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WATER SYSTEM ANALYSIS FOR THE PACIFICA PROJECT IN THE CITY OF OCEANSIDE

June 20, 2023

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6-20-2023

Prepared by:

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Job No. 1043-002

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June 20, 2023 1043-002

MLC Holdings, Inc.
5 Peters Canyon Road, Suite 310
Irvine, CA 92606

Attention: Johanna Crooker, Director of Forward Planning

Subject: Water System Analysis for the Pacifica Project in the City of Oceanside

Introduction and Purpose

The Pacifica project is located in the City of Oceanside southwest of Monica Circle/Macario Drive and west of Roja Drive. Access to the project is from Monica Circle/Macario Drive and Malaga Drive. Water service for the Pacifica project will be provided by the City of Oceanside.

The proposed Pacifica project is a residential development on an approximately 14.55-acre parcel (APN 157-070-42 and 122-190-19). It is situated within a previous elementary school site. The proposed project would develop 164 townhome residential units. Finished floor elevations within the project range from a low of 97 feet to a high of 105 feet in elevation.

The purpose of this letter-report is to analyze the existing and proposed public and private water systems for the Pacifica project and determine if there are any hydraulic deficiencies created by the proposed development of this property.

A Vicinity Map for the project is shown on Figure 1 and a preliminary site plan for the project is included in Appendix A.

Water System Design Criteria

Water system design criteria such as estimating potable water demands and evaluating the capacity of transmission and distribution pipes are based on the City of Oceanside Water Utilities Department, Water, Sewer, and Reclaimed Water Design & Construction Manual, August 2017, Section 2, Potable Water Systems Design Guidelines (Design & Construction Manual). Based on the design manual, domestic average day water demands are determined using land use acreage and an associated water demand factor. A copy of the pertinent sections in the City's Manual where the design criteria is located is attached as Appendix B.

The water demand rates are presented in Table 1.

TABLE 1
PACIFICA PROJECT
AVERAGE DAILY WATER DEMAND FACTORS

Land Use	Gallons Per Day Per Acre
Residential (1-2 DU/ac)	1,200
Residential. (2-4 DU/ac)	2,100
Residential (4-8 DU/ac)	2,400
Residential (8-12 DU/ac)	2,500
Residential (12-15 DU/ac)	2,800
Residential (15-20 DU/ac)	3,200
Residential (20-30 DU/ac)	4,100
Agricultural	1,750
Industrial	2,000
Open Space	1,300
Commercial	1,850
Institutional	1,675

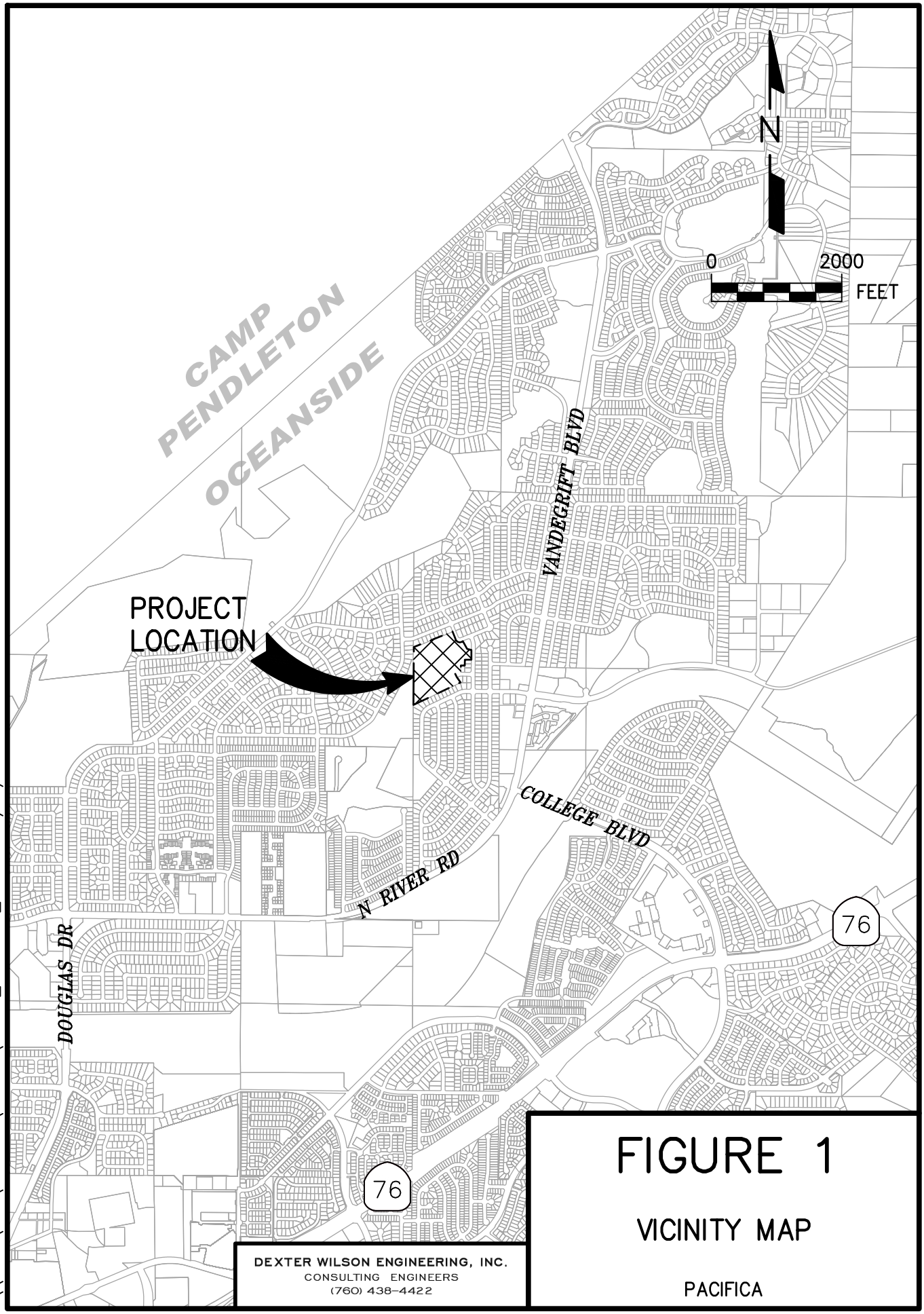

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FIGURE 1

VICINITY MAP

PACIFICA

During maximum day demands, the public water system must maintain a minimum residual pressure of 45 psi. During peak hour demands, the public water system must maintain a minimum residual pressure of 35 psi. Residual pressure under maximum day demands plus fire flow must be greater than 20 psi.

Pipeline velocity must not exceed 7.5 feet per second (fps) under maximum domestic demands (no fire flow). For fire flow conditions, velocities shall not exceed 15 fps for less than 12-inch diameter existing mains, and velocities shall not exceed 10 fps for 12-inch diameter existing mains and above.

Potable Water Demands

The estimated water demand for the project is calculated using the water use factors based on density presented in the City's Design and Construction Manual. The density is calculated based on the City's definition of Gross Developable Area which equates to 12.82 acres for the Pacifica site resulting in a density of 12.79 du/ac. The dwelling unit density for the Pacifica project is shown below in Table 2.

TABLE 2
RESIDENTIAL DENSITY FOR THE PACIFICA PROJECT

Dwelling Units	Gross Developable Area (acres)	Density, DU/acre
164	12.82	12.79

The dwelling unit density corresponds to a water demand factor of 2,800 gpd per acre for the Pacifica project. The total estimated average water demand for the Pacifica project is calculated in Table 3.

TABLE 3
WATER DEMAND FOR THE PACIFICA PROJECT

Land Use	Water Demand Factor (gpd/acre)	Gross Developable Area (acres)	Average Water Demand, gpd
Residential	2,800	12.82	35,896

The maximum day demands are 2 times the average and peak hour demands are 3 times the average according to the City's Design and Construction Manual. This corresponds to 71,792 gpd (50 gpm) and 107,688 gpd (75 gpm) respectively.

Fire Flows

The fire flow requirement for the project site was estimated based on the 2019 California Fire Code. The fire code takes into account building area and construction type. The largest building proposed for the project site is estimated to be 13,152 square feet. Construction Type V-B is proposed for the onsite buildings. This results in an estimated fire flow requirement of 3,000 gpm. After the expected reduction of 50% for an NFPA approved fire sprinkler system, the estimated final fire flow requirement for the project site equates to 1,500 gpm. The excerpt from the 2019 California Fire Code pertaining to fire flow requirements and project information on building area and construction type are shown in Appendix D.

Available Water System Pressure

Water service to the project will be from the Talone 320 Pressure Zone of the City's public water system. Finished floor elevations on the Pacifica property range between 97 feet and 105 feet. This results in a maximum static water pressure range of 93 psi to 97 psi on the project site. The expected maximum working pressure behind/downstream of the meter and backflow preventer will be approximately between 78 to 82 psi.

Existing Water System

The Pacifica project is located in an area of the City of Oceanside that is well developed. Existing water facilities in the vicinity of the project include 6-inch diameter water lines in Monica Circle and 8-inch diameter water lines in Malaga Drive, Macario Drive, and Roja Drive. These lines are served by the City's Talone 320 Pressure Zone.

Figure 2 shows the existing water lines in the vicinity of the Pacifica project.

Proposed Offsite Water Facilities

The water service in the area of the Pacifica project is being supplied by the 320 Zone water system. From a service pressure standpoint, connecting the Pacifica project to this system will provide adequate service. As described in a previous section, the range of pad elevations on the project results in a minimum static water pressure of 93 psi.

The proposed water system for the Pacifica project consists of making connections for its proposed private water system at two locations. A domestic water meter and fire protection system connection will be made at two locations. Additionally, the project will be upsizing the existing 6-inch diameter water lines in the Monica Circle and Macario Drive intersection to 8-inch diameter water lines in order to meet the City's current design standards.

The Pacifica project's proposed onsite water system will consist of private water lines via a private domestic and fire protection system.

LEGEND

PROJECT BOUNDARY

EXISTING PUBLIC WATER LINE 320 ZONE

PROJECT LOCATION

DOUGLAS DR
EX.14"
CONCHO PL
ANN ST
PARKER ST
MICHAEL ST
EX.10"
EX.18"
EX.12"
ARTHUR AVE
EX.10"
CHARLES DR
FLORA DR
ELAINE AVE
LENORE ST
FRANCIS ST
BARRY ST
CARILLO CIR
MONICA CIR
ROJA ST
CLAIRE DR
STEPHANIE PL
EX.8"
CARDIFF BAY DR
MOONSTONE BAY DR
MARBLEHEAD BAY DR
EX.6"
MACARIO DR
GOLD DR
VANDEGRIFT BLVD
SOL DR
MALAGA DR
N REDONDO DR
VERDE DR
SIESTA DR
ROJA DR
LUNA DR
N RIVER RD
EX.14"
EX.18"

N

0 400 FEET

FIGURE 2

EXISTING WATER FACILITIES

PACIFICA

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Private Water System

Per the City's requirement, the onsite water system for Pacifica will be private. Two connections will be made for both domestic service and fire protection service to the project site. Domestic and fire connections will be made at the Monica Circle/Macario Drive intersection and domestic and fire connections will be made at the western terminus of Malaga Drive. Both the project's private domestic water system and private fire protection system will be connected at each location.

Figure 3 shows the proposed water system for the Pacifica project. Reference information surrounding the proposed private water systems for Pacifica are included in Appendix C.

Domestic Meter and Service. The preliminary water fixture count (WFU) for the proposed townhome units are estimated to be 30 to 35 WFUs per unit. Based on a WFU count of between 30 and 35 fixture units per home, the design demand for water meter sizing is estimated to be between 590 and 650 gpm for the entire project.

Based on the meter capacities established in AWWA C700-20 and listed by City's Water Utilities Department, the Pacifica project will require two 3-inch meters, with a 700 gpm total capacity, that shall be constructed per City of Oceanside Standard Drawing W-4. The final sizing of the service laterals and meters will need to be confirmed once the fixture units for each home are finalized.

Private Fire Protection Service. The private fire protection system will consist of two double check detector assembly (DCDA) backflow preventers at each connection point and 8-inch diameter water lines throughout the project. The 8-inch diameter private fire protection system will sufficiently convey the projected 1,500 gpm fire flow requirement. This was confirmed by a hydraulic computer model that is presented in the next section of this water study.

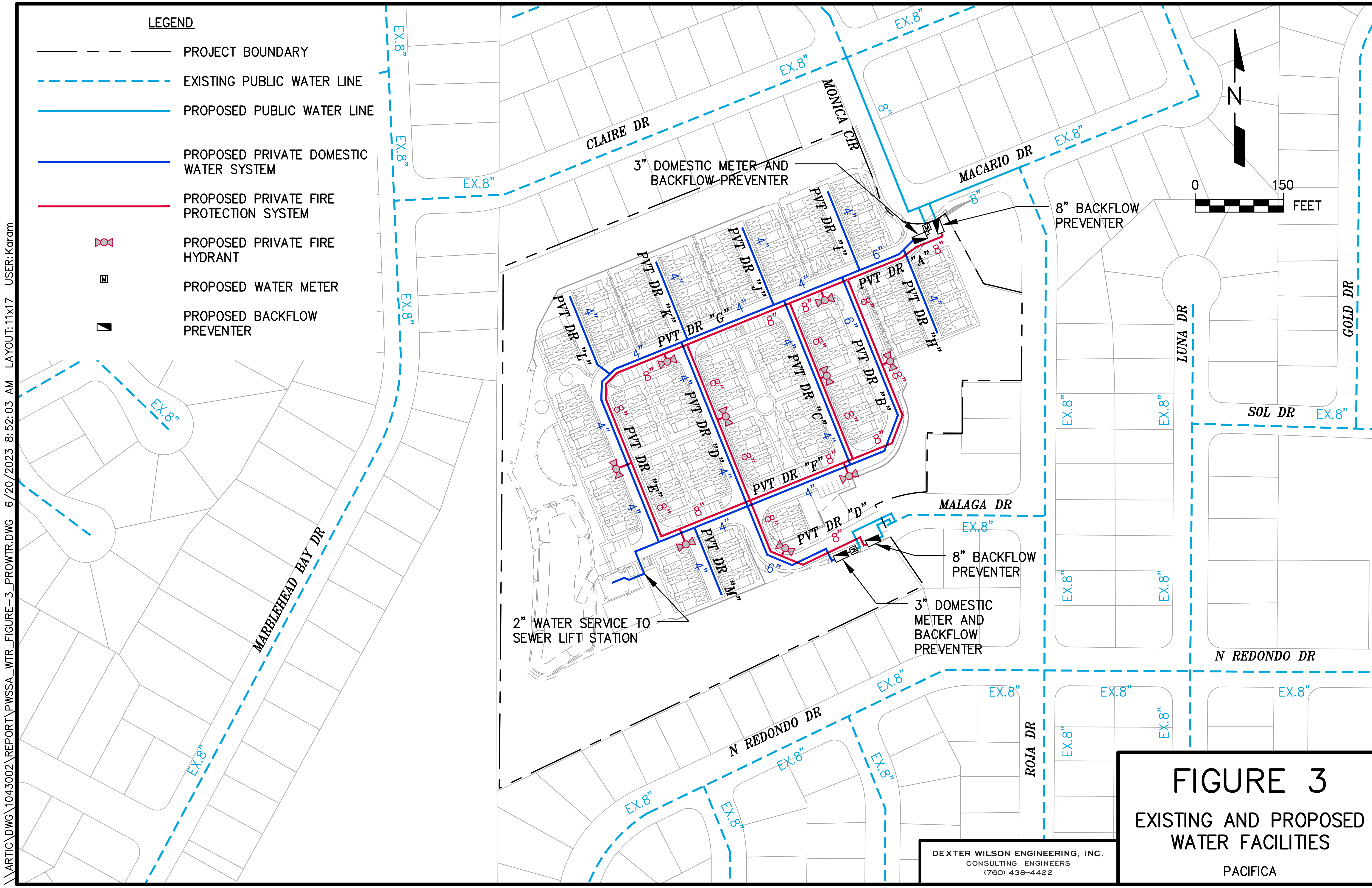

FIGURE 3
EXISTING AND PROPOSED WATER FACILITIES
PACIFICA

Computer Model for System Analysis

To analyze the existing and proposed water systems for the Pacifica project, a water system hydraulic computer model was generated for the pertinent proposed piping in the vicinity of the project. This hydraulic computer model included the public water system piping adjacent to the Pacifica project as well as the proposed onsite piping. Several water demand scenarios were modeled which provided data upon which the recommended pipe sizing is based.

Available Hydraulic Grade Line. As mentioned earlier in this report, the source of water in the vicinity of the Pacifica project is the 320 Zone with the Talone and Pilgrim Creek Reservoirs being nearest to the project site. According to the City's Water Master Plan and atlas maps the 320 foot hydraulic grade line (HGL) is the high water line of the reservoir. There are 18-inch diameter transmission lines that carry the water from these reservoirs to the North Redondo Drive and North River Road intersection; hence the source node for the hydraulic computer model was modeled near this intersection. The available HGL was conservatively estimated to be approximately 285 feet (reservoir floor) during domestic and fire flow scenarios for the proposed project.

Water System Computer Model. Analysis using the KYPIPE computer software program developed by the University of Kentucky determined residual pressures throughout the water system. This computer software utilizes the Hazen-Williams equation for determining headloss in pipes. The Hazen-Williams "C" value used for all pipe sizes in our analysis is 120.

Fitting and Valve Losses. To simulate minor losses through pipe fittings and valves, minor loss coefficients or "k" values for all fittings associated with pipes were included in the hydraulic model.

Meter and Backflow Assembly Losses. The pressure loss through the proposed meters and backflow preventers was incorporated into the computer model. Appendix C presents candidate DCDA and RP backflow preventers. The manufacturer's literature includes charts which show pressure loss through the backflow preventer as a function of flow. These charts were used to incorporate the pressure losses reflected in the computer modeling.

