator drive mechanism shall be temperature compensated, so the indicator hand shall be
15 accurate and linear within +/- 1% at all points on the dial when the unit is operated within the
16 temperature range of 32° to 140° F. The unit shall be equipped with change gears to facilitate
17 easy change of registration without removing pressure from the line or removing the meter head
18 from the meter tube. The indicator-totalizer shall be protected by an o-ring sealed bonnet made
19 from injection molded 20% glass filled engineering grade thermoplastic. The bonnet shall be
20 attached to the meter head by screws located under the hinged lid, which has a padlock hasp.

21
22 (11) Volumetric testing of all meters must be performed and approved prior to shipment. The
23 complete meter head assembly must be accuracy tested in the same pipe size and same type tube
24 that the meter will be mounted in. The test shall be at near minimum, intermediate, and
25 maximum manufacturers specified flow ranges of the meter. The amount of water used to
26 conduct the test must be left on the totalizer. Prior to shipping, a tag shall be attached to the
27 meter showing the totalizer reading after the test. The test facility must be certified annually to
28 an accuracy of ±0.2% and be traceable to the National Institute of Standards and Technology. If
29 desired, the test shall be witnessed by the customer or their selected agent and a copy of the
30 certified accuracy test record must be furnished at no charge to the customer, if requested.

31 32 33 **f. ELECTRONIC/HYDRAULIC CONTROL VALVES**

34
35 (1) The electronic/hydraulic control valve shall be a dual solenoid control which shall close valve
36 upon power loss or PLC failure. The valve shall also have the ability to be operated manually,
37 via the pilot system, upon power or PLC loss and/or during normal operation. The valve shall be
38 per the QPL. The valve to be manufactured as followed; ductile iron body, globe, 150 pound
39 class flanged, 304 stainless steel trim (disc guide, seat & cover bearing), 304 stainless steel cover
40 hardware, brass ASTM B283 solenoid body and pilot tubing, 304 stainless steel disc retainer &
41 diaphragm washer, Buna-N rubber, isolation valves, and flow clean strainers. Valve should be
42 sized in accordance with manufacturer's recommendation. The valve may require an anti-
43 cavitation option or an orifice plate, as determined by the manufacturer and with approval by
44 PSLUSD, based upon the cavitation analysis submitted to PSLUSD. The valve shall have the
45 ability to modulate flow, via a set-point signal from a remote computer, based upon varying
46 feedback signals such as flow rate, upstream and/or downstream pressures, daily volumes
47 delivered and storage levels.

48
49 (2) A valve positioning transmitter shall also be provided. The valve positioning transmitter shall
50 be per the QPL. The transmitter shall be installed and interfaced with applicable electronic

1 components to provide remote monitoring of valve position. The signal from the position sensing
2 mechanism shall be converted to a two-wire 4 to 20 mA current output transmitted to a local
3 display and the PLC. The output signal shall range from 4 mA to represent valve fully closed to
4 20 mA for valve fully open.

5
6 (3) The brass solenoid body, brass pilot tubing, name plate data and all instrumentation
7 connections to the valve shall not be painted.

8 9 **g. STORAGE REQUIREMENTS**

10
11 Storage shall be provided by the developer/customer for the purposes of retention during wet
12 weather conditions, maintenance of irrigation equipment, or other conditions which preclude the
13 use of reclaimed water. Type of storage may include a pond, reservoir, tank, or an above/below
14 ground structure and shall be addressed in the design engineering report required in section H.8
15 of Chapter II. As a minimum, storage capacity shall be three times the average daily volume of
16 reclaimed water used. Construction shall be in compliance with applicable state and local
17 agencies.

18 19 **h. STORAGE LEVEL SENSOR**

20
21 (1) The level monitoring system shall be ultrasonic type, continuous level measuring system
22 consisting of, at the minimum, an ultrasonic level element/transducer, local display of storage
23 elevation and cable for connection from level element to local display and PLC. Level element
24 system shall have the ability to monitor storage levels both locally and through a remote
25 telemetry system.

26
27 (2) Level element shall be ultrasonic type transducer. Transducer shall be of water proof
28 construction with minimum operating range of -20° to $+50^{\circ}$ C (larger range preferred) at one (1)
29 atmosphere, unless otherwise noted. The instrument supplier will coordinate with the transducer
30 manufacturer for proper mounting of the transducer within the storage stilling well, as shown in
31 the standard detail.

32
33 (3) The storage level monitoring system shall provide a 4 to 20 mA DC output signal to the PLC
34 in linear proportion to the level being sensed. The level range/readouts shall be based upon the
35 maximum storage elevation allowed (high level), which is to be provided by the EOR and
36 approved by PSLUSD. The local display component for the storage level shall be provided in the
37 control panel, along with the any necessary functions for level calibration/controls, for use by the
38 PSLUSD operator.

39
40 (4) The system shall have an overall accuracy of plus or minus 0.25% of full scale and shall
41 operate on 120 volts, 50/60-HZ power.

42
43 (5) All necessary interconnecting cables shall be furnished with the equipment provided in
44 sufficient length.

45
46 (6) All equipment shall be provided transient surge protection for the incoming 120 volts AC and
47 DC signals.

48
49 (7) The sensors shall be accessible for calibration, maintenance and replacement.

1
2
3 **i. CONTROL PANEL & TELEMETERY SYSTEM**
4

5 (1) Fiber optic communication shall be used in lieu of telemetry in all instances where fiber optic
6 is available.
7

8 (2) The system supplier shall be per the ISI on the QPL and will be responsible for furnishing
9 and installing the new Radio Telemetry equipment and programming as specified. ISI shall be
10 responsible for all hardware, software system integration, programming, testing and startup.
11 HMI graphical screen development and required database configuration of the existing data
12 acquisition software shall be provided consistent with the monitoring facility (Glades or
13 Westport WWTP).
14

15 (3) Local control of the reclaimed water metering station shall be through a portable laptop
16 computer.
17

18 (4) The panel builder shall be experienced in the construction of lift station control panels, shall
19 have a UL approved shop, and shall be able to provide both a UL 508 label for the panel, and a
20 UL label for service rated.
21

22 (5) The Remote Telemetry shall be microprocessor based, user programmable PLC, and shall
23 serve as an interface to accumulate, process, transmit, and receive discrete and analog status and
24 control messages between the RTU base station and the remote RTU sites located.
25

26 (6) The panel builder shall warrant the panel for one (1) full year minimum from the date of
27 start-up.
28

29 (7) The panel builder or qualified technical representative shall checkout and test the panel as
30 part of the station start-up with PSLUSD and the EOR.
31

32 (8) The panel shall be 316 stainless steel modified NEMA-12 control panel with a drip shield
33 along the complete top of panel. Padlocking handles shall be provided with accessories and
34 doorstop kit. Provide two extra bolted clips on front edge of door panel with all stainless steel
35 hardware. An aluminum inner hinged door shall contain all operators' controls and the dead front
36 panel outside door shall be blank. Provide duct seal putty on all outgoing conduits. Provide
37 corrosion inhibitor per the QPL.
38

39 (9) Control panel shall be mounted to two (2) 3" diameter aluminum pipe supports (6061-T6-
40 Sch40). Length of the pipe supports shall be sized so as to provide for 36" of burial (in 3000 psi
41 concrete), and extend to 3" above the top of the supports. The panel shall be mounted to the pipe
42 supports with one (1) 5/8" x 5/8" 12 gauge stainless steel unistrut at a height consistent with the
43 FPL requirements for mounting their meter. Paint below ground portion of supports with asphalt
44 based paint to 3" above grade. All hardware shall be stainless steel.
45

46 (10) A back mounting panel for heavy components including RTU shall be provided.
47

48 (11) Panel shall be surface wired with numbered terminals. Terminal strip shall be located at
49 least 4" from the bottom of the enclosure for accessibility.