Computer Model Analysis – Domestic Water System

Computer modeling of the proposed onsite private domestic system and existing offsite water system for the Pacifica project was performed to confirm the pipe sizes necessary to provide adequate domestic service. The water system was analyzed under two scenarios: average day demand and peak hour demand.

Appendix E provides the results of the computer modeling for the analyzed water system. Exhibit A at the back of Appendix E provides the Node and Pipe Diagram for the computer model.

The results in Appendix E show that the proposed water system for the Pacifica project is adequate for domestic service. The results of the computer model show that average day demand can be achieved onsite with a minimum residual pressure of 61 psi and that peak hour demand can be achieved onsite with a minimum residual pressure of 60 psi.

Computer Model Analysis – Fire Protection System

Computer modeling of the proposed onsite private fire protection system and existing offsite water system for the Pacifica project was performed to confirm the pipe sizes necessary to provide adequate fire protection service. The water system was analyzed under two maximum day demand plus 1,500 gpm scenarios.

Appendix F provides the results of the computer modeling for the analyzed water system. Exhibit B at the back of Appendix F provides the Node and Pipe Diagram for the computer model.

The results in Appendix F show that the proposed water system for the Pacifica project is adequate for fire protection. The results of the computer model show that a 1,500 gpm fire flow can be provided onsite with a minimum residual pressure of 45 psi.

Conclusions and Recommendations

The following recommendations and conclusions are made based on the water system analyses performed for the Pacifica project.

1. The Pacifica project will be supplied from the Talone 320 Pressure Zone system. Maximum static water pressure will be 97 psi. Maximum working pressure in the private system will be 82 psi.

2. Figure 2 in this report presents the existing water system surrounding the Pacifica project.

3. Public water system connections for the Pacifica project will be made to the existing 8-inch diameter water line at the western end of Malaga Drive as well as the proposed 8-inch diameter water line in the Monica Circle and Macario Drive intersection.

4. The proposed Pacifica development will be served by onsite private water systems stemming off the proposed 8-inch diameter water lines.

5. The Pacifica project will require two 3-inch meters that shall be constructed per City of Oceanside Standard Drawing W-4.

6. Offsite water improvements for the Pacifica project include upsizing existing 6-inch diameter water lines in the Monica Circle and Macario Drive intersection to 8-inch diameter water lines in order to meet the City's current design standards.

7. The fire flow requirement is estimated based on the 2019 California Fire Code. The fire code takes into account building area and construction type which results in a 1,500 gpm fire flow requirement for Pacifica.

8. Figure 3 in this report presents the proposed water system for the Pacifica project.

9. Individual pressure regulators for all building services within the Pacifica project are required to limit building service pressures to 80 psi in accordance with the Uniform Plumbing Code and City of Oceanside standards.

10. For PVC pipe to be used for public water lines within the project, we recommend the piping specification to be AWWA C900 DR-18 Class 235.

Thank you for the opportunity to prepare this report. If you have any questions on the enclosed information, please do not hesitate to call.

Dexter Wilson Engineering, Inc.

Steven Henderson, P.E.

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Attachments

APPENDIX A

PRELIMINARY SITE PLAN


NEED TWO STEPS IN BLDG B/C 3' DRIVEWAYS & 5' END DRIVEWAY
SEWER & SD CROSSINGS
MONICA CIR.
MACARIO DR.
ROJA DRIVE
MALAGA DRIVE
PVT. DRIVE "A"
PVT. DRIVE "B"
PVT. DRIVE "D"
PVT. DRIVE "F"
PVT. DRIVE "K"
PVT. DRIVE "M"
PROJECT BOUNDARY
CONNECT TO EXIST. STREET IMPROVEMENTS
PROP. CURB & GUTTER AND SIDEWALK
EXIST. SPEED BUMP TO REMAIN
EXIST. STREET LIGHT TO REMAIN
REPLACE EXIST. 6" WATER MAIN WITH 8" PVC MAIN
REPLACE EXIST. CROSS GUTTER
CONNECT TO EX. 24" STORM DRAIN
CONNECT TO EXIST. 8" WATER MAIN
RECONSTRUCT EXISTING PED RAMPS AND REPAINT CROSSWALK
EXISTING WALL TO REMAIN
EXIST. INLET TO BE REMOVED
FILTERRA UNIT
FEMA 500 YEAR FLOOD ZONE X FIRM PANEL #488 EFFECTIVE DATE: 5/16/2012
EXISTING STORM DRAIN OUTLET PER DWG. #S-533
EXISTING CLEANOUT TO REMAIN
PORTION OF EXISTING 30" STORM DRAIN TO REMAIN
PROP. RISER
BASIN BOTTOM AREA = 9,164 SF
BASIN BOTTOM AREA = 9,100 SF
TOP OF BASIN ELEV. = 94.0
BASIN BOTTOM ELEV. = 88.0
PUBLIC SEWER LIFT STATION. PUBLIC ACCESS & UTILITY ESMT.
EXISTING STORM GRATE WITH FL OF 88.98 TO REMAIN. PROPOSED CONNECTION TO DOWNSTREAM CLEANOUT WITH FL OF 83.3
HABITAT SETBACK LIMITS
CONNECT TO EXIST. CURB
CONNECT TO EXIST. SEWER 121.28IE
END OF PUBLIC MALAGA DRIVE
PROP. EMERGENCY GATE
PROP. PUBLIC ACCESS & UTILITY ESMT.
6" WATER IN THIS SEGMENT OF PVT. DRIVE "D"
EXIST. 8" VCP SEWER TO REMAIN
EXIST. 6" ACP WATER
BLDG #1 BLDG #3 BLDG #4 BLDG #5 BLDG #6 BLDG #7 BLDG #8 BLDG #9 BLDG #10 BLDG #11 BLDG #12 BLDG #13 BLDG #14 BLDG #15 BLDG #16 BLDG #17 BLDG #18 BLDG #19 BLDG #20 BLDG #21 BLDG #22 BLDG #23 BLDG #24 BLDG #25

APPENDIX B

CITY OF OCEANSIDE DESIGN CRITERIA

2. Pressure Regulating Stations
3. Pressure Relief Stations
4. Reservoirs
5. Wells

H. Demands:

1. Average daily water demands shall be:

LAND USE CATEGORY	GALLONS PER DAY/PER ACRE
Single Family Res. (1-2 DU/ac)	1,200
Single Family Res. (2-4 DU/ac)	2,100
Single Family Res. (4-8 DU/ac)	2,400
Single Family Res. (8-12 DU/ac)	2,500
Single Family Res. (12-15 DU/ac)	2,800
Single Family Res. (15-20 DU/ac)	3,200
Single Family Res. (20-30 DU/ac)	4,100
Agricultural Acres	1,750
Industrial Acres	2,000
Open Space Acres	1,300
Commercial Acres	1,850
Institutional Acres	1,675

DU – Dwelling Unit

2. Peak Factors:

a. Average Daily Demand ADD = 1.00
b. Maximum Daily Demand MDD = 2.0*ADD
c. Peak Hourly Demand PHD = 3.0*ADD

2.2 FIRE FLOWS

The City of Oceanside currently utilizes the latest edition California Fire Code (CFC) requirements for determining fire flow requirements for buildings. The latest edition CFC incorporates many factors in determining fire flows, such as building construction type, building square footage, and fire protection systems. Several factors are combined to determine the minimum required fire flow requirements.

Although General Guidelines contained in Table 2.1 represent typical fire flows for various land use categories, minimum fire flow calculations are governed by the latest edition CFC, Section 507, for each specific building type and construction.

The typical fire flow for the different land use categories are shown in the following Table. All fire flows are measured with a 20-PSI Residual Pressure.

TABLE 2.1: General Fire Flow Guidelines

Land Use Classifications	Design Fire Flow (GPM)	Duration (HOURS)	Residual Pressure (PSI)
Residential - Single Family	1500	2	20
Residential - Multi-Family	3000	2	20
Commercial	4000	4	20
Industrial	4000	4	20
Governmental - Institutional	4000	4	20

All new developments that are required to have a fire suppression system shall have the system approved by the Fire Marshall. Sprinkler calculations shall be provided to the Fire Department for review and to verify the fire service connection and backflow assembly is properly sized.

2.3 PRESSURES

A. Minimum residual pressure shall be 20 PSI at design fire flow plus maximum day domestic demand.

B. Minimum residual pressure shall be 35 PSI at peak hour domestic demand.

C. Minimum residual pressure shall be 45 PSI at peak day.

D. When static pressures exceed 80 PSI at property line, pressure-reducing valves will be required at the building. The pressure regulator shall be Class 150 or greater.

E. All new single-family residential water service in each pressure zone shall be provided with a minimum static pressure of 50 PSI at the water meter.

2.4 MAINS

A. Minimum diameter shall be 8 inches.

B. All mains not meeting the minimum main diameter and material requirements shall be replaced to meet current design standards. This is applicable for all new commercial, industrial, institutional, and residential developments of four (4) units or more. Where the full replacement length along the frontage property is deemed in excess of the overall project cost, the developer may pay an in-lieu fee upon the approval of the Water Utilities Director.

C. All lines are to be looped.

D. Minimum depth of cover required:

1. 36 inches for 12-inch mains and smaller.

2. Mains over 12 inches require special design.

E. Design shall be based on maximum day requirements plus fire flow. Maximum velocity shall be 7.5 FPS not including fire flow.

F. For fire flow conditions, velocities shall not exceed 15 FPS for less than 12-inch existing mains, and velocities shall not exceed 10 FPS for 12-inch existing mains and above. For new mains, velocities shall not exceed 10 FPS with the fire flow demand flowing through one hydrant.

G. Thrust blocks shall be installed in accordance with Standard Drawing W-27. When water pressures exceed 200 PSI and/or soil-bearing pressures are less than 2000 PSF a special design shall be required by a Registered Civil/Structural Engineer.

H. All mains shall be shown in profile on the improvement plans.

I. All water mains not located within the Public right-of-way shall be provided with a minimum 20-foot wide water easement. In some cases, a wider easement may be required, as determined by the Water Utilities Director.

J. Where water and sewer mains are located within the same easement, the minimum easement size shall be 30 feet wide.

K. Easements shall be easily accessible to City maintenance equipment. Access shall be unobstructed with all-weather driveways and capable of withstanding a 40 ton load.

L. No trees, plantings, fences, structures, or building overhang shall be located within City easements.

M. Homeowners who purchase property containing a City easement will be responsible for the maintenance of that easement property.

N. No building foundations will be allowed within 10 feet of the outside edge of a City easement.

O. The shortest pipe length shall be no less than 6 linear feet.

2.5 VALVES

A. Maximum valve spacing:

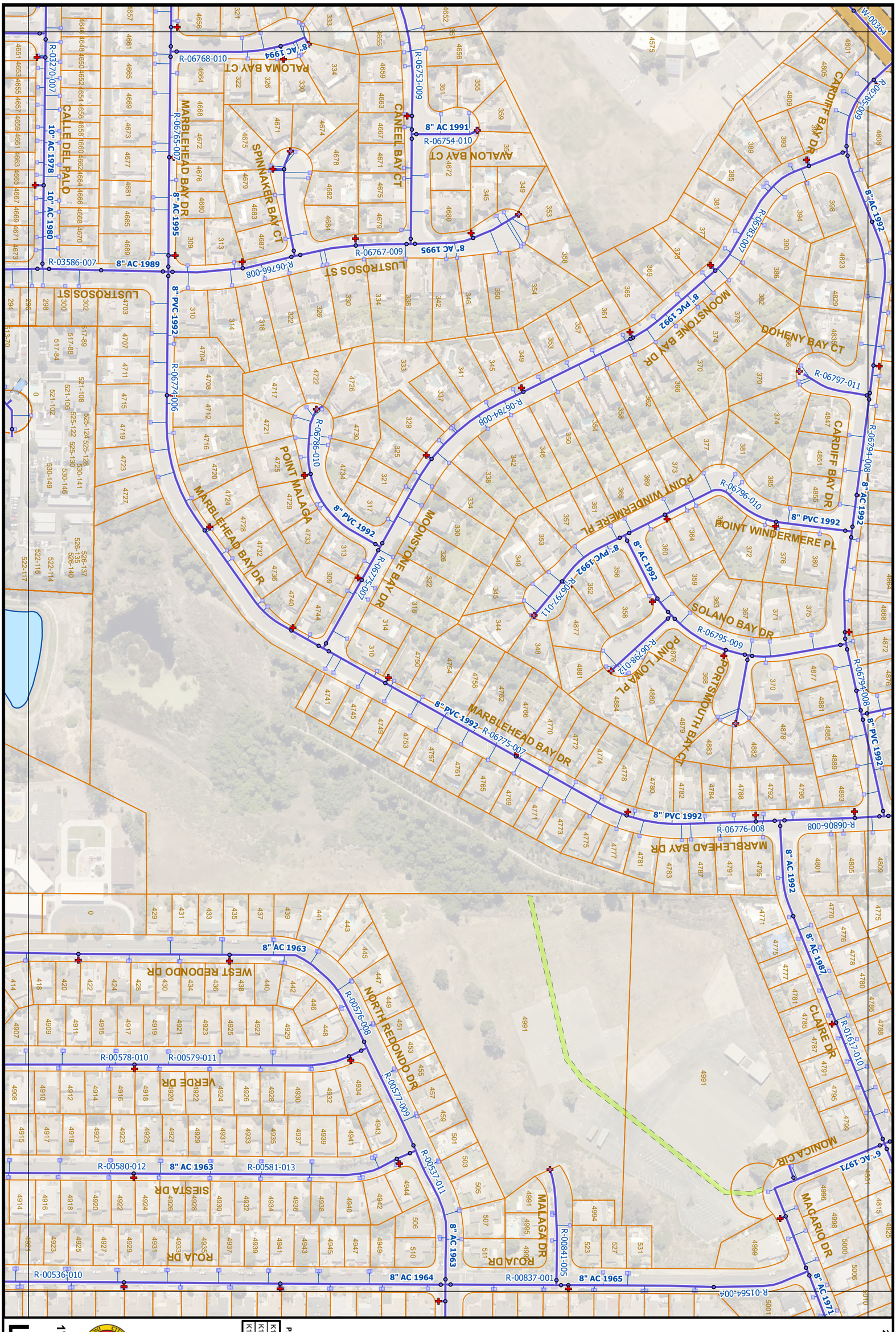
1. 500 feet in residential areas and high-point areas.

2. 1,000 feet on arteries and secondary feeders, supply lines and combination arteries and supply lines.

B. Valve locations: as required by the Water Utilities Director.

C. Butterfly Valves shall conform to the “Standard for Rubber Seated Butterfly Valves”, per AWWA C-504, as last revised and shall be tested and certified with the valve actuator installed on the valve.

D. Gate Valves sizes 3 inches through 12 inches shall conform to the “Standard for Resilient Wedge Gate Valves for Water and Sewerage Systems”, per AWWA C-509, and C-550 for Interior Epoxy coating, and C-110 for Ductile Iron 250 PSI, latest revision. Gate valves shall be as described in Section 2.12.



L12

1" = 200'

N

K11	L11	M11
K12	L12	M12
K13	L13	M13

PAGE INDEX

Water Atlas Map No. L12

- THIS MAP PREPARED SOLELY FOR ILLUSTRATION PURPOSE & IS NOT TO BE RELIED UPON FOR ENGINEERING DRAWINGS.
- SOME INFORMATION MAY NOT BE ACCURATE.

2/4/2022

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- THIS MAP PREPARED SOLELY FOR ILLUSTRATION PURPOSE & IS NOT TO BE RELIED UPON FOR ENGINEERING DRAWINGS.
- SOME INFORMATION MAY NOT BE ACCURATE.

Water Atlas Map No. M12

PAGE INDEX

L11	M11	N11
L12	M12	N12
L13	M13	N13

N

1" = 200'

M12

APPENDIX C

PRIVATE WATER REFERENCE

APPENDIX A

RECOMMENDED RULES FOR SIZING THE WATER SUPPLY SYSTEM

The provisions contained in this appendix are not mandatory unless specifically adopted by a state agency, or referenced in the adopting ordinance.

A 101.0 General.

A 101.1 Applicability. This appendix provides a general procedure for sizing a water supply system. Because of the variable conditions encountered, it is impractical to lay down definite detailed rules of procedure for determining the sizes of water supply pipes in an appendix, which shall necessarily be limited in length. For an adequate understanding of the problems involved, refer to Water-Distributing Systems for Buildings, Report BMS 79 of the National Bureau of Standards; and Plumbing Manual, Report BMS 66, also published by the National Bureau of Standards.

A 102.0 Preliminary Information.

A 102.1 Daily Service Pressure. Obtain the necessary information regarding the minimum daily service pressure in the area where the building is to be located.

A 102.2 Water Meter. Where the building supply is to be metered, obtain information regarding friction loss relative to the rate of flow of meters in the range of sizes likely to be used. Friction-loss data is capable of being obtained from most manufacturers of water meters. Friction losses for disk-type meters shall be permitted to be obtained from Chart A 102.2.

A 102.3 Local Information. Obtain available local information regarding the use of different kinds of pipe with respect both to durability and to decrease in capacity with the length of service in the particular water supply.

A 103.0 Demand Load.

A 103.1 Supply Demand. Estimate the supply demand for the building main, the principal branches and risers of the system by totaling the fixture units on each, Table A 103.1, and then by reading the corresponding ordinate from Chart A 103.1(1) or Chart A 103.1(2), whichever is applicable.

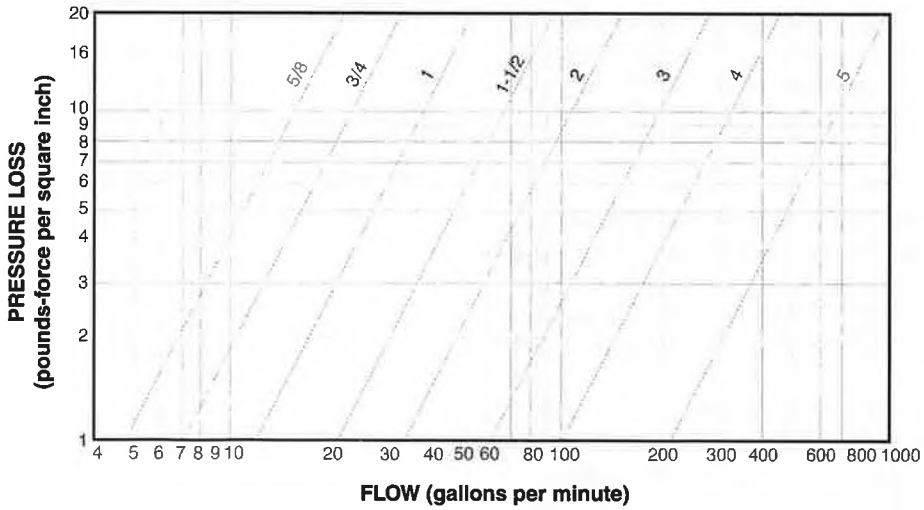
A 103.2 Continuous Supply Demand. Estimate continuous supply demands in gallons per minute (gpm) (L/s) for lawn sprinklers, air conditioners, etc., and add the sum to the total demand for fixtures. The result is the estimated supply demand of the building supply.

A 104.0 Permissible Friction Loss.

A 104.1 Residual Pressure. Decide what is the desirable minimum residual pressure that shall be maintained at the highest fixture in the supply system. Where the highest group of fixtures contains flushometer valves, the residual pressure for the group shall be not less than 15 pounds-force per square inch (psi) (103 kPa). For flush tank supplies, the available residual pressure shall be not less than 8 psi (55 kPa).

A 104.2 Elevation. Determine the elevation of the highest fixture or group of fixtures above the water (street) main. Multiply this difference in elevation by 0.43. The result is the loss of static pressure in psi (kPa).

CHART A 102.2
FRICTION LOSSES FOR DISK-TYPE WATER METERS



For SI units: 1 inch = 25 mm, 1 pound-force per square inch = 6.8947 kPa, 1 gallon per minute = 0.06 L/s

A 104.3 Available Pressure. Subtract the sum of loss in static pressure and the residual pressure to be maintained at the highest fixture from the average minimum daily service pressure. The result will be the pressure available for friction loss in the supply pipes, where no water meter is used. Where a meter is to be installed, the friction loss in the meter for the estimated maximum demand should also be subtracted from the service pressure to determine the pressure loss available for friction loss in the supply pipes.

A 104.4 Developed Length. Determine the developed length of pipe from the water (street) main to the highest fixture. Where close estimates are desired, compute with the aid of Table A 104.4(1), Table A 104.4(2), or Table A 104.4(3), whichever is applicable, the equivalent length of pipe for fittings in the line from the water (street) main to the highest fixture and add the sum to the developed length. The pressure available for friction loss in psi (kPa), divided by the developed lengths of pipe from the water (street) main to the highest fixture, times 100, will be the average permissible friction loss per 100 feet (30 480 mm) length of pipe.

A 105.0 Size of Building Supply.

A 105.1 Diameter. Knowing the permissible friction loss per 100 feet (30 480 mm) of pipe and the total demand, the diameter of the building supply pipe shall be permitted to be obtained from Chart A 105.1(1), Chart A 105.1(2), Chart A 105.1(3), Chart A 105.1(4) Chart A 105.1(5), Chart A 105.1(6), or Chart A 105.1(7), whichever is applicable. The diameter of pipe on or next above the coordinate point corresponding to the estimated total demand and the permissible friction loss will be the size needed up to the first branch from the building supply pipe.

A 105.2 Copper and Copper Alloy Piping. Where copper tubing or copper alloy pipe is to be used for the supply piping and where the character of the water is such that slight changes in the hydraulic characteristics are expected, Chart A 105.1(1) shall be permitted to be used.

A 105.3 Hard Water. Chart A 105.1(2) shall be used for ferrous pipe with the most favorable water supply in regards to corrosion and caking. Where the water is hard or corrosive, Chart A 105.1(3) or Chart A 105.1(4) will be applicable. For extremely hard water, it will be advisable to make additional allowances for the reduction of the capacity of hot-water lines in service.

A 106.0 Size of Principal Branches and Risers.

A 106.1 Size. The required size of branches and risers shall be permitted to be obtained in the same manner as the building supply, by obtaining the demand load on each branch or riser and using the permissible friction loss computed in Section A 104.0.

A 106.2 Branches. Where fixture branches to the building supply are sized for the same permissible friction loss per 100 feet (30 480 mm) of pipe as the branches and risers to the highest level in the building and lead to the inadequate water supply to the upper floor of a building, one of the following shall be provided:

(1) Selecting the sizes of pipe for the different branches so that the total friction loss in each lower branch is approximately equal to the total loss in the riser, including both friction loss and loss in static pressure.

(2) Throttling each such branch using a valve until the preceding balance is obtained.

(3) Increasing the size of the building supply and risers above the minimum required to meet the maximum permissible friction loss.

A 106.3 Water Closets. The size of branches and mains serving flushometer tanks shall be consistent with sizing procedures for flush tank water closets.

A 107.0 General.

A 107.1 Velocities. Velocities shall not exceed 10 feet per second (ft/s) (3 m/s), except as otherwise approved by the Authority Having Jurisdiction.

A 107.2 Pressure-Reducing Valves. Where a pressure-reducing valve is used in the building supply, the developed length of supply piping and the permissible friction loss shall be computed from the building side of the valve.

A 107.3 Fittings. The allowances in Table A 104.4(1) for fittings are based on non-recessed threaded fittings. For recessed threaded fittings and streamlined soldered fittings, one-half of the allowances given in the table will be ample.

TABLE A 103.1
WATER SUPPLY FIXTURE UNITS (WSFU) AND MINIMUM FIXTURE BRANCH PIPE SIZES[3]

APPLIANCES, APPURTENANCES, OR FIXTURES[2]	MINIMUM FIXTURE BRANCH PIPE SIZE[1,4] (inches)	PRIVATE	PUBLIC	ASSEMBLY[6]
Bathtub or Combination Bath/Shower (fill)	½	4.0	4.0	–
¾ inch Bathtub Fill Valve	¾	10.0	10.0	–
Bidet	½	1.0	–	–
Clothes Washer	½	4.0	4.0	–
Dental Unit, cuspidor	½	–	1.0	–
Dishwasher, domestic	½	1.5	1.5	–
Drinking Fountain or Water Cooler	½	0.5	0.5	0.75
Hose Bibb	½	2.5	2.5	–
Hose Bibb, each additional[7]	½	1.0	1.0	–
Lavatory	½	1.0	1.0	1.0
Lawn Sprinkler, each head[5]	–	1.0	1.0	–
Mobile Home, each (minimum)	–	12.0	–	–
Sinks	–	–	–	–
Bar	½	1.0	2.0	–
Clinical Faucet	½	–	3.0	–
Clinical Flushometer Valve with or without faucet	1	–	8.0	–
Kitchen, domestic	½	1.5	1.5	–
Laundry	½	1.5	1.5	–
Service or Mop Basin	½	1.5	3.0	–
Washup, each set of faucets	½	–	2.0	–
Shower per head	½	2.0	2.0	–
Urinal, 1.0 GPF Flushometer Valve	¾	3.0	4.0	5.0
Urinal, greater than 1.0 GPF Flushometer Valve	¾	4.0	5.0	6.0
Urinal, flush tank	½	2.0	2.0	3.0
Wash Fountain, circular spray	¾	–	4.0	–
Water Closet, 1.6 GPF Gravity Tank	½	2.5	2.5	3.5
Water Closet, 1.6 GPF Flushometer Tank	½	2.5	2.5	3.5
Water Closet, 1.6 GPF Flushometer Valve	1	5.0	5.0	8.0
Water Closet, greater than 1.6 GPF Gravity Tank	½	3.0	5.5	7.0
Water Closet, greater than 1.6 GPF Flushometer Valve	1	7.0	8.0	10.0

For SI units: 1 inch = 25 mm

Notes:

1 Size of the cold branch pipe, or both the hot and cold branch pipes.

2 Appliances, appurtenances, or fixtures not included in this table shall be permitted to be sized by reference to fixtures having a similar flow rate and frequency of use.

3 The listed fixture unit values represent their total load on the cold water building supply. The separate cold water and hot water fixture unit value for fixtures having both cold and hot water connections shall be permitted to be three-quarters of the listed total value of the fixture.

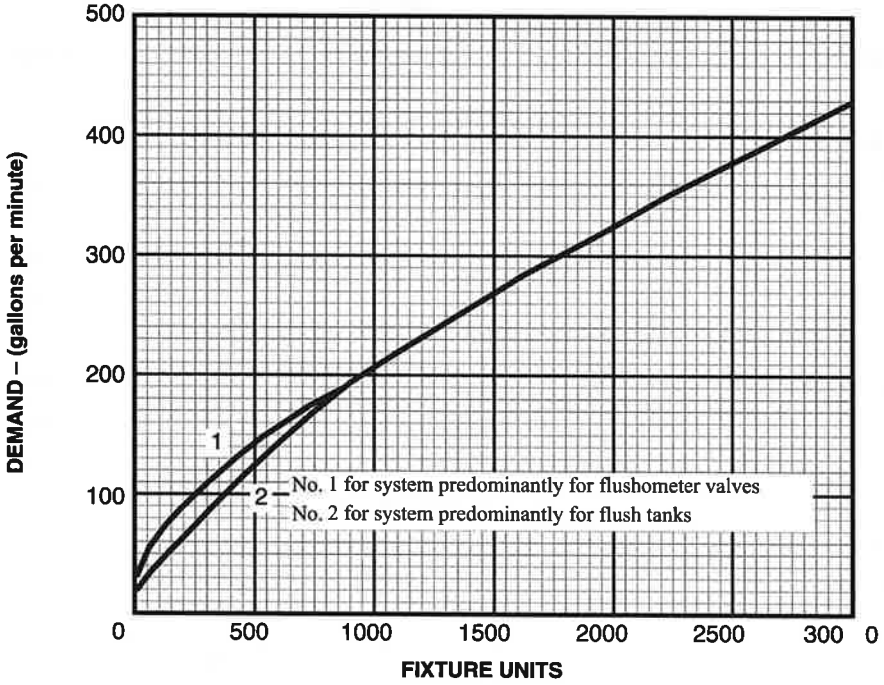
4 The listed minimum supply branch pipe sizes for individual fixtures are the nominal (I.D.) pipe size.

5 For fixtures or supply connections likely to impose continuous flow demands, determine the required flow in gallons per minute (gpm) (L/s) and add it separately to the demand in gpm (L/s) for the distribution system or portions thereof.

6 Assembly [Public Use (see Table 422.1)].

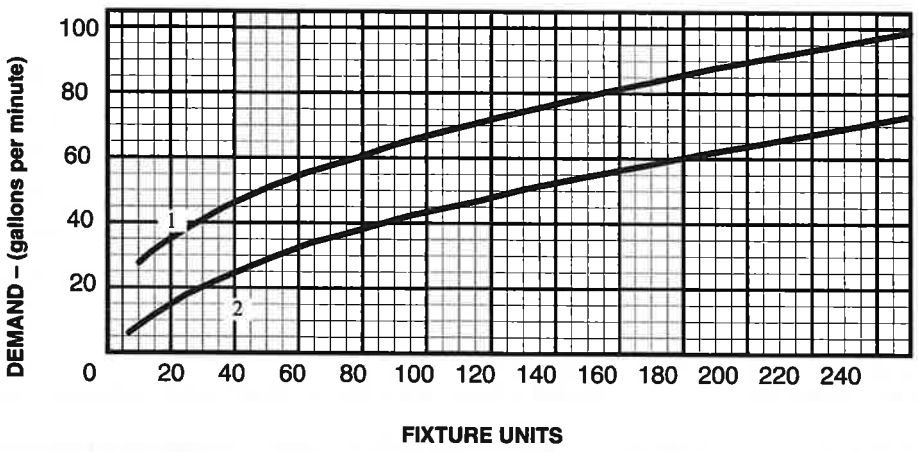
7 Reduced fixture unit loading for additional hose bibbs is to be used where sizing total building demand and for pipe sizing where more than one hose bibb is supplied by a segment of water distribution pipe. The fixture branch to each hose bibb shall be sized by 2.5 fixture units.

CHART A 103.1(1)
ESTIMATE CURVES FOR DEMAND LOAD



For SI units: 1 gallon per minute = 0.06 L/s

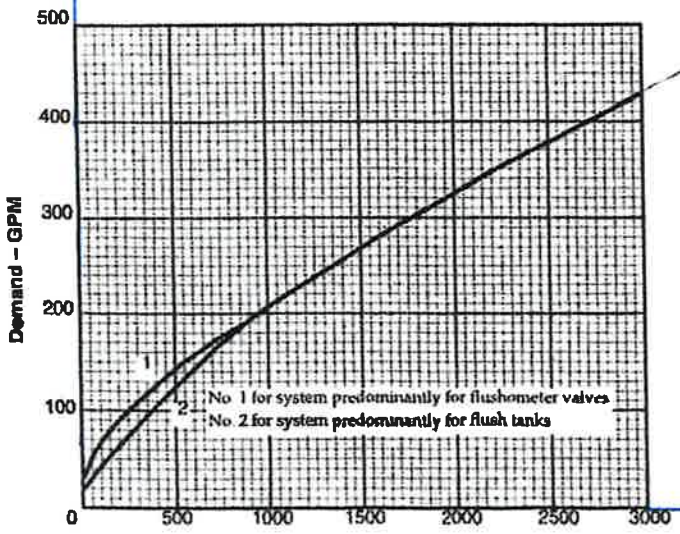
CHART A 103.1(2)
ENLARGED SCALE DEMAND LOAD



For SI units: 1 gallon per minute = 0.06 L/s

Chart A-2

Estimate Curves for Demand Load



1,100

1,000

900

800

4,000

5,000

10,000

CITY OF OCEANSIDE
WATER UTILITIES DEPARTMENT

WATER SYSTEM CAPACITY BUY-IN FEES Based on Meter Size

Use Type	Meter Size	Meter Only	Water System Capacity Buy-In Fees	SDCWA Capacity Charge	SDCWA Water Treatment Cap. Charge	AWWA Operating Capacity (gpm)	Max Fixture Units	Total
Single Family Residential	5/8"	$ 590	$ 5,680	$ 5,328	$ 149	20	30	$ 11,747
	3/4"	$ 618	$ 8,520	$ 5,328	$ 149	30	53	$ 14,615
	1"	$ 742	$ 14,200	$ 8,525	$ 238	50	130	$ 23,705
	1-1/2"	$ 2,214	$ 28,400	$ 15,984	$ 447	100	375	$ 47,045
	2"	$ 2,546	$ 45,440	$ 27,706	$ 775	160	700	$ 76,467
Multi-family & Non-residential	5/8"	$ 590	$ 5,680	$ 5,328	$ 149	20	30	$ 11,747
	3/4"	$ 618	$ 8,520	$ 5,328	$ 149	30	53	$ 14,615
	1"	$ 742	$ 14,200	$ 8,525	$ 238	50	130	$ 23,705
	1-1/2"	$ 2,214	$ 28,400	$ 15,984	$ 447	100	375	$ 47,045
	2"	$ 2,546	$ 45,440	$ 27,706	$ 775	160	700	$ 76,467
	3"	$ 2,639	$ 85,200	$ 51,149	$ 1,430	350	*	$ 140,418
	4"	$ 4,357	$ 142,000	$ 87,379	$ 2,443	600	*	$ 236,179
	6"	$ 7,283	$ 284,000	$ 159,840	$ 4,470	1350	*	$ 455,593
	8"	$ 11,725	$ 454,400	$ 277,056	$ 7,748	1600	*	$ 750,929

WASTEWATER SYSTEM BUY-IN FEES

Meter Size	Wastewater System Capacity Buy-In Fees
5/8"	$ 7,794
3/4"	$ 7,794
1"	$ 7,794
1-1/2"	$ 7,794
2"	$ 7,794
5/8"	$ 7,794
3/4"	$ 11,691
1"	$ 19,486
1-1/2"	$ 38,971
2"	$ 62,354
3"	$ 116,914
4"	$ 194,856
6"	$ 389,712
8"	$ 623,539

TOTAL BUY-IN FEES

Meter Size	Total
5/8"	$ 19,541
3/4"	$ 22,409
1"	$ 31,499
1-1/2"	$ 54,839
2"	$ 84,261
5/8"	$ 19,541
3/4"	$ 26,306
1"	$ 43,191
1-1/2"	$ 86,016
2"	$ 138,821
3"	$ 257,332
4"	$ 431,035
6"	$ 845,305
8"	$ 1,374,468

Operating Capacity: AWWA C700 Cold-Water Meters – Displacement Type, Table 1
Max fixture units per California Plumbing Code Apendix A, Table A 103.1
Max fixture units for meters over 2" shall be determined by the Water Utilities Department
Dedicated irrigation meter required for non-residential and multi-family projects with 3 or more dwelling units

CITY CODES & ORDINANCES FOR FEES

Water System Capacity Buy-In Fees:	Oceanside City Code, Chapter 37, Sec. 37.56.1, Ord. No. 15-OR0480-1
Wastewater System Capacity Buy-In Fees:	Oceanside City Code, Chapter 29, Sec. 29.11.1, Ord. No. 15-OR0479-1
Imposition, Calculation & Collection of Impact Fees	Oceanside City Code, Chapter 32, Sec. 32B.7, Ord. No. 02-OR331-1
SDCWA Capacity Charge:	San Diego County Water Authority effective January 1, 2022
New Water Meter Equipment & Install Fee:	Oceanside City Resolution No. 17-R0121-1

Rev 01/01/2022

Fees effective January 1, 2022

For Non-Health Hazard Applications

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

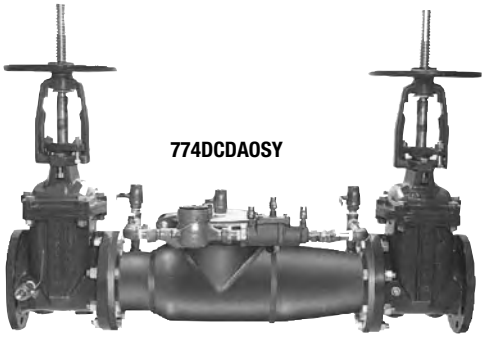
Approval _____ Representative _____

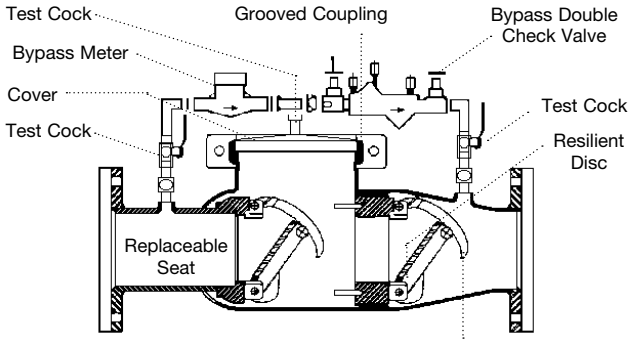
Series 774DCDA

Double Check Detector Assemblies

Sizes 2½" – 12" (65 – 300mm)

Series 774DCDA Double Check Detector Assemblies are designed for use in accordance with water utility non-health hazard containment requirements. It is mandatory to prevent the reverse flow of fire protection system substances, i.e., glycerin wetting agents, stagnant water and water of non-potable quality from being pumped or siphoned into the potable water supply.