- 1
2 (12) All wiring shall be copper THWN. Shielded cable shall be Belden 8760 or approved equal.
3
4 (13) Panel shall be built by U.L. approved shop and adhere to U.L. label 508.
5
6 (14) A circuit breaker disconnecting NEMA-4X stainless steel enclosure shall be provided
7 outside the control panel. Disconnect shall be service entrance rated.
8 (15) Panel components shall be as listed. No substitutions shall be made without prior approval
9 in writing from the PSLUSD.
10
11 (16) Telemetry hardware and conduit will conform as specified in control panel requirements.
12 Telemetry systems shall be compatible with PSLUSD's central control receiving station.
13
14 (17) RTU antenna requirement shall be as shown on the standard detail.
15
16 (18) Local and remote readouts shall be provided per the standard detail for I/O Schematic and,
17 at a minimum, as listed below in the units shown:
18
19 (a) Upstream pressure (psi)
20 (b) Downstream pressure (psi)
21 (c) Flow (gpm/gpd) (two readouts/modes:
22 (i) Instantaneous flow rate, and
23 (ii) Daily volume delivered
24 (d) Storage Level (two readouts/modes:
25 (i) Storage Elevation (NGVD), and
26 (ii) Feet above or below storage high water elevation
27 (e) Valve position (% open)
28 (f) FPL power (light)
29
30 (19) Breakers shall be per the QPL.
31
32 (20) Pilot lights, selector switches and push buttons shall be per the QPL.
33
34 (21) Surge Arrestor for power and lighting shall be per the QPL.
35
36 (22) The PLC shall be per the QPL and shall have:
37
38 (a) One (1) digital output card 8 channel
39 (b) One (1) digital input card 8 channel
40 (c) One (1) CPU
41 (d) One (1) Ethernet Module or Ethernet/Modbus converter
42 (e) One (1) fiber optic/Ethernet switch
43 (f) One (1) 8 channel analog input card
44 (g) One (1) 4 channel analog output card
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(23) General I/O schedule is as follows, unless otherwise modified by the PSLUSD:

- | | |
|--|-------------------------------|
| (a) Upstream Pressure | Analog Input |
| (b) Downstream Pressure | Analog Input |
| (c) Instantaneous Flow rate | Analog Input |
| (d) Daily Volume Pumped | Totalizer Programmed into PLC |
| (e) Daily Volume Delivered | Totalizer Programmed into PLC |
| (f) Valve Position (Feed back) | Analog Input |
| (g) Valve Position (Flow rate Set Point) | Analog Output |
| (h) Storage Level | Analog Input |
| (i) FPL Power | Analog Input |
| (j) Storage Flow Rate | Analog Input |
| (k) Local/Remote Indication | Discrete Input |

1 **CHAPTER III**
2 **CONSTRUCTION COORDINATION, INSPECTIONS AND TESTING**
3

4 **A. GENERAL**
5

6 1. The Engineer of Record (EOR) shall have a pre-construction meeting with the PSLUSD and
7 the contractor prior to starting construction. The meeting shall be held at the Utility Department
8 Office.
9

10 2. The EOR shall coordinate all construction and inspections on the project and shall be the point
11 of contact with PSLUSD. Testing shall be conducted by or at the direction of the EOR in the
12 presence of a PSLUSD inspector.
13

14 3. The contractor shall contact the EOR, the appropriate governmental jurisdictional agency, and
15 all utility companies at least 48 hours prior to commencement of construction for coordination of
16 any utilities.
17

18 4. There shall be no field changes or deviations from design without prior written approval of the
19 PSLUSD and EOR.
20

21 5. All materials, construction methods, testing, and disinfection shall conform to the
22 requirements of the PSLUSD and AWWA current standards.
23

24 6. Density test results shall be submitted to the PSLUSD no later than 7 calendar days from the
25 date the test was taken. The inspections required in this Chapter shall not be scheduled by
26 PSLUSD, as noted in Section B.2.d. until such time as the density test results have been
27 approved by the PSLUSD.
28

29 7. It is the EOR's responsibility to coordinate the installation of other public utilities near the
30 PSLUSD facilities.
31

32 8. The contractor shall strictly adhere to the horizontal and vertical separation requirements
33 specified in the PSLUSD utility standards and applicable standard detail. All crossings between
34 PSLUSD facilities as well as with other utilities shall be left exposed until observed by a
35 PSLUSD inspector.
36

37 9. Contractor shall adhere to the approved Maintenance of Traffic Plan at all times where work is
38 in progress. Traffic control, barricades, etc., shall be in accordance with applicable permits, local
39 regulations and Florida Department of Transportation and OSHA standards.
40

41 10. Contractor shall repair any damage caused to existing utilities by construction activity in
42 accordance with applicable standards.
43

44 11. No pollution or erosion caused by this project will be allowed off site or in the stormwater
45 drainage system. The contractor shall install any devices necessary to prevent pollution or
46 erosion and comply with the City's code for erosion and sediment control standards. The cost of
47 pollution and erosion control shall be incidental to the cost of construction.
48
49

1 **B. INSPECTIONS & TESTING**

2
3 The EOR shall perform inspections, observations, and tests necessary to assure compliance with
4 utility standards; complete the required PSLUSD forms for inspections and testing; and certify
5 completion of the utility facilities. The contractor shall not cover newly constructed facilities
6 prior to a required inspection being conducted by the EOR and the PSLUSD. If any construction
7 is covered before an inspection by PSLUSD, the contractor shall be required to uncover it at his
8 expense. All work that has been rejected or condemned shall be repaired, or if it cannot be
9 satisfactorily repaired, shall be removed and replaced at the contractor/developer's expense.
10 Materials not conforming to the requirements of the specifications shall be removed immediately
11 from the site of work and replaced with satisfactory material by the contractor/developer. The
12 PSLUSD shall have the right to require additional inspections, certifications and/or testing to
13 confirm that the deficient work has been corrected.
14

15 **1. PSLUSD INSPECTOR'S AUTHORITY**

16
17 a. The PSLUSD inspections are intended to make observations for verification of compliance
18 and do not relieve the EOR or contractor from fulfilling their responsibilities. Any items found to
19 be deficient after PSLUSD has passed an inspection will still require correction at the
20 contractor/developer's expense.
21

22 b. The PSLUSD inspector is not authorized to revoke, alter or waive any requirements of the
23 specifications, but is authorized and expected to call to the attention of the EOR and/or
24 contractor any failure of work or materials to conform to the plans or specifications. The
25 PSLUSD inspector does NOT have the authority to make changes to the approved plans. The
26 inspector shall have the authority to reject materials or suspend the work until questions of issue
27 can be referred to and decided upon by the Utility Director or his designated representative.
28

29 c. The inspector shall in no case either act as foreman or perform other duties for the EOR and/or
30 contractor nor interfere with the management of the work. Advice that the inspector may give
31 shall in no way be construed as binding to the City of Port St. Lucie or releasing the developer,
32 his engineer or contractor from performing according to the intent of the plans and minimum
33 PSLUSD Standards.
34

35 **2. SCHEDULING OF INSPECTIONS**

36
37 a. It shall be the responsibility of the EOR to schedule inspections and their qualified
38 representative shall be present at all scheduled tests and inspections. Pre-testing is encouraged to
39 be completed prior to scheduled inspections, to minimize failures. A scheduled inspection will be
40 canceled, and a re-inspection fee assessed if one of the three following situations occurs:
41

- 42 (1) Failure to show for inspection by the EOR or contractor,
43 (2) Cancellation of the inspection with less than 24 hours notice,
44 (3) A failing test result.
45

46 Re-inspection fees shall be assessed per scheduled hour of the inspection; the exception is for TV
47 inspection of gravity sewer, for which the re-inspection fee will be assessed on the hours
48 scheduled for the repairs and the TV inspection. The EOR will be notified or given a Failed

1 Inspection Notice at the time of the failed inspection. All re-inspection fees shall be paid to the
2 PSLUSD prior to any subsequent scheduling of further inspections.

3
4 b. The PSLUSD shall be provided with at least two (2) full working days notice for scheduled
5 inspections. Inspectors will make unscheduled visits as needed to observe such items as ongoing
6 work on site, restraints and clearances between conflicting lines.

7
8 c. Scheduled inspections will be conducted during normal business hours, Monday through
9 Friday, except when service disruptions are anticipated. When progress of a project requires, for
10 the convenience of the contractor, the periodic presence of a PSLUSD representative during
11 after hours, weekends and/or city holidays, the contractor/developer shall accept the financial
12 responsibility for the overtime hours (at overtime rates) with a minimum of four (4) hours,
13 including travel time.

14
15 d. * The required inspections for items marked with an asterisk below shall not be scheduled until
16 such time as the density test results, as-built drawings, asset list, and easements have been
17 submitted and approved by the PSLUSD.

18
19 **3. REQUIRED INSPECTIONS (In no specific order)**

20
21 Materials Inspection

22 Connection to existing mains, tie-ins, wet taps, etc

23 Jack & Bores and installation of the carrier pipes, Directional Drilling, Directional Boring and
24 any other type of bore.

25 Restraints & Conflicts

26 Flushing (Pigging)

27 Pressure/Leak Testing *

28 Chlorination Test

29 Disinfection

30 Removal and plugging of sample points

31 Fire Hydrant Flow Test

32 Wire Trace Continuity and electronic marker verification

33 Any re-construction repairs and field changes, including lines that have not been turned over to
34 the PSLUSD

35 Concrete pad formwork/rebar placement

36 Installation of the first manhole of the lift station and the first manhole to be installed

37 TV Inspection (gravity sewer)

38 Infiltration/Ex-filtration Test Report (gravity sewer, manholes, pump stations and grease
39 interceptors) *

40 Spark testing manhole liners

41 Deflection Test

42 Installation of lift station/grinder structures/valve vault/grease interceptor

43 Electrical components of pump station

44 Pump Station Start-up

45 Any re-construction repairs and field changes, including lines that have not been turned over to
46 the PSLUSD

47 Liner Welding and spark testing

48 Backflow Assembly Certification

49 Final Inspection

1 The PSLUSD forms for the scheduled inspections noted above shall be completed by the EOR
2 and submitted to PSLUSD with a sealed and signed cover letter. The forms are can be
3 downloaded from the city’s website at <http://www.cityofpsl.com/utility/commercial>
4 [development/utility-commercial-development.html](http://www.cityofpsl.com/utility/commercial-development/utility-commercial-development.html) .
5

6 All pipe restraints and crossings shall be left exposed until inspected and approved by the
7 PSLUSD. Such inspections may be combined with scheduled inspections or will be conducted at
8 a separate scheduled time.
9

10 **4. REQUIRED TESTING**

11
12 The testing for various components of the water, wastewater and reclaimed water system
13 components shall be performed as detailed below. The EOR shall provide the PSLUSD with
14 written test results on PSLUSD forms noted above in 3.a. & b. for each required test with a
15 signed and sealed cover letter from the EOR in the Final Inspection package. During
16 construction, the individual test reports shall be submitted to the City in pdf format, via email
17 within 7 calendar days of the test.
18

19 **a. Performance testing of pressure pipe**

20 **(1) Type of Testing**

21 The following performance testing must be conducted:
22

- 23 (a) Water Main: Hydrostatic, Leakage and Bacteriological Testing
- 24 (b) Force Main: Hydrostatic, and Leakage Testing
- 25 (c) Low Pressure Main: Hydrostatic, and Leakage Testing

26 **(2) References** - Testing shall be performed in accordance with the following references: 27

- 28 (a) ANSI/AWWA C600 - Standard for Ductile Iron Pipe Installation and Testing.
- 29 (b) ANSI/AWWA C605 – Standard for Polyvinyl Chloride (PVC) Pipe Installation and Testing
- 30 (c) ANSI/AWWA C651 - Standard for Disinfecting Water Mains.
- 31 (d) ANSI/AWWA C900 - Standard for PVC Pipe, 4"-12" for Water Distribution.
- 32 (e) ANSI/AWWA C905 - Standard for PVC Pipe 14"& above for Water Distribution.

33
34 **(3) Regulations** – No leak testing shall be performed until easements, as-built drawings, and
35 density tests have been submitted and accepted by the City. Testing shall conform to PSLUSD
36 requirements and FDEP regulations.
37

38 **(4) Temporary Connection to PSLUSD Water Main**

- 39 (a) A temporary jumper connection is required between an existing active water main and a
40 newly constructed main until a clearance is obtained from the PSLUSD. The temporary
41 connection shall be used at point (s) of filling in accordance with the standard details for
42 potable and non-potable water jumper connection.
43
44
45
46
47

1 (b) The EOR shall contact the PSLUSD via e-mail at (inspectors@cityofpsl.com) regarding
2 scheduling of required inspections listed in this chapter or any other inspections deemed
3 necessary by the PSLUSD and shall strictly follow all procedures detailed in this chapter.
4

5 (c) The temporary jumper assembly (flange to flange) will be supplied, installed and tested by
6 the PSLUSD, in coordination with the EOR and contractor. Other materials and installation
7 required for the connection shall be responsibility of the contractor. The contractor shall disinfect
8 the tapping sleeve and exterior of the main to be tapped by spraying and swabbing with chlorine
9 in the presence of a PSLUSD inspector. The underground fittings shall be restrained mechanical
10 joint type. All materials shall be per the PSLUSD approved Qualified Products List.
11