Laser Cut Polished Cam Arm

Features

- Torsion spring check valve provides low head loss
- Short lay length is ideally suited for retrofit installations
- Stainless steel body is half the weight of competitive designs reducing installation and shipping cost
- Stainless steel construction provides long term corrosion protection and maximum strength
- Single top access cover with two-bolt grooved style coupling for ease of maintenance
- Thermoplastic and stainless steel check valves for trouble-free operation
- No special tools required for servicing
- Compact construction allows for smaller vaults and enclosures
- Furnished with ⅝" x ¾" (16x19mm) bronze meter (gpm or cfm)
- Detects underground leaks and unauthorized water use
- May be installed horizontal or vertical "flow up" position

Specifications

A Double Check Detector Assembly shall be installed on fire protection systems when connected to a potable water supply. Degree of hazard present is determined by the local authority having jurisdiction. The assembly shall consist of two positive seating check valves located between two resilient seated shutoffs with a hydraulically balanced bypass line and four test cocks. The main valve body shall be manufactured from 300 Series stainless steel to provide corrosion resistance. The check valves shall be of thermoplastic construction with stainless steel hinge pins, cam arm and cam bearing. The check valves shall utilize a single torsion spring design to minimize pressure drop through the assembly. The check valves shall be modular and shall seal to the main valve body by the use of an O-ring. There shall be no brass or bronze parts used within the check valve assembly. The check valve seats shall be of molded thermoplastic construction. The use of seat screws as a retention method is prohibited. All internal parts shall be accessible through a single cover on the valve assembly. The valve cover shall be held in place through the use of a single grooved style two-bolt coupling. The bypass line shall be hydraulically sized to accurately measure low flow. The bypass line shall consist of a meter, a small diameter double check assembly with test cocks and isolation valves. The bypass line double check valve shall have two independently operating modular poppet check valves, and top mounted test cocks. The assembly shall be a Watts Series 774DCDA.

Available Models

Suffix:

LF –	without shutoff valves
OSY –	UL/FM outside stem and yoke resilient seated gate valves
*OSY FxG –	flanged inlet gate connection and grooved outlet gate connection
*OSY GxF –	grooved inlet gate connection and flanged outlet gate connection
*OSY GxG –	grooved inlet gate connection and grooved outlet gate connection
CFM –	cubic feet per minute meter
GPM –	gallons per minute meter

Available with grooved NRS gate valves - consult factory*
Post indicator plate and operating nut available - consult factory*
*Consult factory for dimensions

Now Available
WattsBox Insulated Enclosures.
For more information, send for literature ES-WB.

NOTICE

Inquire with governing authorities for local installation requirements

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

WATTS®

Materials

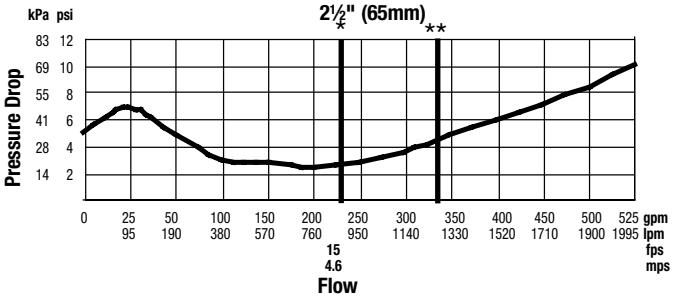
All internal metal parts: 300 Series stainless steel, Main valve body: 300 Series stainless steel, Check assembly: Noryl® Flange dimensions in accordance with AWWA Class D.

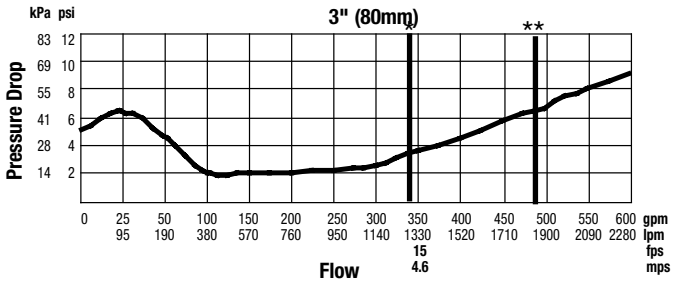
Pressure - Temperature

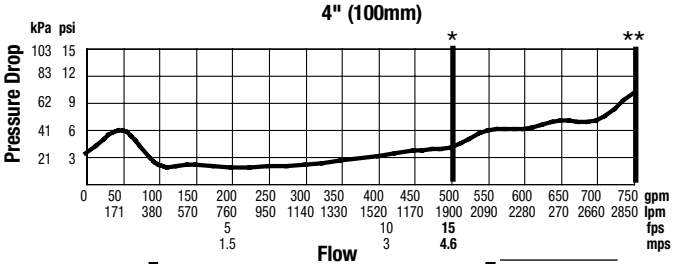
Temperature Range: 33°F – 110°F (0.5°C – 43°C) continuous
Pressure Range: 175psi (12.1 bar)

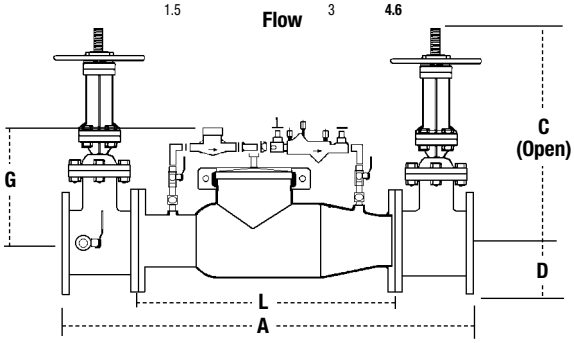
Capacity

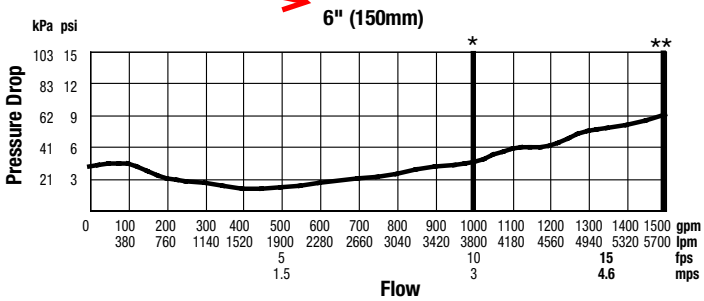
Flow curves as tested by Underwriters Laboratory per UL 1469, 1996 * Rated flow **UL Tested

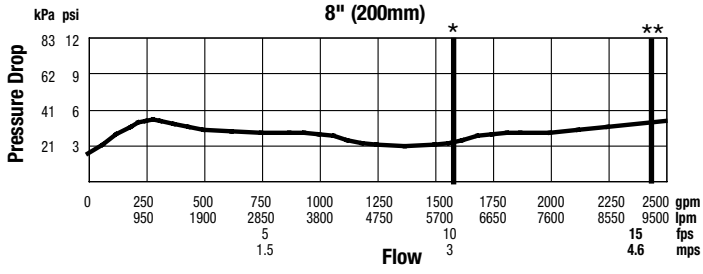


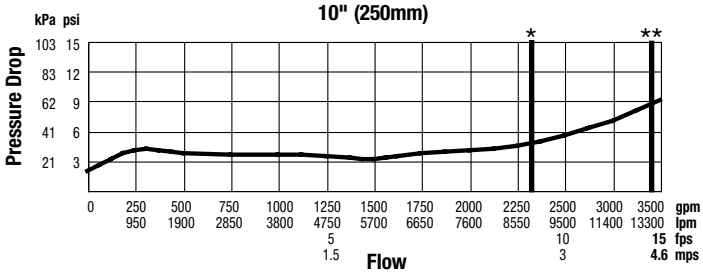


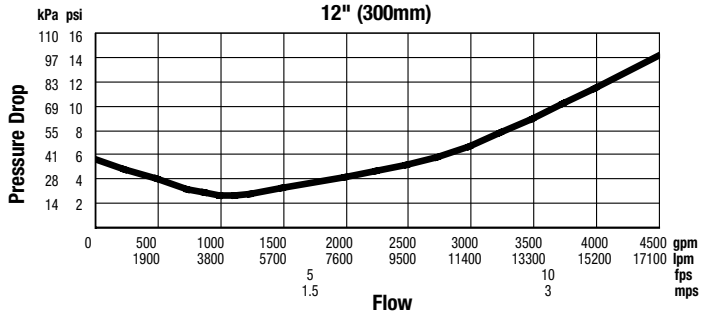












Standards

AWWA C510, CSA B64.5

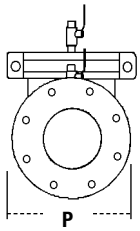
Approvals

(2½" - 10" only)
(65 - 250mm)

ASSE 1048

CLASSIFIED c UL us (OSY only)

FM Approved



SIZE (DN)		DIMENSIONS												WEIGHT			
		A		C (OSY)		D		G		L		P		w/Gates		w/o Gates	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.	lbs.	kgs.
2½	65	37	940	16⅜	416	3½	89	10	250	22	559	12½	318	155	70	68	31
3	80	38	965	18⅞	479	3¾	95	10	250	22	559	13	330	230	104	70	32
4	100	40	1016	22¾	578	4½	114	10	250	22	559	14½	368	240	109	73	33
6	150	48½	1232	30⅛	765	5½	140	15	381	27½	699	15½	394	390	177	120	54
8	200	52½	1334	37¾	959	6¾	171	15	381	29½	749	18¼	464	572	259	180	82
10	250	55½	1410	45¾	1162	8	200	15	381	29½	749	19½	495	774	351	190	86
12	300	57½	1461	53⅛	1349	9½	241	15	381	29½	749	21	533	1044	474	220	100

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WATTS®

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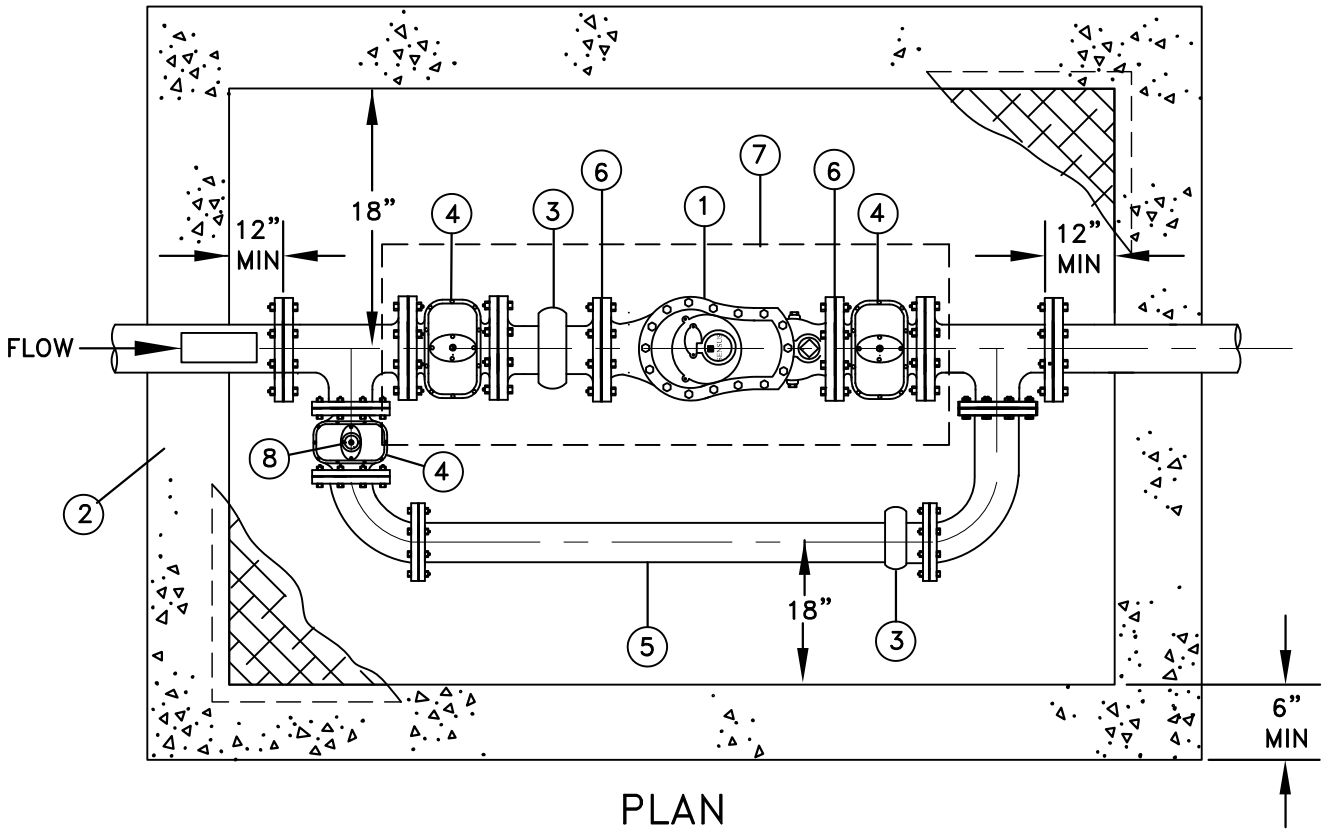


PLAN

BILL OF MATERIALS:

1. MASTER METER SRH COMPOUND METER WITH BUILT IN TEST OUTLET (APPROXIMATELY 20" LONG).
2. VAULT FRAME AND COVER PER STANDARD DWG W-19 AND W-20
3. VICTAULIC COUPLING.
4. RESILIENT WEDGE GATE VALVE, FLANGE X FLANGE WITH 2" OPERATING NUT (CLOSED VALVE).
5. MAINLINE BY-PASS (MAIN LINE SIZE).
6. SUPPORT METER WITH VALVE SUPPORTS PER STANDARD DWG W-18.
7. BILCO 2 PIECE OR USF 2 PIECE ALUMINUM DIAMOND PLATE HATCH. THE HATCH MUST COVER THE LIMITS OF EITHER SIDE OF THE RWGV ON THE MAIN LINE. RATING OF THE HATCH WILL BE MADE ON A CASE-BY-CASE BASIS, APPROVED BY THE WATER UTILITIES DEPARTMENT.
8. PIPELINE PRODUCTS GVL-200 LOCKING GATE VALVE CAP.

NOTES:

1. VAULT DEPTH NOT TO EXCEED 5'-0" FROM TOP OF VAULT TO FLOOR.
2. SERVICES 6" AND LARGER REQUIRE SPECIAL DESIGN.

Revision	By	Approved	Date
10/16/02	DW		
06/04/07	AC		
09/22/10	DW		
12/01/11	DW		
01/04/116	MU		
07/01/17	SM		08/01/17

CITY OF OCEANSIDE

Steven E Strapac 9/17/17

CITY ENGINEER Date

3" & 4" WATER METER FOR COMMERCIAL/INDUSTRIAL/ MULTI-FAMILY SERVICE

STANDARD DRAWING NO. W-10

Sensus SRH Compound Meters

3" SRH Compound Meter

Specifications:

Normal Operating Flow Range

- 2" Size: 2 to 160 gpm
- 3" Size: 4 to 320 gpm
- 4" Size: 6 to 500 gpm
- 6" Size: 10 to 1000 gpm
- *8" Manifold Size: 16 to 1600 gpm

Accuracy (Except at crossover)

- 100% ± 1.5% of actual thruput

Accuracy at Crossover

- 95% minimum

Low Flow Accuracy (95% minimum)

- 2" Size: ¼ gpm
- 3" Size: ½ gpm
- 4" Size: ¾ gpm
- 6" Size: 1½ gpm
- *8" Manifold Size: 2 gpm

Operating Pressure

- 150 psi maximum

* 8" manifold assembly consists of two (2) 4" compound meters, four (4) gate valves, two (2) flanged coupling adapters and two (2) reducing manifolds.

The SRH (Single Register High Performance) Magnetic Drive Compound Meters are intended for use in commercial, industrial and institutional cold water services in which accurate measurement of a wide range of low to high flows is required. Typical applications are for apartment dwellings, office buildings, hotels, schools, hospitals and smaller industrial facilities.

The SRH Compound Meter is essentially two meters within a single, cast bronze housing. All water enters and passes through the turbine chamber. At low flow rates, the water is diverted up through the positive displacement (bypass) measuring chamber. After passing through this chamber, the water passes over the valve and out of the meter. As the flow rate increases, the pressure against the swing action valve increases, forcing the valve to quickly swing to a full open position. The water then flows straight through the turbine chamber and out of the meter.

Conformance to Standards

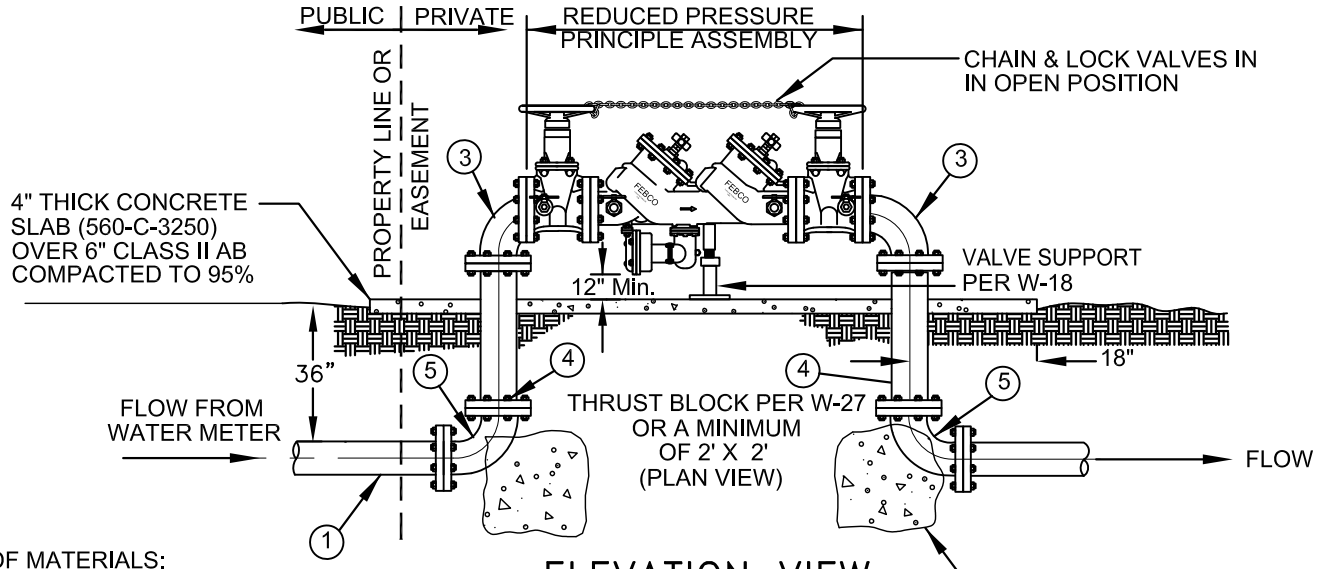
These SRH Compound Meters meet or exceed all requirement of ANSI/AWWA Standard C-702 latest edition.

METER SIZE	PRODUCT NUMBERS REGISTRATION	
	100 CUBIC FEET	1,000 GALLONS
2"	50325	50330
3"	50350	50354
4"	50405	50410
6"	50449	50447
8"	NS	NS

NOTES:

- Compound Meters are normally a non-stock item. Please call your local Team EJP sales office for more information.
- Compound Meters include bronze companion flanges.
- All compound meters are available with TouchRead® System registers.
- Ask about Sensus Pre-Fab-Pak Compound Meter, prefabricated assemblies which include meters, valves, couplings, fittings and fabricated pipe; everything for a complete installation.

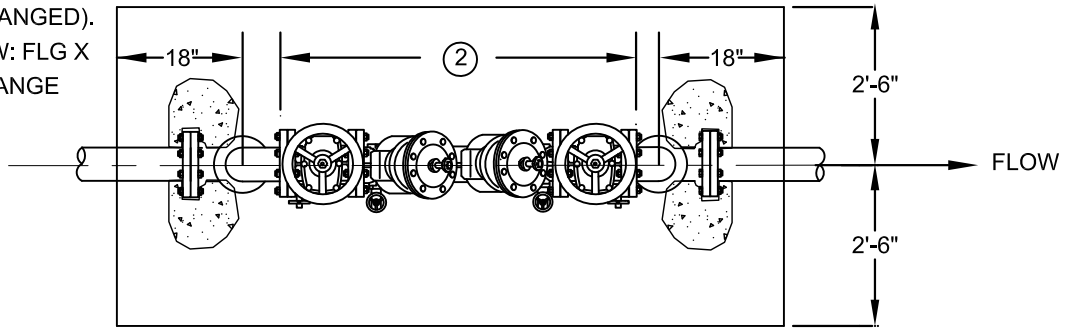
Please see pages H-13—H-16 for information about a new large meter line that will replace the current large meters.



ELEVATION VIEW

BILL OF MATERIALS:

1. PRIVATE WATER MAIN.
2. FACTORY ASSEMBLED.
3. 90° FLANGED DUCTILE IRON ELBOW.
4. FLANGED DUCTILE IRON SPOOL. (BOTH ENDS SHALL BE FLANGED).
5. 90°, DUCTILE IRON ELBOW: FLG X FLG OR FLG X P.O.UNI-FLANGE SHALL NOT BE USED.



PLAN VIEW

NOTES:

1. ASSEMBLY TO BE APPROVED BY THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD OFFICE OF DRINKING WATER AND CITY OF OCEANSIDE WATER UTILITIES DEPARTMENT.
2. ASSEMBLY SHALL BE ON STATE OF CALIFORNIA LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES FOUND ON UNIVERSITY OF SOUTHERN CALIFORNIA'S FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH.
3. ASSEMBLY SHALL BE INSTALLED DOWNSTREAM OF THE METER WITHIN 18".
4. NO CONNECTIONS BETWEEN THE METER AND THE ASSEMBLY ARE PERMITTED.
5. NUTS, BOLTS, AND WASHERS SHALL BE TYPE 316 STAINLESS STEEL.
6. WHEN THE DISTANCE BETWEEN THE METER BOX AND THE RISER TO THE ASSEMBLY EXCEEDS 18", PROVIDE PVC SLEEVE 2 TIMES THE DIAMETER OF THE WORKING PIPE OR INSTALL A CASING ENCASED IN CONCRETE. INSPECTION IS REQUIRED PRIOR TO BACKFILL.

THIS ASSEMBLY SHALL BE INSPECTED BY THE WATER UTILITIES DEPARTMENT. AFTER WATER UTILITIES DEPARTMENT'S APPROVAL, ASSEMBLY SHALL BE TESTED BY A TESTER ON THE CITY'S APPROVED TESTER LIST. THE DEVELOPER/OWNER IS RESPONSIBLE FOR THE COST OF TESTING THE ASSEMBLY. THEREAFTER, THE ASSEMBLY SHALL BE TESTED ANNUALLY AT THE OWNER'S EXPENSE. THE TEST REPORT IS TO BE SUBMITTED TO THE CITY WATER UTILITIES DEPARTMENT, CROSS CONNECTION CONTROL AT PHONE NUMBER 760-435-5800

Revision	By	Approved	Date
06/08/01	DW		
09/17/02	DW		
07/08/04	AC		
06/04/07	AC		
01/04/16	MU		
07/01/17	SM		08/01/17

CITY OF OCEANSIDE

Steven E Strapac 9/17/17

CITY ENGINEER Date

REDUCED PRESSURE PRINCIPLE ASSEMBLY (3" & LARGER)

STANDARD DRAWING NO. W-13

SPECIFICATION SHEET

FEBCO®

MASTER series®

LEAD FREE*

MasterSeries® LF860

Reduced Pressure Zone Backflow Prevention Assemblies

Size: 2½" - 10" (65mm - 250mm)

The FEBCO MasterSeries LF860 Reduced Pressure Zone Assembly is specifically designed to protect against possible backpressure and backsiphonage conditions for high hazard [i.e., toxic] application in accordance with Local Governing Water Utility Code. This Backflow Prevention Assembly is primarily used on potable drinking water systems where Local Governing Code mandates protection from non-potable water being pumped or siphoned back into the potable water system.

The LF860 features Lead Free* construction to comply with low lead installation requirements. The Lead Free* Reduced Pressure Zone Assemblies shall comply with state codes and standards, where applicable, requiring reduced lead content.

Series LF860 Reduced Pressure Zone Assembly

Features

- Inline Serviceable Assembly
- No Special Tools Required for Servicing
- Captured Modular Spring Assembly
- Reversible & Replaceable Discs
- Field Replaceable Seats
- Ductile Iron Valve Body Design
- Stainless Steel Check Components
- Modular Pressure Differential Relief Valve
- Repairable Pressure Differential Relief Valve
- Clapper Check Assembly
- Captured O-ring Design

Specifications

The FEBCO MasterSeries LF860 Reduced Pressure Zone Assembly shall be installed on the potable water supply and at each point of cross-connection to protect against possible backpressure and backsiphonage conditions for high hazard [i.e., toxic] applications. The assembly shall consist of a main line valve body composed of a pressure differential relief valve located in a zone between two (2) independently acting approved clapper style check modules with replaceable seats and disc rubbers. Servicing of the pressure differential relief valve and both check modules does not require any special tools; both check modules are accessed through independently top entry covers. This assembly shall be fitted with AWWA Compliant inlet/outlet resilient seated shutoff valves; when used on a Fire-Sprinkler application, the assembly shall be fitted with approved UL/FM inlet/outlet resilient seated shutoff valves and contain four (4) properly located resilient seated test cocks as specified by AWWA Standard C511. Flow and pressure loss performance parameters shall meet the requirements of AWWA Standard C511.

NOTICE

This information is not intended to replace the product installation and safety information available or the experience of a trained product installer. Please refer to the product installation and safety instructions for further information.

***The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.**

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

FEBCO product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact FEBCO. FEBCO reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on FEBCO products previously or subsequently sold.

Options - Suffix

OSY: UL/FM Approved OS&Y Gate Valves (ANSI/AWWA C515 Compliant)

NRS: Non-Rising Stem Gate Valves (ANSI/AWWA C509 Compliant)

LG: Less Shut-off valves; This is NOT an APPROVED ASSEMBLY

Example Ordering Descriptions:

4" LF860-OSY - Valve Assembly fitted with OS&Y Shutoff Valves

4" LF860-NRS - Valve Assembly fitted with NRS Shutoff Valves

Assembly Flow Orientation:

- Horizontal (2½" – 10") - Approved by FCCCHR-USC, ASSE, cULus, FM, IAPMO and CSA

Approvals - Standards

- Approved by the Foundation for Cross-Connection Control and Hydraulic Research at The University of Southern California (FCCCHR-USC)
- ASSE 1013 Listed
- **UL Classified (US & Canada)
- **FM Approved
- IAPMO
- AWWA Standard C511 Compliant
- End Connections: Compliant to ASME B16.1 Class 125 & AWWA Class D Flange

**Assembly configured with UL/FM Approved OS&Y RW Gate Valves. Less gate valve assemblies are not UL/FM approved configurations.

1048 B64.4

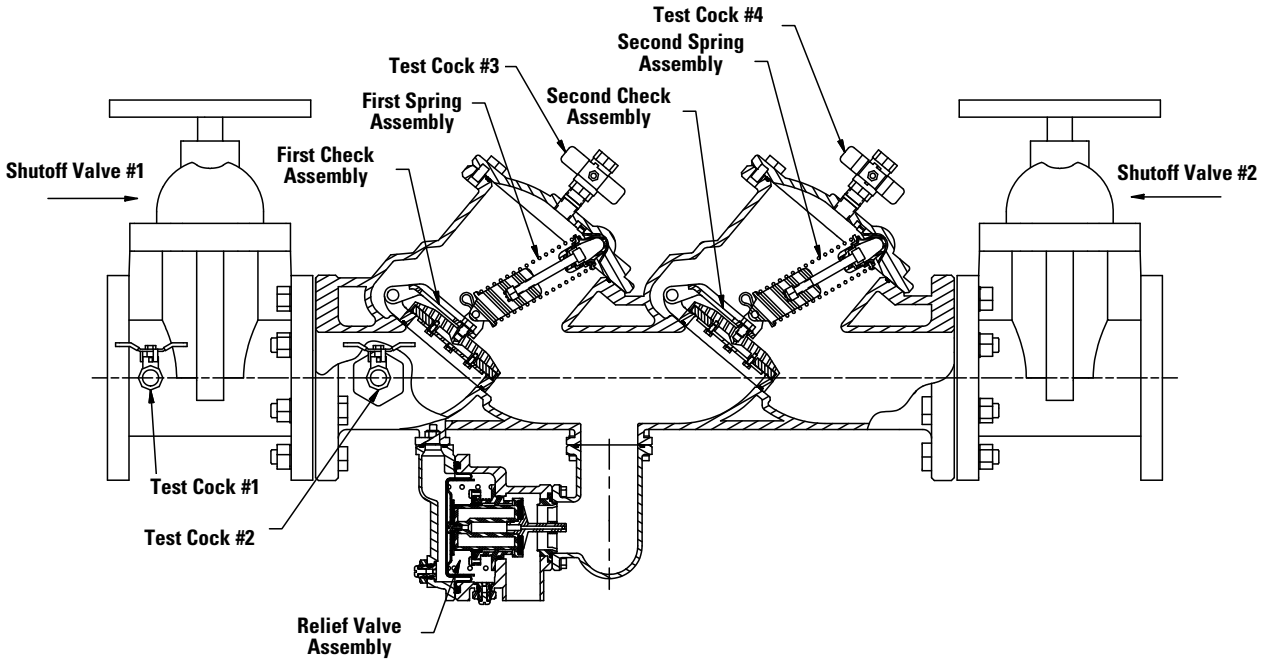
Materials

Below is a general materials list of the Series LF860. All assemblies size 2-1/2" through 10" is similar in materials and construction. Please contact your local FEBCO Representative if you require further information.

Main Valve Body:	Ductile iron Grade 65-45-12
Relief Valve Body:	Ductile iron Grade 65-45-12
Coating:	Fusion epoxy coated internal and external AWWA C550
Shutoff Valves:	NRS resilient wedge gate valve AWWA C509 (Standard) OSY resilient wedge gate valve AWWA C515 (UL/FM)
Check Seats:	Stainless Steel
Disc Holder:	Stainless Steel
Elastomer Disc:	Silicone
Spring:	Stainless Steel
Clamp:	AWWA C606 (10" Only)

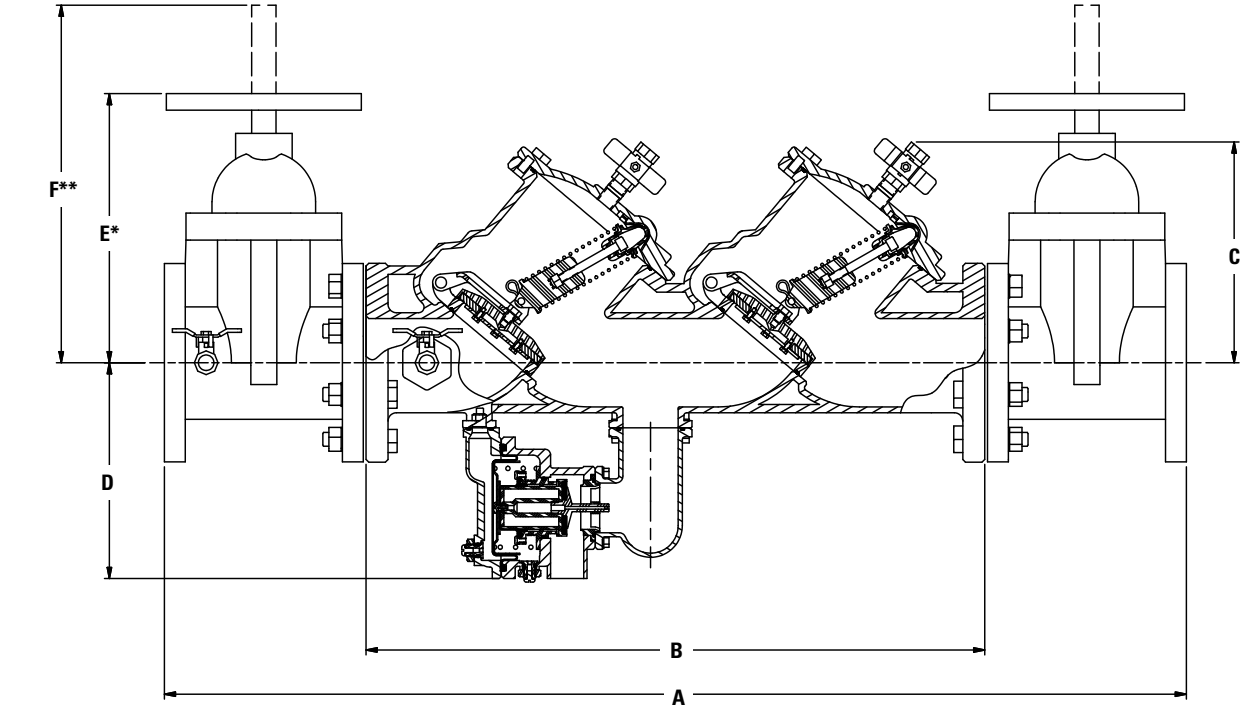
Pressure - Temperature

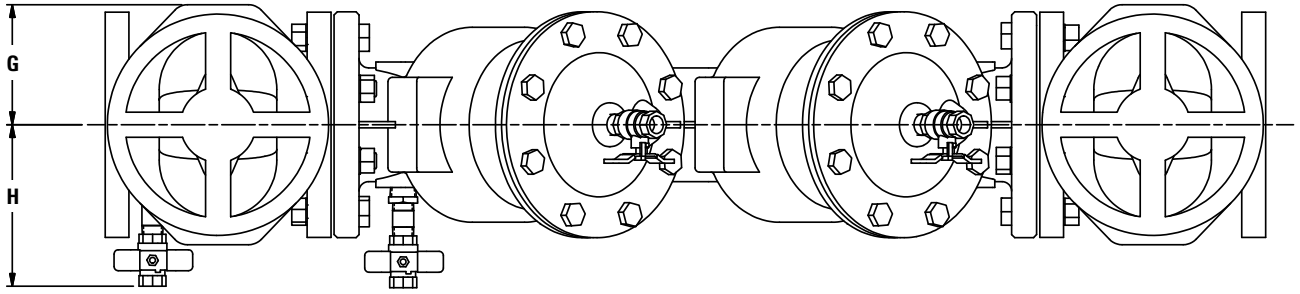
Max. Working Pressure:	175 psi (12.1 bar)
Min. Working Pressure:	20 psi (1.4 bar)
Hydrostatic Test Pressure:	350 psi (24.1 bar)
Hydrostatic Safety Pressure:	700 psi (48.3 bar)
Temperature Range:	33°F - 140°F (0.5°C - 60°C) Continuous



Dimensions & Weights

Below are the nominal dimensions and physical weights for the Series LF860 size 2-1/2" through 10". Allowances must be made for normal manufacturing tolerances. Please visit our website to download a copy of this product's installation instructions, or contact your local FEBCO Representative for more information.