12 (d) The jumper connection shall be maintained by the contractor until filling, flushing,
13 hydrostatic pressure/leakage testing, disinfection and bacteriological sampling have been
14 satisfactorily completed by the contractor and the test results are in compliance with the
15 PSLUSD and FDEP standards. Disinfection and bacteriological sampling is not required for
16 newly constructed force mains and reclaimed water mains.
17

18 (e) A physical separation shall be maintained between an existing water main and the newly
19 constructed water main, except as noted herein. If the new main is of a size or length that
20 pigging/flushing cannot be effectively accomplished with the jumper connection, the PSLUSD
21 may allow a physical connection under controlled conditions as follows:
22

23 (i) The procedure will be conducted by the contractor in the presence of a PSLUSD
24 inspector and the Engineer-of-Record (EOR) or representative.
25

26 (ii) The new valve(s) shown in this detail shall be pressure/leakage tested and
27 replaced if leakage is observed. The valves will be kept closed by the PSLUSD and
28 shall not be operated by any one other than PSLUSD personnel.
29

30 (iii) The jumper connection shall be used to fill the new main.
31

32 (iv) The contractor shall disinfect the pipe and fittings used to make the connection by
33 spraying and swabbing with chlorine.
34

35 (v) All valves in the new system downstream of the jumper shall be opened by the
36 contractor prior to flushing. The valves shown in the standard detail shall be opened
37 by PSLUSD personnel only.
38

39 (vi) The pigging and flushing shall be performed by the contractor in the presence of a
40 PSLUSD inspector. The valves will be closed by PSLUSD personnel after the main
41 has been flushed.
42

43 (vii) The main shall be pressure tested after flushing and prior to disinfection. All
44 valves shall be kept closed during the pressure test and will be opened by PSLUSD
45 personnel if the test results are satisfactory.
46

47 (viii) Disinfection shall be conducted in accordance with AWWA C651. A minimum
48 pressure of 20 psi shall be maintained in the new water main after disinfection.
49

1 (f) Bacteriological sampling and testing of the new water main shall be conducted per section
2 B.4a.(8) of this Chapter and a clearance obtained from the PSLUSD or FDEP, as applicable. The
3 sampling points shall be removed and plugged, and the permanent connection made by the
4 contractor. The contractor shall disinfect the pipe and fittings used to make the connection by
5 spraying and swabbing with chlorine.
6

7 (g) The PSLUSD will remove the jumper assembly (flange to flange) after the corporation stop
8 valves to the jumper have been closed; the valves shall be plugged by the contractor after
9 removal of the assembly.
10

11 (h) The contractor shall pay the PSLUSD for all the water used, based on the initial and final
12 reading of the water meter.
13

14 **(5) Cleaning/Flushing**

15
16 (a) Flushing shall be conducted to clean the mains and remove all foreign matter.
17

18 (b) For water mains, flushing shall be conducted prior to disinfection. Hoses, fittings and
19 temporary pipes in ditches shall be provided as required to dispose flushing water without
20 damage to adjacent properties. Flushing velocities shall be at least 2.5 fps.
21

22 (c) All mains shall be cleaned using a poly-pig cleaning system as detailed in Chapter II,
23 Section J.9. All equipment and piping shall be provided by the contractor. Testing shall be
24 conducted to ensure proper cleanliness of the pipe as detailed in this section. PSLUSD will not
25 accept any utility mains that do not pass the cleanliness test.
26

27 (d) Prior to the actual line flushing operation, the contractor shall properly notify the PSLUSD
28 and EOR of such intended water use a minimum of 48 hours prior to flushing of mains up to 8"
29 diameter, and at least 1 week prior to flushing of mains larger than 8". All flushing times will be
30 limited to off peak times of water system demand and consumption. No flushing shall take place
31 without the PSLUSD inspector and EOR being present.
32

33 (e) The contractor shall pay the PSLUSD for all water used.
34

35 (f) The flushing report shall be submitted by the EOR on PSLUSD form prior to disinfection.
36

37 **(6) Hydrostatic and Leakage Testing**

38
39 (a) Hydrostatic and leakage tests shall be made between valves and/or connectors for each
40 section tested using the procedure outlined in ANSI/AWWA C600 for DIP and C605 for PVC.
41

42 (b) The contractor shall provide all necessary equipment such as pumps, gauges and water
43 measuring tanks and shall perform all work required for pipe pressure and leakage test. The
44 gauge shall read in 2 pound increments.
45

46 (c) Hydrostatic testing shall be performed for a period of not less than two hours at 150 psi
47 pressure for water/force/reclaimed water mains and at 100 psi for low-pressure mains. The
48 allowable rate of leakage shall be less than the number of gallons per hour determined by the
49 following formula:

$$L = \frac{SD \sqrt{P}}{148,000}$$

L = Allowable leakage in gallons per hour.

S = Length of pipe tested in feet.

D = Nominal diameter of the pipe in inches.

P = Average test pressure maintained during the test in pounds per square inch gauge.

1
2 (d) The testing procedure shall include the continued application of the specified pressure to
3 the test system for the two-hour period using a suitable pump connected to the pipeline. The
4 pipeline shall be allowed to stabilize at the test pressure before conducting the hydrostatic test.
5 The pressure shall not vary by more than ± 5 psi from the required pressure for the duration of the
6 test. Test pressure shall be maintained with this tolerance by adding makeup water through the
7 pump into the pipeline. The amount of makeup water shall be accurately measured and shall not
8 exceed the allowable leakage rate (L) as determined using the above formula. If at any point
9 during the test the pressure loss exceeds 5 psi, the test is considered failed. Should the test fail,
10 the contractor shall make necessary repairs and the test shall be repeated until satisfactory results
11 are obtained.

12 (e) Any exposed pipe, fittings, valves, hydrants, and joints shall be examined during the test
13 to ensure there are no visible leaks. Any damaged or defective pipe fittings, valves, or hydrants
14 that are discovered following the pressure test shall be repaired or replaced with sound material,
15 and the test shall be repeated.

16
17 (f) The pressure test report shall be submitted by the EOR on PSLUSD form prior to
18 disinfection.

19
20 **(7) Disinfection (Water Facilities Only)**

21
22 (a) Disinfection of mains shall comply with AWWA C651. Each unit of completed water main
23 and distribution system shall be thoroughly flushed and then disinfected with chlorine.

24
25 (b) Chemicals:

26
27 (i) Sodium or calcium hypochlorite conforming to ANSI/AWWA B300 shall be
28 used.

29
30 (ii) Calcium hypochlorite intended for use in swimming pools shall not be used.

31
32 (iii) Chlorine tablets shall not be used unless specifically approved in writing by the
33 PSLUSD.

34
35 (iv) Pure chlorine gas or liquid shall not be used

36
37 (c) The disinfection test report shall be submitted by the EOR on PSLUSD form prior to final
38 inspection.

39
40

1 **(8) Bacteriological Sampling & Testing (Water Facilities Only)**
2

3 (a) The contractor shall verify that piping system has been cleaned and properly isolated. The
4 maximum length of line to be tested as one section will be 2500’.