LF860

SIZE (DN)		DIMENSIONS																WEIGHT***			
		A		B		C		D		E*		F**		G		H		NRS		OSY	
in.	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kg.*	*lbs.*	*kg.*
2½	65	40¾	1035	25½	648	10	254	10	254	12⅝	321	16⅜	416	4½	114	7⅛	181	250	113	254	115
3	80	41⅞	1064	25⅝	651	10	254	10	254	12⅞	327	22¼	565	4½	114	7⅜	187	276	125	280	127
4	100	46¼	1175	28	711	10⅛	257	10⅛	257	14⅜	365	23¼	591	5½	140	8⅛	206	335	152	347	157
6	150	56	1422	34¾	883	12¾	324	11⅛	283	18⅞	479	30⅛	765	6½	165	9⅞	251	503	228	523	237
8	200	65	1651	41¾	1061	15⅝	397	12¼	311	23½	597	37¾	959	7	178	11⅛	283	807	366	835	379
10	250	72⅝	1845	46⅜	1178	15⅝	397	12⅜	314	27½	699	48	1219	9	229	12⅜	314	1205	547	1243	564

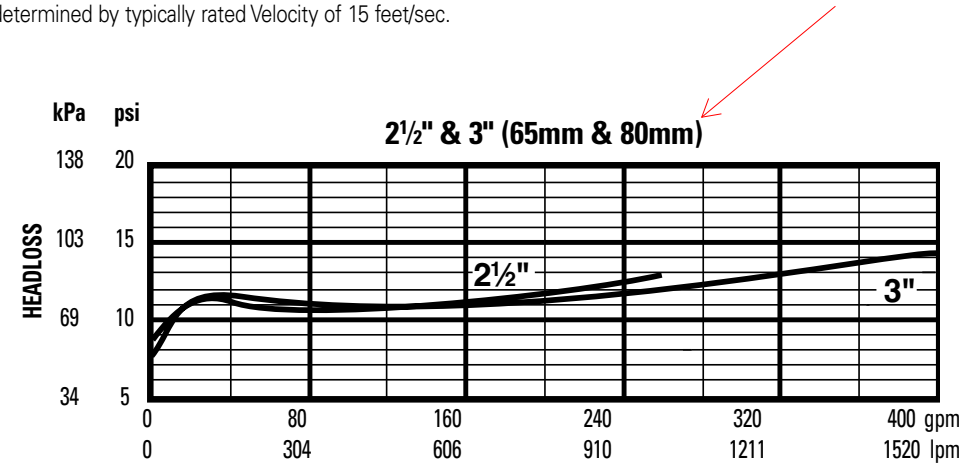
* Indicates nominal dimensions with NRS Gate Valves
** Indicates nominal dimensions with OSY Gate Valves (Full Open Position)
*** Indicates weight of complete Backflow Assemblies with specified Gate Valves

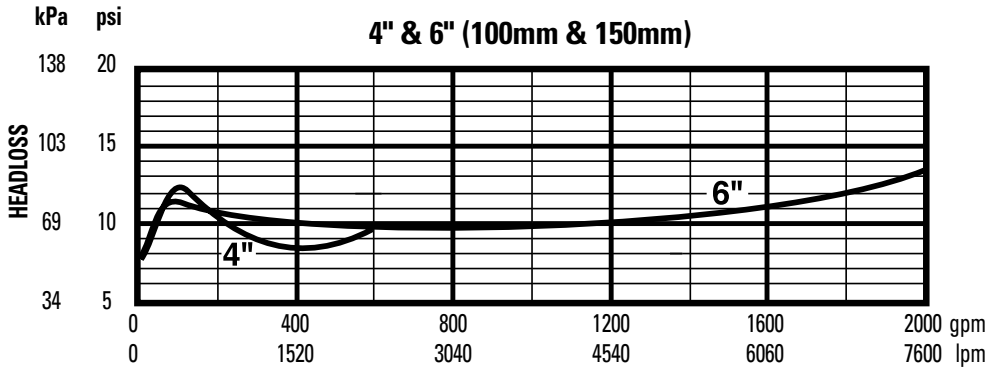
The gap drain is not designed to catch the maximum discharge possible from the relief valve. The installation of the FEBCO air gap with the drain line terminating above a floor drain will handle any normal discharge or nuisance spitting through the relief valve. However, floor drain size may need to be designed to prevent water damage caused by a catastrophic failure condition. Do not reduce the size of the drain line from the air gap fitting.

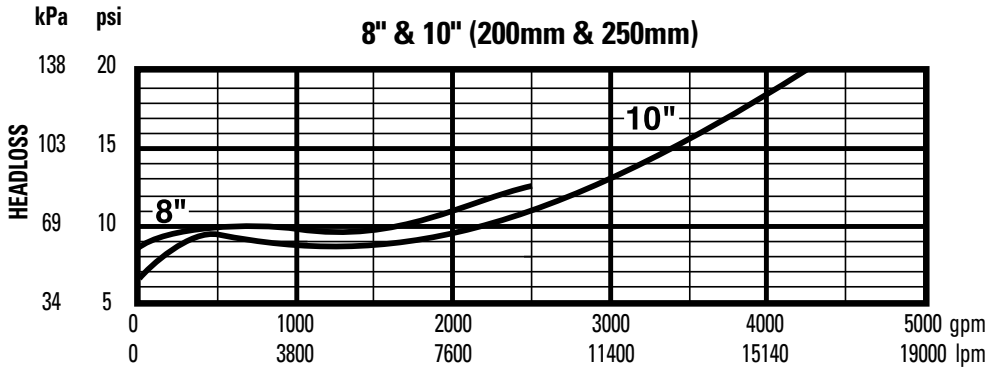
Performance

Flow capacity chart identifies valve performance based upon rated water Velocity up to 20fps

- Maximum service flow rate is determined by maximum rated Velocity of 7.5fps.
- AWWA Manual M-22 (Appendix C) recommends that the maximum water Velocity in the services be not more than 10fps.
- UL flow rate is determined by typically rated Velocity of 15 feet/sec.







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APPENDIX D

FIRE CODE REFERENCE

APPENDIX B

FIRE-FLOW REQUIREMENTS FOR BUILDINGS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance or legislation of the jurisdiction.

User note:

About this appendix: *Appendix B provides a tool for the use of jurisdictions in establishing a policy for determining fire-flow requirements in accordance with Section 507.3. The determination of required fire flow is not an exact science, but having some level of information provides a consistent way of choosing the appropriate fire flow for buildings throughout a jurisdiction. The primary tool used in this appendix is a table that presents fire flow based on construction type and building area based on the correlation of the Insurance Services Office (ISO) method and the construction types used in the* International Building Code®.

SECTION B101
GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases. The fire code official is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases. The fire code official is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall be not more than twice that required for the building under consideration.

B103.3 Areas without water supply systems. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142.

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

B104.2 Area separation. Portions of buildings that are separated by fire walls without openings, constructed in accordance with the *California Building Code,* are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings, Group R-3 and R-4 buildings and townhouses. The minimum fire-flow and flow duration requirements for one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses shall be as specified in Tables B105.1(1) and B105.1(2).

TABLE B105.1(1)
REQUIRED FIRE FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
0–3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required fire-flow rate
0–3,600	Section 903.3.1.3 of the *California Fire Code* or Section *313.3* of the *California Residential Code*	500	$^1/_2$
3,601 and greater	Section 903.3.1.3 of the *California Fire Code* or Section *313.3* of the *California Residential Code*	$^1/_2$ value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m.

TABLE B105.1(2)
REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *California Building Code*.

b. Measured at 20 psi residual pressure.

TABLE B105.2
REQUIRED FIRE FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)
Section 903.3.1.1 of the *California Fire Code*	25% of the value in Table B105.1(2)[a]	Duration in Table B105.1(2) at the reduced flow rate
Section 903.3.1.2 of the *California Fire Code*	25% of the value in Table B105.1(2)[b]	Duration in Table B105.1(2) at the reduced flow rate

For SI: 1 gallon per minute = 3.785 L/m.

a. The reduced fire flow shall be not less than 1,000 gallons per minute.

b. The reduced fire flow shall be not less than 1,500 gallons per minute.

B105.2 Buildings other than one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses. The minimum fire-flow and flow duration for buildings other than one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses shall be as specified in Tables B105.2 and B105.1(2).

Exception: *[SFM] Group B, S-2 and U occupancies having a floor area not exceeding 1,000 square feet, primarily constructed of noncombustible exterior walls with wood or steel roof framing, having a Class A roof assembly, with uses limited to the following or similar uses:*

1. *California State Parks buildings of an accessory nature (restrooms).*
2. *Safety roadside rest areas, (SRRA), public restrooms.*
3. *Truck inspection facilities, (TIF), CHP office space and vehicle inspection bays.*
4. *Sand/salt storage buildings, storage of sand and salt.*

B105.3 Water supply for buildings equipped with an automatic sprinkler system. For buildings equipped with an approved automatic sprinkler system, the water supply shall be capable of providing the greater of:

1. The automatic sprinkler system demand, including hose stream allowance.
2. The required fire flow.

SECTION B106
REFERENCED STANDARDS

ICC	IBC—18	International Building Code	B104.2
ICC	IWUIC—18	International Wildland-Urban Interface Code	B103.3
ICC	IRC—18	International Residential Code	Table B105.1(1)
NFPA	1142—17	Standard on Water Supplies for Suburban and Rural Fire Fighting	B103.3

TABLE B105.1(1) REQUIRED FIRE FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
0–3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required fire-flow rate
0–3,600	Section 903.3.1.3 of the *California Fire Code* or Section 313.3 of the *California Residential Code*	500	$^1/_2$
3,601 and greater	Section 903.3.1.3 of the *California Fire Code* or Section 313.3 of the *California Residential Code*	$^1/_2$ value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m.

TABLE B105.1(2) REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0–22,700	0–12,700	0–8,200	0–5,900	0–3,600	1,500	2
22,701–30,200	12,701–17,000	8,201–10,900	5,901–7,900	3,601–4,800	1,750	
30,201–38,700	17,001–21,800	10,901–12,900	7,901–9,800	4,801–6,200	2,000	
38,701–48,300	21,801–24,200	12,901–17,400	9,801–12,600	6,201–7,700	2,250	
48,301–59,000	24,201–33,200	17,401–21,300	12,601–15,400	7,701–9,400	2,500	
59,001–70,900	33,201–39,700	21,301–25,500	15,401–18,400	9,401–11,300	2,750	
70,901–83,700	39,701–47,100	25,501–30,100	18,401–21,800	11,301–13,400	3,000	3
83,701–97,700	47,101–54,900	30,101–35,200	21,801–25,900	13,401–15,600	3,250	

APPENDIX E

HYDRAULIC COMPUTER MODEL OUTPUT
PRIVATE DOMESTIC SYSTEM

Reference Exhibit A for Node and Pipe Diagram

The following conditions were modeled for the Pacifica Project:

0. Average Day Demand

1. Peak Hour Demand

2. Peak Demand - WFU Based

```
* * * * * * * * * * * * *  K Y P I P E  * * * * * * * * * * * * *
*                                                                 *
*  Pipe Network Modeling Software                                 *
*                                                                 *
*  CopyRighted by KYPIPE LLC (www.kypipe.com)                     *
*  Version: 10.009  10/01/2019                                    *
*  Company:  Dexter        Serial #:  592169                      *
*  Interface:  Classic                                            *
*  Licensed for Pipe2018                                          *
*                                                                 *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

Date & Time: Mon Mar 20 14:08:28 2023

Master File : \\artic\eng\1043002\pacifica mar 2023 ky pipe domestic.KYP\pacifica mar 2023 ky pipe domestic.P2K

SUMMARY OF ORIGINAL DATA

U N I T S S P E C I F I E D

FLOWRATE ..... = gallons/minute
HEAD (HGL) ..... = feet
PRESSURE ..... = psig

P I P E L I N E D A T A

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NAMES #1	#2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.
P-1	J-2	Source	450.00	18.00	120.0000	0.00
P-2	J-3	J-13	600.00	8.00	120.0000	0.00
P-3	J-3	J-18	200.00	8.00	120.0000	0.00
P-4	O-M & RP 1	J-12	200.00	6.00	120.0000	1.67
P-5	J-12	J-15	75.00	6.00	120.0000	0.00
P-6	J-15	J-6	380.00	4.00	120.0000	0.00
P-7	J-6	J-9	160.00	4.00	120.0000	1.00
P-8	J-7	J-6	320.00	4.00	120.0000	1.00
P-9	J-7	J-8	160.00	4.00	120.0000	1.00
P-10	J-9	J-17	120.00	6.00	120.0000	0.70
P-11	J-8	J-9	320.00	4.00	120.0000	1.00
P-12	J-8	J-11	160.00	4.00	120.0000	1.00
P-13	J-10	J-9	160.00	4.00	120.0000	1.00
P-14	J-11	J-10	320.00	4.00	120.0000	1.45
P-15	J-4	I-M & RP 1	50.00	4.00	120.0000	1.67
P-16	J-13	J-4	230.00	8.00	120.0000	0.00
P-17	J-14	J-3	270.00	8.00	120.0000	0.00
P-18	J-15	J-7	160.00	4.00	120.0000	1.70
P-19	J-12	J-5	150.00	4.00	120.0000	0.00
P-20	J-18	I-M & RP 2	190.00	4.00	120.0000	1.67
P-22	O-M & RP 2	J-17	160.00	6.00	120.0000	1.67
P-23	J-1	J-14	250.00	8.00	120.0000	0.00
P-24	J-1	J-2	670.00	8.00	120.0000	0.00
P-25	Source	J-19	670.00	6.00	120.0000	0.00

P-26	J-19	J-1	450.00	8.00	120.0000	0.00
P-27	J-11	J-20	150.00	8.00	120.0000	1.00
P-28	J-8	J-21	150.00	8.00	120.0000	1.00
P-29	J-7	J-22	150.00	8.00	120.0000	1.00
P-30	J-10	J-23	140.00	8.00	120.0000	1.00
P-31	J-15	J-24	150.00	8.00	120.0000	1.00

P U M P/L O S S E L E M E N T D A T A

THERE IS A DEVICE AT NODE M & RP 1 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)	EFFICIENCY (%)
-18.00	0.00	75.00 (Default)
-25.00	40.00	75.00 (Default)
-28.00	160.00	75.00 (Default)
-30.00	240.00	75.00 (Default)
-35.00	400.00	75.00 (Default)

THERE IS A DEVICE AT NODE M & RP 2 ....> (ID= 1)

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
O-M & RP 1		0.00	102.00	
I-M & RP 2		0.00	120.00	
Source		----	0.00	285.00
J-1		0.00	125.00	
J-2		0.00	125.00	
J-3		0.00	126.00	
J-4		0.00	101.00	
J-5		3.00	105.00	
J-6		2.00	100.00	
J-7		2.00	105.00	
J-8		2.00	101.00	
J-9		0.00	98.00	
J-10		2.00	98.00	
J-11		2.00	100.00	
J-12		0.00	104.00	
J-13		0.00	103.00	
J-14		0.00	123.00	
J-15		2.00	105.00	
J-17		0.00	99.00	
J-18		0.00	125.00	
J-19		0.00	125.00	
J-20		2.00	101.00	
J-21		2.00	102.00	
J-22		2.00	106.00	
J-23		2.00	98.00	
J-24		2.00	106.00	
I-M & RP 1		0.00	102.00	
O-M & RP 2		0.00	120.00	

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
MAXIMUM AND MINIMUM PRESSURES = 3
MAXIMUM AND MINIMUM VELOCITIES = 3

S Y S T E M C O N F I G U R A T I O N

NUMBER OF PIPES .....(P) = 30
NUMBER OF END NODES .....(J) = 25
NUMBER OF PRIMARY LOOPS .....(L) = 5
NUMBER OF SUPPLY NODES .....(F) = 1
NUMBER OF SUPPLY ZONES .....(Z) = 1

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Case: 0

RESULTS OBTAINED AFTER 8 TRIALS: ACCURACY = 0.87693E-04

AVERAGE DAY DEMAND

S I M U L A T I O N D E S C R I P T I O N (L A B E L)

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
P-1	J-2	Source	-17.42	0.00	0.00	0.02	0.00	0.00
P-2	J-3	J-13	12.61	0.00	0.00	0.08	0.01	0.01
P-3	J-3	J-18	12.39	0.00	0.00	0.08	0.01	0.01
P-4	O-M & RP 1	J-12	12.61	0.01	0.00	0.14	0.03	0.03
P-5	J-12	J-15	9.61	0.00	0.00	0.11	0.02	0.02
P-6	J-15	J-6	1.43	0.00	0.00	0.04	0.00	0.00
P-7	J-6	J-9	-2.99	0.00	0.00	0.08	0.01	0.01
P-8	J-7	J-6	-2.43	0.00	0.00	0.06	0.01	0.01
P-9	J-7	J-8	2.60	0.00	0.00	0.07	0.01	0.01
P-10	J-9	J-17	-12.39	0.00	0.00	0.14	0.03	0.03
P-11	J-8	J-9	-3.83	0.01	0.00	0.10	0.02	0.02
P-12	J-8	J-11	2.43	0.00	0.00	0.06	0.01	0.01
P-13	J-10	J-9	-5.57	0.01	0.00	0.14	0.04	0.04
P-14	J-11	J-10	-1.57	0.00	0.00	0.04	0.00	0.00
P-15	J-4	I-M & RP 1	12.61	0.01	0.00	0.32	0.24	0.19
P-16	J-13	J-4	12.61	0.00	0.00	0.08	0.01	0.01
P-17	J-14	J-3	25.00	0.01	0.00	0.16	0.02	0.02
P-18	J-15	J-7	4.17	0.00	0.00	0.11	0.03	0.02
P-19	J-12	J-5	3.00	0.00	0.00	0.08	0.01	0.01
P-20	J-18	I-M & RP 2	12.39	0.03	0.00	0.32	0.20	0.18
P-22	O-M & RP 2	J-17	12.39	0.00	0.00	0.14	0.03	0.03
P-23	J-1	J-14	25.00	0.01	0.00	0.16	0.02	0.02
P-24	J-1	J-2	-17.42	0.01	0.00	0.11	0.01	0.01
P-25	Source	J-19	7.58	0.01	0.00	0.09	0.01	0.01
P-26	J-19	J-1	7.58	0.00	0.00	0.05	0.00	0.00
P-27	J-11	J-20	2.00	0.00	0.00	0.01	0.00	0.00
P-28	J-8	J-21	2.00	0.00	0.00	0.01	0.00	0.00
P-29	J-7	J-22	2.00	0.00	0.00	0.01	0.00	0.00
P-30	J-10	J-23	2.00	0.00	0.00	0.01	0.00	0.00
P-31	J-15	J-24	2.00	0.00	0.00	0.01	0.00	0.00

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC-ENCY %	USEFUL POWER Hp	INCREMTL COST $	TOTAL COST $	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Case
M & RP 1	12.61	182.96	159.76	-23.2	75.00	0.	0.0	0.0	**	**	216.2	0.0000
M & RP 2	12.39	164.94	141.76	-23.2	75.00	0.	0.0	0.0	**	**	198.1	0.0000

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
O-M & RP 1		0.00	261.76	102.00	159.76	69.23
I-M & RP 2		0.00	284.94	120.00	164.94	71.47
Source		----	285.00			
J-1		0.00	284.99	125.00	159.99	69.33
J-2		0.00	285.00	125.00	160.00	69.33
J-3		0.00	284.98	126.00	158.98	68.89
J-4		0.00	284.97	101.00	183.97	79.72
J-5		3.00	261.75	105.00	156.75	67.93
J-6		2.00	261.75	100.00	161.75	70.09
J-7		2.00	261.75	105.00	156.75	67.93
J-8		2.00	261.75	101.00	160.75	69.66
J-9		0.00	261.76	98.00	163.76	70.96
J-10		2.00	261.75	98.00	163.75	70.96
J-11		2.00	261.75	100.00	161.75	70.09
J-12		0.00	261.76	104.00	157.76	68.36
J-13		0.00	284.98	103.00	181.98	78.86
J-14		0.00	284.99	123.00	161.99	70.19
J-15		2.00	261.75	105.00	156.75	67.93
J-17		0.00	261.76	99.00	162.76	70.53
J-18		0.00	284.98	125.00	159.98	69.32
J-19		0.00	284.99	125.00	159.99	69.33
J-20		2.00	261.75	101.00	160.75	69.66
J-21		2.00	261.75	102.00	159.75	69.22
J-22		2.00	261.75	106.00	155.75	67.49
J-23		2.00	261.75	98.00	163.75	70.96
J-24		2.00	261.75	106.00	155.75	67.49
I-M & RP 1		0.00	284.96	102.00	182.96	79.28
O-M & RP 2		0.00	261.76	120.00	141.76	61.43

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
J-4	79.72	O-M & RP 2	61.43
I-M & RP 1	79.28	J-22	67.49
J-13	78.86	J-24	67.49

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-15	0.32	P-27	0.01
P-20	0.32	P-28	0.01
P-17	0.16	P-29	0.01

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
Source	25.00	

NET SYSTEM INFLOW = 25.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 25.00

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Case: 1

C H A N G E S F O R N E X T S I M U L A T I O N (Change Number = 1)

Peak Hour Demand

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.66058E-05

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
P-1	J-2	Source	-52.26	0.00	0.00	0.07	0.00	0.00
P-2	J-3	J-13	38.96	0.03	0.00	0.25	0.05	0.05
P-3	J-3	J-18	36.04	0.01	0.00	0.23	0.05	0.05
P-4	O-M & RP 1	J-12	38.96	0.04	0.01	0.44	0.24	0.21
P-5	J-12	J-15	29.96	0.01	0.00	0.34	0.13	0.13
P-6	J-15	J-6	4.99	0.01	0.00	0.13	0.03	0.03
P-7	J-6	J-9	-8.21	0.01	0.00	0.21	0.09	0.08
P-8	J-7	J-6	-7.19	0.02	0.00	0.18	0.07	0.07
P-9	J-7	J-8	8.17	0.01	0.00	0.21	0.09	0.08
P-10	J-9	J-17	-36.04	0.02	0.00	0.41	0.20	0.18
P-11	J-8	J-9	-11.27	0.05	0.00	0.29	0.16	0.15
P-12	J-8	J-11	7.44	0.01	0.00	0.19	0.07	0.07
P-13	J-10	J-9	-16.56	0.05	0.00	0.42	0.33	0.31
P-14	J-11	J-10	-4.56	0.01	0.00	0.12	0.03	0.03
P-15	J-4I-M & RP 1		38.96	0.08	0.03	0.99	2.03	1.52
P-16	J-13	J-4	38.96	0.01	0.00	0.25	0.05	0.05
P-17	J-14	J-3	75.00	0.05	0.00	0.48	0.17	0.17
P-18	J-15	J-7	12.97	0.03	0.00	0.33	0.22	0.20
P-19	J-12	J-5	9.00	0.02	0.00	0.23	0.10	0.10
P-20	J-18I-M & RP 2		36.04	0.25	0.02	0.92	1.43	1.32
P-22	O-M & RP 2	J-17	36.04	0.03	0.00	0.41	0.21	0.18
P-23	J-1	J-14	75.00	0.04	0.00	0.48	0.17	0.17
P-24	J-1	J-2	-52.26	0.06	0.00	0.33	0.09	0.09
P-25	Source	J-19	22.74	0.05	0.00	0.26	0.08	0.08
P-26	J-19	J-1	22.74	0.01	0.00	0.15	0.02	0.02
P-27	J-11	J-20	6.00	0.00	0.00	0.04	0.00	0.00
P-28	J-8	J-21	6.00	0.00	0.00	0.04	0.00	0.00
P-29	J-7	J-22	6.00	0.00	0.00	0.04	0.00	0.00
P-30	J-10	J-23	6.00	0.00	0.00	0.04	0.00	0.00
P-31	J-15	J-24	6.00	0.00	0.00	0.04	0.00	0.00

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC-ENCY %	USEFUL POWER Hp	INCREMTL COST $	TOTAL COST $	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Case
M & RP 1	38.96	182.70	157.75	-25.0	75.00	0.	0.0	0.0	**	**	215.9	1.0000
M & RP 2	36.04	164.57	139.75	-24.8	75.00	0.	0.0	0.0	**	**	197.8	1.0000

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
O-M & RP 1		0.00	259.75	102.00	157.75	68.36
I-M & RP 2		0.00	284.57	120.00	164.57	71.31
Source		----	285.00			
J-1		0.00	284.94	125.00	159.94	69.31
J-2		0.00	285.00	125.00	160.00	69.33
J-3		0.00	284.85	126.00	158.85	68.83
J-4		0.00	284.81	101.00	183.81	79.65
J-5		9.00(3.00)	259.69	105.00	154.69	67.03
J-6		6.00(3.00)	259.68	100.00	159.68	69.20
J-7		6.00(3.00)	259.66	105.00	154.66	67.02
J-8		6.00(3.00)	259.65	101.00	158.65	68.75
J-9		0.00	259.70	98.00	161.70	70.07
J-10		6.00(3.00)	259.64	98.00	161.64	70.05
J-11		6.00(3.00)	259.63	100.00	159.63	69.17
J-12		0.00	259.70	104.00	155.70	67.47
J-13		0.00	284.82	103.00	181.82	78.79
J-14		0.00	284.90	123.00	161.90	70.15
J-15		6.00(3.00)	259.69	105.00	154.69	67.03
J-17		0.00	259.72	99.00	160.72	69.64
J-18		0.00	284.84	125.00	159.84	69.26
J-19		0.00	284.95	125.00	159.95	69.31
J-20		6.00(3.00)	259.63	101.00	158.63	68.74
J-21		6.00(3.00)	259.64	102.00	157.64	68.31
J-22		6.00(3.00)	259.66	106.00	153.66	66.59
J-23		6.00(3.00)	259.64	98.00	161.64	70.05
J-24		6.00(3.00)	259.69	106.00	153.69	66.60
I-M & RP 1		0.00	284.70	102.00	182.70	79.17
O-M & RP 2		0.00	259.75	120.00	139.75	60.56

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
J-4	79.65	O-M & RP 2	60.56
I-M & RP 1	79.17	J-22	66.59
J-13	78.79	J-24	66.60

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-15	0.99	P-27	0.04
P-20	0.92	P-28	0.04
P-17	0.48	P-29	0.04

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
Source	75.00	

NET SYSTEM INFLOW = 75.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 75.00

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Case: 2

C H A N G E S F O R N E X T S I M U L A T I O N (Change Number = 2)

Peak Demand - WFU Based

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.17561E-05

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
P-1	J-2	Source	-470.36	0.05	0.00	0.59	0.10	0.10
P-2	J-3	J-13	376.20	2.08	0.00	2.40	3.47	3.47
P-3	J-3	J-18	298.80	0.45	0.00	1.91	2.26	2.26
P-4	O-M & RP 1	J-12	376.20	2.81	0.47	4.27	16.43	14.07
P-5	J-12	J-15	295.20	0.67	0.00	3.35	8.98	8.98
P-6	J-15	J-6	59.75	1.28	0.00	1.53	3.36	3.36
P-7	J-6	J-9	-56.23	0.48	0.03	1.44	3.20	3.00
P-8	J-7	J-6	-61.98	1.15	0.04	1.58	3.71	3.59
P-9	J-7	J-8	81.43	0.95	0.07	2.08	6.37	5.96
P-10	J-9	J-17	-298.80	1.10	0.12	3.39	10.22	9.18
P-11	J-8	J-9	-96.82	2.63	0.09	2.47	8.50	8.20
P-12	J-8	J-11	70.25	0.72	0.05	1.79	4.84	4.53
P-13	J-10	J-9	-145.75	2.80	0.21	3.72	18.85	17.50
P-14	J-11	J-10	-37.75	0.46	0.02	0.96	1.50	1.43
P-15	J-4	I-M & RP 1	376.20	5.07	2.39	9.60	149.17	101.34
P-16	J-13	J-4	376.20	0.80	0.00	2.40	3.47	3.47
P-17	J-14	J-3	675.00	2.76	0.00	4.31	10.23	10.23
P-18	J-15	J-7	127.45	2.18	0.28	3.25	15.40	13.65
P-19	J-12	J-5	81.00	0.88	0.00	2.07	5.90	5.90
P-20	J-18	I-M & RP 2	298.80	12.57	1.51	7.63	74.09	66.14
P-22	O-M & RP 2	J-17	298.80	1.47	0.30	3.39	11.04	9.18
P-23	J-1	J-14	675.00	2.56	0.00	4.31	10.23	10.23
P-24	J-1	J-2	-470.36	3.51	0.00	3.00	5.24	5.24
P-25	Source	J-19	204.64	3.05	0.00	2.32	4.56	4.56
P-26	J-19	J-1	204.64	0.50	0.00	1.31	1.12	1.12
P-27	J-11	J-20	54.00	0.01	0.00	0.34	0.11	0.10
P-28	J-8	J-21	54.00	0.01	0.00	0.34	0.11	0.10
P-29	J-7	J-22	54.00	0.01	0.00	0.34	0.11	0.10
P-30	J-10	J-23	54.00	0.01	0.00	0.34	0.11	0.10
P-31	J-15	J-24	54.00	0.01	0.00	0.34	0.11	0.10

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC-ENCY %	USEFUL POWER Hp	INCREMTL COST $	TOTAL COST $	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Case
M & RP 1	376.20	163.79	129.57	-34.2	75.00	-3.	0.0	0.0	**	**	195.6	2.0000
M & RP 2	298.80	141.59	109.85	-31.7	75.00	-2.	0.0	0.0	**	**	173.9	2.0000

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
O-M & RP 1		0.00	231.57	102.00	129.57	56.15
I-M & RP 2		0.00	261.59	120.00	141.59	61.36
Source		----	285.00			
J-1		0.00	281.44	125.00	156.44	67.79
J-2		0.00	284.95	125.00	159.95	69.31
J-3		0.00	276.12	126.00	150.12	65.05
J-4		0.00	273.25	101.00	172.25	74.64
J-5		81.00(**)	227.40	105.00	122.40	53.04
J-6		54.00(**)	226.34	100.00	126.34	54.75
J-7		54.00(**)	225.15	105.00	120.15	52.07
J-8		54.00(**)	224.13	101.00	123.13	53.36
J-9		0.00	226.85	98.00	128.85	55.84
J-10		54.00(**)	223.84	98.00	125.84	54.53
J-11		54.00(**)	223.36	100.00	123.36	53.45
J-12		0.00	228.29	104.00	124.29	53.86
J-13		0.00	274.04	103.00	171.04	74.12
J-14		0.00	278.89	123.00	155.89	67.55
J-15		54.00(**)	227.61	105.00	122.61	53.13
J-17		0.00	228.08	99.00	129.08	55.93
J-18		0.00	275.67	125.00	150.67	65.29
J-19		0.00	281.95	125.00	156.95	68.01
J-20		54.00(**)	223.34	101.00	122.34	53.01
J-21		54.00(**)	224.11	102.00	122.11	52.92
J-22		54.00(**)	225.13	106.00	119.13	51.63
J-23		54.00(**)	223.82	98.00	125.82	54.52
J-24		54.00(**)	227.60	106.00	121.60	52.69
I-M & RP 1		0.00	265.79	102.00	163.79	70.97
O-M & RP 2		0.00	229.85	120.00	109.85	47.60

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
J-4	74.64	O-M & RP 2	47.60
J-13	74.12	J-22	51.63
I-M & RP 1	70.97	J-7	52.07

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-15	9.60	P-27	0.34
P-20	7.63	P-28	0.34
P-17	4.31	P-29	0.34

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
Source	675.00	

NET SYSTEM INFLOW = 675.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 675.00

***** HYDRAULIC ANALYSIS COMPLETED *****

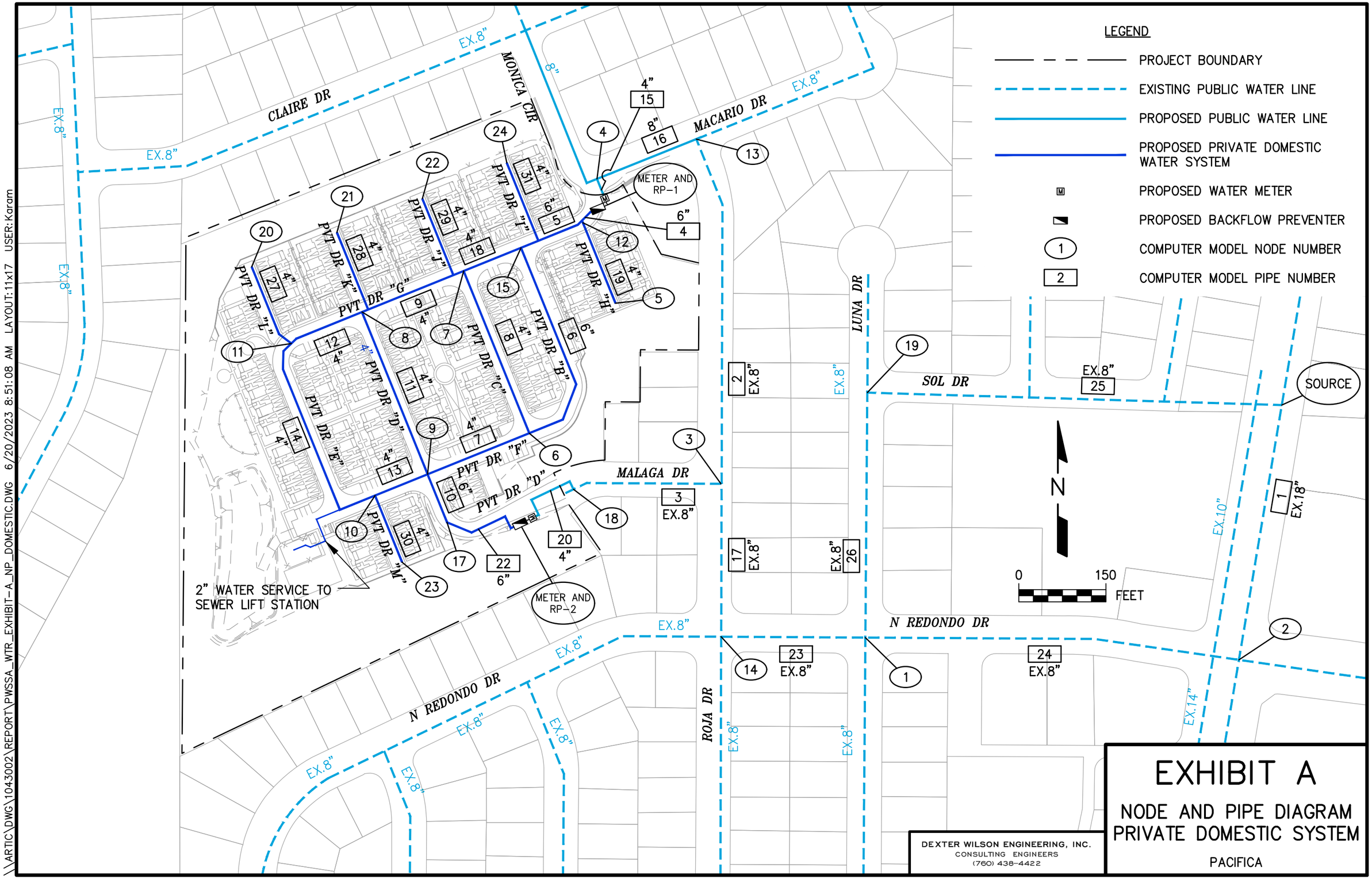

EXHIBIT A

NODE AND PIPE DIAGRAM PRIVATE DOMESTIC SYSTEM

PACIFICA

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

\\ARTIC\DWG\1043002\REPORT\PWSSA_WTR_EXHIBIT-A_NP_DOMESTIC.DWG 6/20/2023 8:51:08 AM LAYOUT:11x17 USER:Karam

APPENDIX F

HYDRAULIC COMPUTER MODEL OUTPUT
PRIVATE FIRE PROTECTION SYSTEM

Reference Exhibit B for Node and Pipe Diagram

The following conditions were modeled for the Pacifica Project:

1. Maximum Day Demands plus 1,500 gpm at Node 15

2. Maximum Day Demands plus 1,500 gpm at Node 11