5
6 (b) Bacteriological testing shall not begin until after the pressure test has been passed.
7

8 (c) The contractor shall install sampling points required to take all necessary water samples at
9 locations designated in the approved plans, and submit an 8-1/2 x 11” map of all sample points
10 for review and approval prior to sampling.
11

12 (d) The contractor shall coordinate with a Florida Department of Health certified testing
13 laboratory to take all water samples required for bacteriological tests and shall maintain
14 continuous running bacteriological sample taps. Water mains being tested must remain under
15 line pressure until release of system into service by the PSLUSD and FDEP.
16

17 (e) The test report shall include the following information:
18

- 19 (i) Date issued, project name, and testing laboratory name, address, telephone number
20 and State Certification Number.
- 21 (ii) Time and date of water sample collection
- 22 (iii) Name of person collecting samples
- 23 (iv) Test locations
- 24 (v) Coliform bacteria test results for each outlet tested
- 25 (vi) Certification that water conforms to bacterial standards
- 26 (vii) Bacteriologist's signature and authority
27

28 (f) The bacteriological test results shall be submitted to the PSLUSD with the Final
29 Inspection Package, as required in Section C. of this chapter.
30

31 **b. Fire Hydrant Flow Testing**
32

33 (1) A flow test to verify the fire flow rates shall be performed by the EOR on all new fire
34 hydrants prior to the project’s final inspection. The gauges for the test will be provided by the
35 PSLUSD. The flow tests shall be witnessed by the PSLUSD and contractor. The contractor shall
36 make provisions for minimizing interruptions to traffic and for adequate drainage of water.
37

38 (2) Each hydrant shall be capable of delivering a minimum flow of 600 gpm for residential areas,
39 and 1250 gpm for non-residential areas (or a higher flow as required by the Fire Chief), with a
40 residual pressure of not less than 20 psi.
41

42 (3) The contractor shall provide one hydrant wrench, fire hydrant repair kits and maintenance
43 manuals to the PSLUSD at the time of flow testing. One fire hydrant repair kit shall be provided
44 per every five fire hydrants. If there are less than five hydrants, one kit will be required. These
45 kits shall be turned over to the PSLUSD with the turnover package. Each kit shall include a
46 sufficient quantity of parts and lubricant to facilitate quick repairs, and a copy of the maintenance
47 manual. The repair kit items required for each approved manufacturer are mentioned on the
48 Qualified Products List.
49

1 (4) The test results shall be submitted by the EOR on PSLUSD form prior to final inspection.

2
3 **c. Infiltration/Ex-filtration Test (pump station and interceptor)**

4
5 Infiltration and ex-filtration testing shall be performed on interceptors and pump stations to
6 assure there are no leaks from joints or as a result of improper construction. The following
7 observation and test shall be conducted by the EOR in the presence of PSLUSD inspector:

8
9 (1) Visual – During and after construction the inside of the structure shall be closely observed for
10 signs of wetness and leaks. The PSLUSD will fail the inspection if wetness and leaks are visible.

11
12 (2) Ex-filtration Test – All pipe openings shall be plugged and the interceptor/wet-well shall be
13 filled with water to the level of the underside of the access covers. After allowing for an initial
14 drop in elevation the chamber shall be refilled and the level observed for duration of 2 hours.
15 Any drop in water level is unacceptable and result in the inspection being failed by PSLUSD.
16 Pressure grouting shall not be considered an acceptable method of repair.

17
18 (3) The results of the test shall be submitted by the EOR on PSLUSD form prior to final
19 inspection.

20
21 **d. Pump Station Start-up and Testing**

22
23 Upon completion of the entire pump station, an inspection shall be coordinated with the EOR,
24 PSLUSD, contractor and manufacturer’s representative for the station. The EOR and
25 PSLUSD shall be notified 48 hours in advance of the start-up. The following items shall be the
26 basis of a satisfactory inspection:

27
28 (1) The station was built in accordance with the approved plans and utility standards.

29
30 (2) The station is functioning as designed.

31
32 (3) Tests shall be conducted to determine if the pumps conform to the specifications.
33 Specifically, the testing shall confirm that –

34
35 (a) The pumps are working per the design curve.

36 (b) The design amperage is not being exceeded.

37 (c) Both pumps can be removed and re-installed without obstructions.

38 (d) The pump station can be operated with a generator in the same manner as with electric
39 power. The PSLUSD shall provide the generator for startup for a lift station.

40
41 If the pump performance does not meet the specifications, corrective measures shall be taken or
42 pumps shall be removed and replaced with pumps that satisfy the conditions specified.

43
44 (4) The contractor/manufacturer representative shall check direction of rotation of all motors and
45 reverse connections if necessary.

46
47 (5) All pump operation settings, alarms, and shutdown devices shall be calibrated and tested
48 during the field test.

1 (6) Should any material or installation fail to meet the specifications, the contractor shall take
2 corrective measures or the item shall be removed and replaced.
3

4 (7) A repair kit shall be provided to the PSLUSD at the time of start up and testing inspection;
5 the kit shall include one full set of fuses for entire control panel, one full set of fuses for the
6 disconnect box (if fused) and one set of contacts for the motor starts for each pump station.
7

8 (8) The test report shall be submitted by the EOR on PSLUSD form prior to final inspection.
9

10 **e. Gravity Sewer Inspection and Testing**

11
12 The contractor shall perform testing of all wastewater gravity mains, as set forth in the following,
13 and shall conduct said tests in the presence of representatives from the PSLUSD and EOR.
14

15 **(1) TV Inspection**

16
17 A television inspection shall be performed by the contractor or his representative as stated below,
18 prior to final inspection by the PSLUSD. Testing shall not proceed until the facilities have been
19 backfilled and the compaction of roadway base is complete.
20

21 (a) At time of inspection, the lines shall be clean with sufficient water having been introduced
22 into each segment of the line to show any sags or dips present. The video camera shall have a
23 depth gauge attached to the front of the camera that will show depth of water in the line dips.
24

25 (b) If inspection reveals cracked, broken, or defective pipe or pipe misalignment resulting in
26 vertical sags $\frac{3}{4}$ " or more, the contractor shall be required to repair or replace the pipeline at no
27 cost to the PSLUSD. Prior to repair or replacement of failed sewer pipe, the method of
28 replacement shall be submitted to the PSLUSD for approval. Pressure grouting shall not be
29 considered as an acceptable method of repair.
30

31 (c) The test results shall be submitted on PSLUSD form by the EOR prior to the infiltration/ex-
32 filtration test. Color CD/DVD and inspection logs shall be provided prior to final inspection.
33

34 **(2) Infiltration/Ex-filtration Test**

35
36 The gravity sewer shall be subjected to infiltration and/or ex-filtration tests after it has passed the
37 TV inspection. The test shall be conducted as follows:
38

39 (a) When testing mains and laterals separate of the manholes and the groundwater is at least 2'
40 above the highest invert, infiltration testing shall be performed.
41

42 (b) When testing mains and laterals separate of the manholes and the groundwater is less than
43 2' above the highest invert, ex-filtration testing shall be performed.
44

45 (c) All manholes shall be subject to an ex-filtration test and may be conducted in conjunction
46 with the testing of the mains and laterals. A maximum of 1000' of mainline and four structures
47 shall be tested; the PSLUSD inspector must be able to view all the manholes from one location at
48 the site.

1 (d) The allowable leakage shall not exceed 50 gallons/day/inch of diameter/mile.

2 (e) Should the test fail, the contractor shall accomplish necessary repairs and the test repeated
3 until the results are satisfactory. The contractor shall furnish the necessary labor, water, and all
4 other items required to conduct the testing and shall perform the necessary system repairs
5 required to comply with the specified test. All re-testing shall be at the contractor's expense.

6 (f) Pressure grouting is not considered an acceptable repair.
7

8 (g) The test results shall be submitted by the EOR on PSLUSD form prior to final inspection.
9

10 **(3) Deflection Test**

11
12 Testing is required for all flexible pipes to assure that deflection does not exceed 5%. The test
13 shall be performed as follows using a mandrel or a calibrated television/video camera.
14

15 (a) Test shall be conducted at least 30 days after the final backfill has been in place to allow for
16 stabilization of the soil-pipe system.
17

18 (b) If a mandrel is utilized, its diameter shall be 95% of the inside diameter of the pipe being
19 tested. Prior to use the mandrel shall be certified by the EOR and the PSLUSD. Use of an
20 uncertified mandrel or a mandrel altered or modified after certification will invalidate the test.
21 The mandrel shall be flushed with water or pulled through the pipe by hand with a 1/4" nylon
22 rope; mechanical pulling devices shall not be used. Excessive force shall not be applied in
23 pulling the mandrel that may damage the pipe or erroneously indicate that deflection was within
24 acceptable limits by temporarily expanding the pipe. The pipe shall be deemed acceptable if the
25 mandrel passes completely through the pipe without restriction. When the mandrel does not pass
26 through the pipe, the contractor shall locate and correct the defect to the satisfaction of the EOR
27 and PSLUSD. Re-testing of the pipe after correction of the defect shall be no sooner than 30 days
28 after final backfill has been in place.
29

30 (c) The test report shall be submitted by the EOR on PSLUSD form with the Final Inspection
31 Package.
32

33 **f. Reclaimed Water System Start-up and Testing**

34
35 (1) All reclaimed water main shall be tested in accordance with the Hydrostatic and Leakage
36 Testing procedure specified in this section. The test results shall be submitted by the EOR on
37 PSLUSD form prior to final inspection.
38

39 (2) The EOR and PSLUSD shall be notified 48 hours prior to start-up and final inspection of the
40 reuse metering station.
41

42 (3) All systems shall be exercised through operational tests in the presence of the EOR and
43 PSLUSD representatives to demonstrate achievement of the specified performance. The
44 scheduling of tests shall be coordinated by the contractor, so that the tests may proceed without
45 delays or disruption by incomplete work.
46

47 (4) During start-up the contractor's and/or manufacturer's representative shall be present at the
48 job site.

1
2 **C. AS-BUILT SURVEYS**
3

4 As-built surveys are required for all newly constructed facilities prior to final inspection, and
5 must be accompanied by the Completion Certification . As-built surveys shall be prepared by a
6 Professional Surveyor and Mapper licensed in the State of Florida. Each page of the as-built
7 survey shall include the name, original signature, date, and seal of the Professional Surveyor and
8 Mapper. The signature shall certify that as-built survey reflects the true as-built conditions as
9 located under direct supervision of the Professional Surveyor and Mapper. Record drawings are
10 not an acceptable substitution for an as-built survey, but may be submitted in addition to the as-
11 built survey.

12
13 Inspectors will do a courtesy as-built review during all scheduled inspection of any as-built
14 drawings and/or any redline drawings that are available on site.
15

16 **1. General As-Built Requirements**
17

18 As-built surveys shall be prepared at the same scale as the approved construction plans and shall
19 contain the following information:
20

21 a. Cover sheet with the name of project, developer and engineer; detailed location map with
22 street names and legal description; an index and a revision block. Each sheet shall be labeled
23 “As-built” in 1” high block printed letters and shall be on 24" x 36" sheets; the as-built surveys
24 shall match, sheet by sheet, the construction plans approved by PSLUSD; additional sheets may
25 be submitted if necessary.
26

27 b. A vicinity map with street names for all streets and right-of-ways.
28

29 c. The City of Port St. Lucie section, lot and block numbers and street names.
30

31 d. Elevation information, where required, shall be referenced to the North American Vertical
32 Datum of 1988 (NAVD 88). A complete description, including material, location and elevation
33 of at least one benchmark shall be shown on the as-built plans. The horizontal survey
34 information shall be referenced to the State Plane Coordinate System, Florida East Zone, North
35 American Datum of 1983 (NAD 83). A description of the control points upon which the as-built
36 survey is based shall be included with the plans.
37

38 e. At least 2 ties to all valves, service lines, fitting and fire hydrants from permanent points
39 (manholes, property lines, property corners, curbs, or pavement). Station and offset system may
40 be used if referencing the same baseline as the approved construction plans.
41

42 f. Location of mains from property or easement lines and alignment distance from centerline of
43 road at 300+/-ft. intervals.
44

45 g. Size, length and type of material, used to construct all mains.
46

47 h. Distance of mains from buildings or structures within 20’ of the main.
48

- 1 i. Special detail drawings where installations are not as shown on the contract drawings due to
2 the field conditions or where required for clarity.
3
- 4 j. Right-of-way, easements and lot lines and pertinent easement information, showing Official
5 Record Book and page number.
6
- 7 k. For horizontal directionally drilled (HDD) segments of pipe mains, a pre-drill survey shall be
8 performed by a Professional Surveyor and Mapper to obtain reference measurements, as required
9 to tie the HDD tracking information from the driller to the project survey control. As a minimum,
10 this will include vertical (NAVD) and horizontal location at the point of entry for the borehole.
11 This shall include the alignment vector for the drill rig relative to the project control baseline
12 survey.
13
- 14 l. Show actual location and elevation of all tees, crosses, bends, terminal ends, valves, fire
15 hydrants, air release valves, and sampling points, etc., by distances from known reference points.
16
- 17 m. Show actual location, size and type of material of all sleeves and casing pipes.
18
- 19 n. Elevation and horizontal location of all storm sewers, gravity sewers including laterals, force
20 mains, water mains, etc. which are crossed; including clearance dimension at all conflicts or
21 crossings.
22
- 23 o. Top of pipe elevation and horizontal location of all water and force main stub outs.
24
- 25 p. Horizontal location of all services at the termination point.
26
- 27 q. Location of fire lines.
28
- 29 r. A Valve Table including the Plan ID, Size, Type, Manufacturer, Date Set, Cover, Number of
30 Turns, Open Direction, Joint Type and Position.
31
- 32 s. All locate marker balls shall be shown.
33

34 **2. Water Mains**

35

- 36 a. The location of all valves, fittings, fire hydrants, casings and points of connection to the
37 existing system shall be referenced in two perpendicular directions. Horizontal dimensions shall
38 be to the nearest tenth of a foot and vertical dimensions shall be to the nearest hundredth of a
39 foot.
40
- 41 b. Horizontal locations will be required perpendicular to the right-of-way at 100' intervals.
42
- 43 c. Elevations on the main and finished grade will also be required at all pipe dead ends,
44 intersections, size changes, points of connection to existing system, at fittings, at intersections of
45 pipe, at 100' intervals, and where the depth of cover is less than 36" or greater than 60".
46
- 47 d. Separation between the storm water, reclaimed water mains, force mains and water mains.
48
- 49 e. Distance from hydrant to hydrant valve.