```
* * * * * * * * * * * * K Y P I P E * * * * * * * * * * * *
*                                                           *
*  Pipe Network Modeling Software                           *
*                                                           *
*  CopyRighted by KYPIPE LLC (www.kypipe.com)               *
*  Version: 10.009  10/01/2019                              *
*  Company:  Dexter        Serial #:  592169                *
*  Interface:  Classic                                      *
*  Licensed for Pipe2018                                    *
*                                                           *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
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Date & Time: Mon Mar 20 14:19:51 2023

Master File : \\artic\eng\1043002\pacifica mar 2023 ky pipe fire.KYP\pacifica mar 2023 ky pipe fire.P2K

SUMMARY OF ORIGINAL DATA

UNITS SPECIFIED

FLOWRATE ..... = gallons/minute
HEAD (HGL) ..... = feet
PRESSURE ..... = psig

PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NAMES #1	#2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.
P-1	J-2	Source	450.00	18.00	120.0000	0.00
P-2	J-3	J-13	600.00	8.00	120.0000	0.00
P-3	J-3	J-18	200.00	8.00	120.0000	0.00
P-4	J-6	J-15	360.00	8.00	120.0000	2.00
P-5	O-DCDA-1	J-15	160.00	8.00	120.0000	5.57
P-7	J-6	J-9	160.00	8.00	120.0000	1.00
P-8	J-7	J-6	320.00	8.00	120.0000	2.00
P-9	J-7	J-8	160.00	8.00	120.0000	1.00
P-10	J-9	J-17	120.00	8.00	120.0000	0.70
P-11	J-8	J-9	320.00	8.00	120.0000	1.40
P-12	J-8	J-11	160.00	8.00	120.0000	0.70
P-13	J-10	J-9	160.00	8.00	120.0000	1.00
P-14	J-11	J-10	320.00	8.00	120.0000	0.75
P-15	J-4	I-DCDA-1	50.00	8.00	120.0000	1.67
P-16	J-13	J-4	230.00	8.00	120.0000	0.00
P-17	J-14	J-3	270.00	8.00	120.0000	0.00
P-18	J-15	J-7	160.00	8.00	120.0000	1.70
P-20	J-18	I-DCDA-2	190.00	8.00	120.0000	1.67
P-22	O-DCDA-2	J-17	160.00	8.00	120.0000	1.67
P-23	J-1	J-14	250.00	8.00	120.0000	0.00
P-24	J-1	J-2	670.00	8.00	120.0000	0.00
P-25	Source	J-19	670.00	6.00	120.0000	0.00
P-26	J-19	J-1	450.00	8.00	120.0000	0.00

P U M P/L O S S E L E M E N T D A T A

THERE IS A DEVICE AT NODE DCDA-1 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)	EFFICIENCY (%)
-9.00	0.00	75.00 (Default)
-12.00	900.00	75.00 (Default)
-14.00	1100.00	75.00 (Default)
-18.00	1300.00	75.00 (Default)
-21.00	1500.00	75.00 (Default)

THERE IS A DEVICE AT NODE DCDA-2 ....> (ID= 1)

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
Source		----	0.00	285.00
O-DCDA-1		0.00	102.00	
I-DCDA-2		0.00	120.00	
J-1		0.00	125.00	
J-2		0.00	125.00	
J-3		0.00	126.00	
J-4		12.50	101.00	
J-6		0.00	100.00	
J-7		0.00	105.00	
J-8		0.00	101.00	
J-9		0.00	98.00	
J-10		0.00	98.00	
J-11		0.00	100.00	
J-13		0.00	103.00	
J-14		0.00	123.00	
J-15		0.00	105.00	
J-17		0.00	99.00	
J-18		12.50	125.00	
J-19		0.00	125.00	
I-DCDA-1		0.00	102.00	
O-DCDA-2		0.00	120.00	

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
MAXIMUM AND MINIMUM PRESSURES = 3
MAXIMUM AND MINIMUM VELOCITIES = 3

S Y S T E M C O N F I G U R A T I O N

NUMBER OF PIPES .....(P) = 23
NUMBER OF END NODES .....(J) = 18
NUMBER OF PRIMARY LOOPS .....(L) = 5
NUMBER OF SUPPLY NODES .....(F) = 1
NUMBER OF SUPPLY ZONES .....(Z) = 1

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Case: 1

C H A N G E S F O R N E X T S I M U L A T I O N (Change Number = 1)

Maximum Day plus 1,500 gpm Fire Flow Scenario
1,500 gpm at Node 15

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

RESULTS OBTAINED AFTER 9 TRIALS: ACCURACY = 0.30242E-04

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
P-1	J-2	Source	-1080.08	0.21	0.00	1.36	0.47	0.47
P-2	J-3	J-13	720.50	6.93	0.00	4.60	11.55	11.55
P-3	J-3	J-18	829.50	3.00	0.00	5.29	14.99	14.99
P-4	J-6	J-15	339.35	1.03	0.15	2.17	3.27	2.86
P-5	O-DCDA-1	J-15	695.50	1.73	1.70	4.44	21.46	10.81
P-7	J-6	J-9	-446.25	0.76	0.13	2.85	5.54	4.75
P-8	J-7	J-6	-106.90	0.11	0.01	0.68	0.38	0.34
P-9	J-7	J-8	-358.26	0.51	0.08	2.29	3.67	3.17
P-10	J-9	J-17	-804.50	1.70	0.29	5.13	16.55	14.16
P-11	J-8	J-9	-211.51	0.38	0.04	1.35	1.32	1.19
P-12	J-8	J-11	-146.75	0.10	0.01	0.94	0.67	0.61
P-13	J-10	J-9	-146.75	0.10	0.01	0.94	0.69	0.61
P-14	J-11	J-10	-146.75	0.19	0.01	0.94	0.64	0.61
P-15	J-4	I-DCDA-1	695.50	0.54	0.51	4.44	21.03	10.81
P-16	J-13	J-4	720.50	2.66	0.00	4.60	11.55	11.55
P-17	J-14	J-3	1550.00	12.88	0.00	9.89	47.71	47.71
P-18	J-15	J-7	-465.15	0.82	0.23	2.97	6.59	5.13
P-20	J-18	I-DCDA-2	804.50	2.69	0.68	5.13	17.76	14.16
P-22	O-DCDA-2	J-17	804.50	2.27	0.68	5.13	18.43	14.16
P-23	J-1	J-14	1550.00	11.93	0.00	9.89	47.71	47.71
P-24	J-1	J-2	-1080.08	16.37	0.00	6.89	24.44	24.44
P-25	Source	J-19	469.92	14.23	0.00	5.33	21.24	21.24
P-26	J-19	J-1	469.92	2.35	0.00	3.00	5.23	5.23

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC- ENCY %	USEFUL POWER Hp	INCREMTL COST $	TOTAL COST $	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Case
DCDA-1	695.50	130.97	120.42	-10.6	75.00	-2.	-0.1	-0.1	**	**	163.9	1.0000
DCDA-2	804.50	117.24	105.98	-11.3	75.00	-2.	-0.1	-0.1	**	**	150.0	1.0000

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
Source		----	285.00			
O-DCDA-1		0.00	222.42	102.00	120.42	52.18
I-DCDA-2		0.00	237.24	120.00	117.24	50.80
J-1		0.00	268.42	125.00	143.42	62.15
J-2		0.00	284.79	125.00	159.79	69.24
J-3		0.00	243.61	126.00	117.61	50.96
J-4		25.00(2.00)	234.03	101.00	133.03	57.64
J-6		0.00	220.16	100.00	120.16	52.07
J-7		0.00	220.04	105.00	115.04	49.85
J-8		0.00	220.63	101.00	119.63	51.84
J-9		0.00	221.05	98.00	123.05	53.32
J-10		0.00	220.94	98.00	122.94	53.27
J-11		0.00	220.73	100.00	120.73	52.32
J-13		0.00	236.68	103.00	133.68	57.93
J-14		0.00	256.49	123.00	133.49	57.85
J-15		1500.00	218.98	105.00	113.98	49.39
J-17		0.00	223.03	99.00	124.03	53.75
J-18		25.00(2.00)	240.61	125.00	115.61	50.10
J-19		0.00	270.77	125.00	145.77	63.17
I-DCDA-1		0.00	232.97	102.00	130.97	56.76
O-DCDA-2		0.00	225.98	120.00	105.98	45.93

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
J-2	69.24	O-DCDA-2	45.93
J-19	63.17	J-15	49.39
J-1	62.15	J-7	49.85

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-17	9.89	P-8	0.68
P-23	9.89	P-12	0.94
P-24	6.89	P-13	0.94

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
Source	1550.00	

NET SYSTEM INFLOW = 1550.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 1550.00

==========

Case: 2

C H A N G E S F O R N E X T S I M U L A T I O N (Change Number = 2)

Maximum Day plus 1,500 gpm Fire Flow Scenario
1,500 gpm at Node 11

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

RESULTS OBTAINED AFTER 4 TRIALS: ACCURACY = 0.30322E-06

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
P-1	J-2	Source	-1080.08	0.21	0.00	1.36	0.47	0.47
P-2	J-3	J-13	683.07	6.28	0.00	4.36	10.46	10.46
P-3	J-3	J-18	866.93	3.25	0.00	5.53	16.26	16.26
P-4	J-6	J-15	-251.96	0.59	0.08	1.61	1.87	1.65
P-5	O-DCDA-1	J-15	658.07	1.56	1.53	4.20	19.30	9.76
P-7	J-6	J-9	136.15	0.08	0.01	0.87	0.60	0.53
P-8	J-7	J-6	-115.81	0.13	0.02	0.74	0.44	0.39
P-9	J-7	J-8	521.92	1.02	0.17	3.33	7.43	6.35
P-10	J-9	J-17	-841.93	1.85	0.31	5.37	18.02	15.41
P-11	J-8	J-9	-376.31	1.11	0.13	2.40	3.86	3.47
P-12	J-8	J-11	898.23	2.78	0.36	5.73	19.60	17.37
P-13	J-10	J-9	-601.77	1.32	0.23	3.84	9.70	8.27
P-14	J-11	J-10	-601.77	2.65	0.17	3.84	8.81	8.27
P-15	J-4	I-DCDA-1	658.07	0.49	0.46	4.20	18.91	9.76
P-16	J-13	J-4	683.07	2.41	0.00	4.36	10.46	10.46
P-17	J-14	J-3	1550.00	12.88	0.00	9.89	47.71	47.71
P-18	J-15	J-7	406.11	0.64	0.18	2.59	5.10	3.99
P-20	J-18	I-DCDA-2	841.93	2.93	0.75	5.37	19.35	15.41
P-22	O-DCDA-2	J-17	841.93	2.46	0.75	5.37	20.09	15.41
P-23	J-1	J-14	1550.00	11.93	0.00	9.89	47.71	47.71
P-24	J-1	J-2	-1080.08	16.37	0.00	6.89	24.44	24.44
P-25	Source	J-19	469.92	14.23	0.00	5.33	21.24	21.24
P-26	J-19	J-1	469.92	2.35	0.00	3.00	5.23	5.23

P U M P/L O S S E L E M E N T R E S U L T S

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC- ENCY %	USEFUL POWER Hp	INCREMTL COST $	TOTAL COST $	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Case
DCDA-1	658.07	131.98	121.63	-10.4	75.00	-2.	-0.1	-0.2	**	**	164.9	2.0000
DCDA-2	841.93	116.68	105.15	-11.5	75.00	-2.	-0.1	-0.2	**	**	149.4	2.0000

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
Source		----	285.00			
O-DCDA-1		0.00	223.63	102.00	121.63	52.71
I-DCDA-2		0.00	236.68	120.00	116.68	50.56
J-1		0.00	268.42	125.00	143.42	62.15
J-2		0.00	284.79	125.00	159.79	69.24
J-3		0.00	243.61	126.00	117.61	50.96
J-4		25.00(2.00)	234.93	101.00	133.93	58.04
J-6		0.00	219.87	100.00	119.87	51.94
J-7		0.00	219.73	105.00	114.73	49.72
J-8		0.00	218.54	101.00	117.54	50.93
J-9		0.00	219.77	98.00	121.77	52.77
J-10		0.00	218.22	98.00	120.22	52.10
J-11		1500.00	215.40	100.00	115.40	50.01
J-13		0.00	237.33	103.00	134.33	58.21
J-14		0.00	256.49	123.00	133.49	57.85
J-15		0.00	220.54	105.00	115.54	50.07
J-17		0.00	221.94	99.00	122.94	53.27
J-18		25.00(2.00)	240.36	125.00	115.36	49.99
J-19		0.00	270.77	125.00	145.77	63.17
I-DCDA-1		0.00	233.98	102.00	131.98	57.19
O-DCDA-2		0.00	225.15	120.00	105.15	45.56

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
J-2	69.24	O-DCDA-2	45.56
J-19	63.17	J-7	49.72
J-1	62.15	J-18	49.99

V E L O C I T I E S

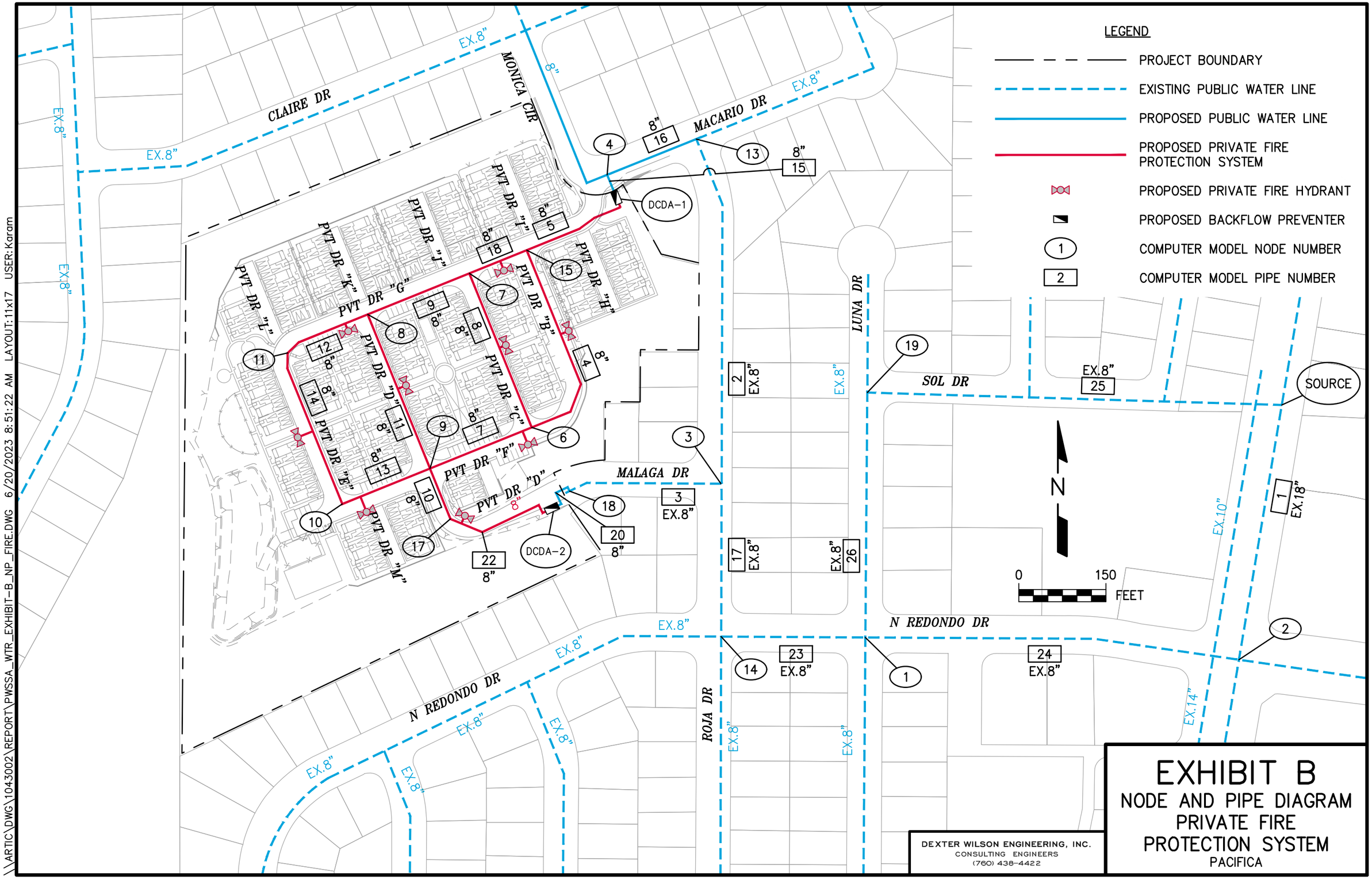
PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-17	9.89	P-8	0.74
P-23	9.89	P-7	0.87
P-24	6.89	P-1	1.36

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
Source	1550.00	

NET SYSTEM INFLOW = 1550.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 1550.00
***** HYDRAULIC ANALYSIS COMPLETED *****



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