1 **3. Gravity Sewer**

2
3 a. The location of all piping, wyes, tees, manholes, cleanouts and points of connection to the
4 existing system shall be referenced in two perpendicular directions. Horizontal dimensions shall
5 be to the nearest tenth of a foot and vertical dimensions shall be to the nearest hundredth of a
6 foot. Runs of gravity sewers shall be identified (e.g., 300' of 8" PVC SDR 26 at S=.004).
7 Elevations shall be given for the north rim of the top of all manhole covers and all manhole
8 inverts.

9
10 b. Elevations on the service piping and finished grade will be required at the property line.
11 Location of the end of sewer services shall be given to the plug and be located from the side
12 property line.

13
14 c. Manhole types shall be identified (e.g. Type A, B, etc.)

15
16 d. Elevation of manhole top rim and invert of each line.

17
18 e. Show distance between manholes center-to-center and horizontal location.

19
20 f. Show material size and type used to construct sewer mains.

21
22 g. Show length (center of manhole to end of stub) distances from known reference points or
23 baseline offsets, and elevation of stub-outs.

24
25 h. Show station and offset location of sanitary services' at property line. Particular care in
26 dimensioning needed in special situations, i.e., cul-de-sacs and locations where services are not
27 perpendicular to the wye.

28
29 i. Show invert elevation of sanitary service at property line.

30
31 **4. Wastewater Pump Stations**

32
33 a. Wet-well size and location shall be indicated and located to property lines and/or ROW lines.

34
35 b. All lines within the pump station site shall be located to property lines and/or ROW lines.
36 Elevations shall be indicated at inverts, wet-well top/bottom, and at ground adjacent to wet-well.

37
38 c. All types and sizes of lines and fittings shall be indicated.

39
40 d. All schedules that show pump, motor and electrical data shall be corrected to show the as-built
41 condition and submitted with the pump station drawings. As-built survey shall indicate the make,
42 model number, horsepower, impeller and condition point of pumps selected and installed, shape
43 of wet well, location of control panel, location of pump out connection, control level settings,
44 any deviation from the plans, and serial number of the pumps.

45
46 e. Within the pump station boundaries the following shall be located horizontally: pump-out,
47 hose bib and RPZ device, wet-well, control panel, bends, fittings, manholes, generator and fuel
48 tank, transformer, irrigation system, fence, and auxiliary electrical enclosures, as applicable.

- 1 f. A detail of the pump station site showing above and below ground improvements is required.
2
3 g. All buried fiber, pull boxes, splice boxes, and electrical conduit shall be labeled and located to
4 property lines and/or right-of-way lines including electrical service from utility transformer to
5 station meter and to control panel.
6

7 **5. Force Mains**

8

- 9 a. The location of valves, fittings, casings and points of connection to the existing system shall
10 be referenced in two perpendicular directions. Horizontal dimensions shall be to the nearest tenth
11 (1/10) of a foot and vertical dimensions shall be to the nearest hundredth (1/100) of a foot.
12
13 b. Horizontal locations will be required perpendicular to the right-of-way at 100' intervals.
14
15 c. Elevations on the main and finished grade will be required at points of connection to the
16 existing system at fittings, 100' intervals, at high points, and where the depth of cover is less than
17 36" or greater than 60".
18

19 **6. Reclaimed Water Mains**

20

- 21 a. The location of valves, fittings, casings and points of connection to the existing system shall
22 be referenced in two perpendicular directions.
23
24 b. Horizontal dimensions shall be to the nearest tenth (1/10) of a foot and vertical dimensions
25 shall be to the nearest hundredth of a foot.
26
27 c. Horizontal locations will be required perpendicular to the right-of-way at 100' intervals.
28
29 d. Elevations on the main and finished grade will be required where the depth of cover is less
30 than 36" or greater than 60", at fittings, and at 100' intervals.
31
32 e. Elevations on the main and finished grade will be required at all pipe dead ends, intersections,
33 and size changes.
34

35 **D. FINAL INSPECTION PACKAGE**

36

37 The final inspection shall be scheduled by contacting the Utility Engineering Division Inspection
38 Group at inspectors@cityofpsl.com. The Utility Final Inspection Package shall be submitted
39 **prior** to the PSLUSD scheduling a final inspection, including but not limited to the following
40 items: (each signed item must be accompanied by the Sunbiz page for authorized signatures).
41

42 **01 Utility Final Inspection Checklist**

43

44 The Utility Final Inspection Package Checklist and other related forms can be downloaded from
45 the PSLUSD web site at www.cityofpsl.com. The EOR must initial each applicable item on the
46 form to certify that the information is satisfactory and meets the PSLUSD requirements. The
47 required information must be submitted together with the completed form; submittal of
48 incomplete or unsatisfactory information will delay transfer of the system to PSLUSD.
49

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02. As-Built Survey

One black or blue line set of as-built survey shall be submitted to PSLUSD at least 7 days prior to the desired inspection date together with a completed form for Project Completion. If as-built survey is not correct, the final inspection will be completed but considered a failed inspection. A punch list compiled by the EOR of incomplete minor items and a schedule for completion shall be submitted with the as-built survey.

03. Project Completion Certification

One original of the Project Completion Certification shall be signed by the Surveyor, Contractor, and the Engineer of Record. This shall be submitted on PSLUSD Doc. No. 131.

Test reports

04. Current Bacteriological Report (water system)

The report shall be submitted, as required in Section 4.a.8 of this chapter, prior to the expiration date for bacteriological results. The EOR must allow for proper review time by the PSLUSD. Expiring tests do not warrant shorter review times.

05. Sample Point Map

Sample point map must be a single sheet of paper (8 ½ x 11) and must be submitted depicting the actual location of all sample points for approval prior to chlorination of the line.

06. Pressure Test

Pressure testing reports for all pressure mains installed.

07. Backflow Prevention Assembly Certification (per assembly)

Certification shall be submitted from a certified ‘Backflow Tester’ that the device is functioning per specifications. PSLUSD Form No. 47 may be used for certification.

08. All Test Reports

All test reports shall be submitted on PSLUSD forms by the EOR with a sealed and signed cover letter.

09. New/Existing Grease Interceptors

Current inspection reports and/or a pump-out report shall be submitted for each existing interceptor.

10. Density Test Reports

1
2 Density test reports shall be submitted as required in Section J.1.h.(2)(3)(4) & (5) of Chapter II.

3
4 **11. Pump Station Record Information**

5
6 One copy of the pump station record information form shall be submitted for each pump station.
7 The information shall be submitted using the PSLUSD Doc. No. 113.

8
9 **12. Pump Station/Metering Station Start-up Report & Manuals (If applicable)**

10
11 a. Pump Station

12
13 Two (2) sets of the documents indicated below shall be submitted.

- 14
15 (1) Pump Station Record Information on PSLUSD form.
16 (2) Parts manual
17 (3) O & M manuals (2 hard copies & 1 electronic copy in pdf format).

18
19 b. Metering Station

20
21 Two (2) sets of the documents indicated below shall be submitted.

- 22
23 (1) Parts manual
24 (2) O & M manuals and warranties
25 (3) Electrical schematics in pdf. and dwg. formats
26 (4) One (1) copy of the installed system software on CD-ROM disk
27 (5) Start-up reports indicating all start-up parameters and results and station performance
28 certification (the control valve manufacturer's representative shall also sign off on the startup
29 documentation)

30
31 **13. Bill of sale with**

32
33 **14. Sunbiz Detail by Entity Name indicating authorization of signatory**

34
35 This shall be a draft with all spaces filled in and proposed signers name (no signature).

- 36 a. Bill of sale shall be submitted on the City's standard form.
37 b. Exhibit A – shall contain the legal description of the property.
38 c. Exhibit B – shall contain the list that includes the “furnish and install” price of all materials,
39 equipment and labor. This shall be submitted on the City's standard form.

40
41 **15. Utility Easement Document**

- 42
43 a. A copy of the recorded agreement previously approved by the City.

44
45 **16. Gate Codes and Contact Information**

46
47 If applicable, submit all gate codes and contact information to gain entry to the property for
48 maintenance and repair of all PSLUSD facilities.

1 **CHAPTER IV**
2 **ACCEPTANCE OF SYSTEM FOR OPERATION**

3
4 **A. GENERAL**
5

6 Upon completion of construction by the contractor and passing of final inspection by PSLUSD,
7 the Engineer of Record must submit the turnover package to the PSLUSD office, in person by
8 appointment. The submittal will undergo an initial review for content only and shall be accepted
9 or rejected for a complete review. If the submittal is incomplete and rejected, it will be returned
10 to the EOR in its entirety. Once the submittal has been accepted by the PSLUSD for complete
11 review, the detailed review will be completed within 7 days.
12

13 **B. UTILITY ACCEPTANCE TURNOVER PACKAGE**
14

15 The Utility Acceptance Turnover Package includes the following:
16

17 **01. Utility Acceptance Turnover Checklist**
18

19 The Utility Acceptance Turnover Checklist and other related forms can be downloaded from the
20 PSLUSD web site at [www.cityofpsl.com/utility/commercial-development/utility-commercial-](http://www.cityofpsl.com/utility/commercial-development/utility-commercial-development.html)
21 [development.html](http://www.cityofpsl.com/utility/commercial-development/utility-commercial-development.html). The EOR must initial each applicable item on the form to certify that the
22 information is satisfactory and meets the PSLUSD requirements. The required information must
23 be submitted together with the completed form; submittal of incomplete or unsatisfactory
24 information will delay transfer of the system to PSLUSD. (each page with a signature must be
25 accompanied by the printout from Sunbiz showing the names of authorized signatures).
26

27 **As-built Survey**
28

29 As-built survey shall be prepared in accordance with the requirements of Section C., Chapter III.
30 The survey must be submitted as follows:
31

32 **02.** One set of signed and sealed black or blue line as-built surveys (utility sheets only).
33

34 **03.** 2 CD's each containing one single file in PDF of the full set of as-builts (all sheets) and a
35 single file in AutoCAD and any other associated files (using standard fonts) of the full set of as-
36 builts. (1 PDF and Cad files on each disk).
37

38 **04. Contractor's Affidavit & Release of Lien with**
39

40 **05. Sunbiz Detail by Entity Name**
41

- 42 a. Contractor's affidavit and final release of lien shall be submitted on the City's standard form.
43 b. All Contractors who performed work on the utility portion of the project must submit an
44 affidavit and release of lean.
45

46 **06. Request to Place Water Distribution and/or Sewage Collection/Transmission System**
47 **into Operation**
48

1 A Request to Place a Water Distribution and/or Sewage Collection/Transmission System into
2 Operation shall be submitted on FDEP or PSLUSD forms, as applicable.

3
4 If the water and wastewater system are permitted by FDEP for construction approval to place
5 the system into operation must be obtained from FDEP. The PSLUSD will not release the water
6 and wastewater facilities for use until an approval has been issued by FDEP. The FDEP forms
7 must be completed and submitted to PSLUSD for signature. The forms will be signed by the
8 PSLUSD after the system has passed final inspection.

9
10 **07. Owner's Affidavit with**

11
12 **08. Sunbiz Detail by Entity Name**

- 13
14 a. Owner's affidavit shall be submitted on the City's standard form.
15 b. Exhibit A shall contain the legal description of the property.

16
17 **Final Inspection Report, Inspection Overtime/Re-Inspection Fees, and Other**
18 **Fees/Charges**

19
20 **09. Passing Final Inspection Report**

21
22 Final inspection report completed by the EOR on PSLUSD forms must indicate compliance with
23 all items on the form. The final inspection shall be considered unsatisfactory by the PSLUSD if
24 any items on the report do not comply with the utility standards even if the EOR has noted that
25 the project did pass final inspection.

26
27 **Fees & Charges**

28
29 All fees and charges must be paid prior to acceptance of the turnover package, including:

30
31 **10. Overtime inspection fees**

32
33 **11. Re-Inspection fees**

34
35 **12. All other fees incurred, including Guaranteed Revenue**

36
37 **13. Bill of sale with**

38
39 **14. Sunbiz Detail by Entity Name indicating authorization of signatory**

40
41 This shall be the complete signed original.

42
43 **15. Material and Installation Warranty**

- 44
45 a. Any cost associated with the repair or adjustment of PSLUSD facilities during the warranty
46 period shall be the responsibility of the contractor and/or developer. The PSLUSD may perform
47 the necessary work and bill the contractor and/or developer for the expenses. The developer may
48 perform this work with prior approval, and inspection of the PSLUSD.

1 b. The materials and workmanship shall be warranted on all equipment supplied for a period of
2 one (1) year. Warranty period shall commence on the date of PSLUSD acceptance.

3
4 c. The equipment shall be warranted to be free from defects in workmanship, design and
5 materials. If any part of the equipment should fail during the warranty period, it shall be replaced
6 in the machine(s) and the unit(s) restored to service at no expense to the PSLUSD.

7
8 d. The warranty shall be submitted on the City's standard form on contractor's letterhead.

9

10 **C. APPROVAL TO PLACE SYSTEM INTO OPERATION**

11

12 When all the items, as required in Sections A. and B. above, are in compliance, the PSLUSD will
13 issue a Letter of Acceptance, release the water meter(s) to be set, and give clearance to the
14 Building Department for issuance of a Certificate of Occupancy.