Appendix P2

Supplemental Water Study

DEXTER WILSON ENGINEERING, INC.

WATER • WASTEWATER • RECYCLED WATER

CONSULTING ENGINEERS

SUPPLEMENTAL WATER STUDY FOR THE CARLTON OAKS DEVELOPMENT PROJECT IN THE CITY OF SANTEE

June 24, 2024

2234 FARADAY AVENUE • CARLSBAD, CA • (760) 438-4422

SUPPLEMENTAL WATER STUDY FOR THE CARLTON OAKS DEVELOPMENT PROJECT IN THE CITY OF SANTEE

June 24, 2024

6-24-2024

Prepared by:
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Job No. 663-082

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June 24, 2024

663-082

Lennar
16465 Via Esprillo, Suite 150
San Diego, CA 92127

Attention: David W. Shepherd, Director of Entitlements

Subject: Supplemental Water Study for the Carlton Oaks Development Project, City of Santee

Introduction

Lennar Homes and Carlton Oaks Golf Course, as joint project proponents, are proposing to redevelop the existing Carlton Oaks Country Club into a resort with residential accessory uses. The proposed project would include a redesign of the existing Carlton Oaks golf course which will include the following on approximately 168 acres: residential accessory uses consisting of two residential neighborhoods with open space areas; a hotel and associated cottages; an improved golf course clubhouse and pro shop, golf course and practice area, and learning center structure.

The proposed project includes the demolition of the existing Carlton Oaks golf course clubhouse, restaurant/bar, pro shop, hotel and hotel cottages, and surface parking lots; construction of new residential accessory uses and a resort facility; and redevelopment of the golf course.

The proposed project would redesign the existing 145-acre, 18-hole golf course into a 104-acre, 18-hole course. The length of the golf course would be reduced from approximately 7,300 yards to 6,450 yards. Currently the golf course has approximately 132 acres of turf irrigation; the new course design would have approximately 66 acres of turf irrigation.

In addition to the golf course, the Carlton Oaks Golf Course owner would develop several golf amenities including a pro shop, cart barn, and a cart waiting area on the eastern end of the golf course, northeast of the golf resort, as well as two practice areas. A golf learning center structure would also be developed northeast of the pro shop. The existing maintenance buildings would remain on site in their current location.

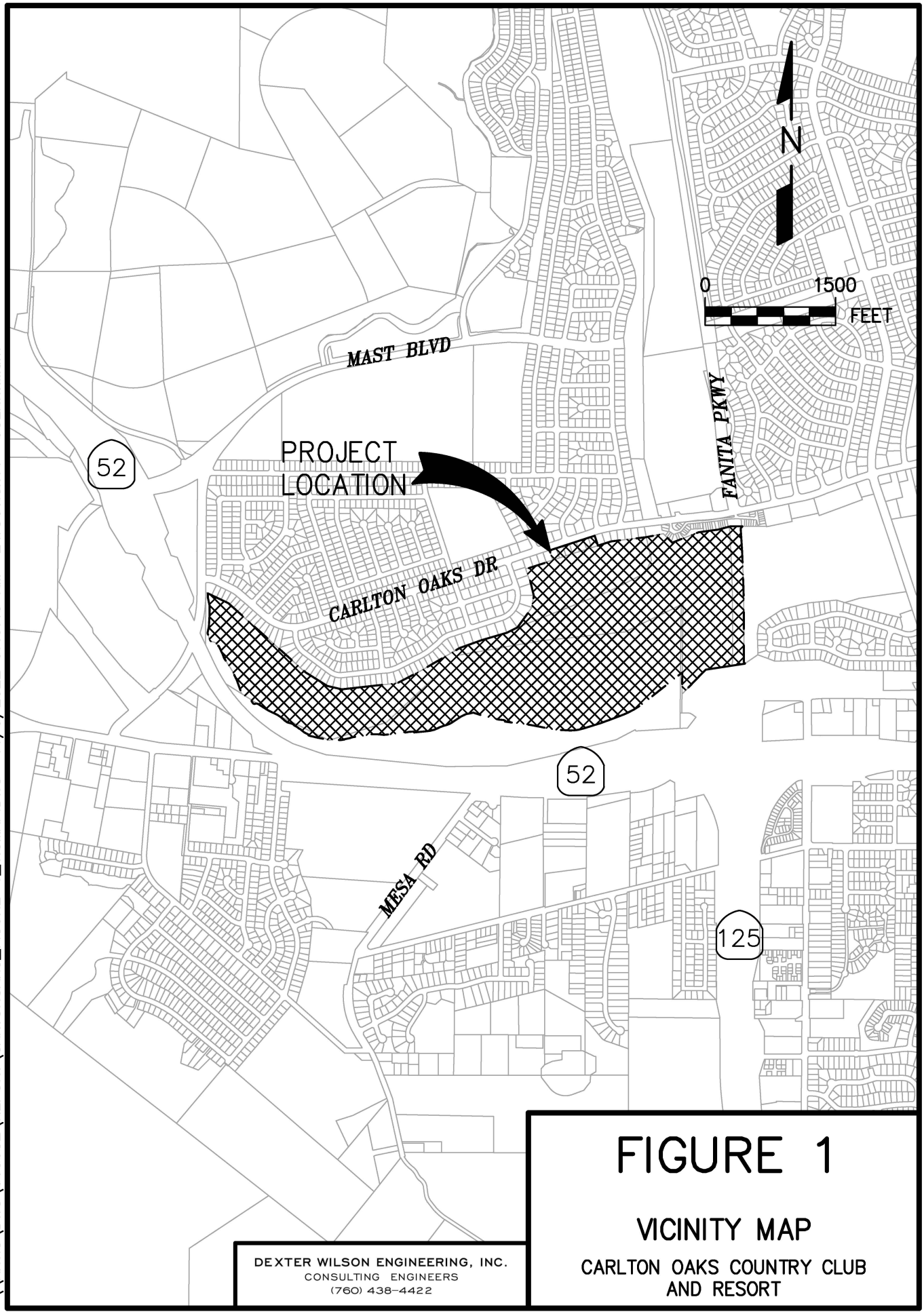
The clubhouse and hotel would consist of 10 cottage-style hotel units, 42 hotel rooms, a restaurant, event space, and other accommodations on 6.02 acres. The outdoor space of the clubhouse would consist of an outdoor swimming pool and deck area, a patio, and a courtyard.

The proposed residential development would be clustered into two areas: PA-1 also called Residential West comprising 86 multi-family detached homes with a density of 9 DUs/acre, and PA-2 also called Residential North with 150 detached condominiums and six single family, single-story lots with an overall density of 8.0 DUs/acre. All residential development will be accessible through privately maintained internal streets.

Figure 1 presents a vicinity map for the Carlton Oaks project. An overall site plan of the Carlton Oaks project is included in Appendix A.

Purpose of Study

The purpose of this supplemental water study for the Carlton Oaks project is to demonstrate that the water system needed for the currently proposed Carlton Oaks project map is consistent with the water study previously prepared for the Carlton Oaks project by HDR. This previous report was prepared for Padre Dam Municipal Water District and is titled, *Carlton Oaks Golf Course Proposed Community Water Study*, dated November 22, 2021.



\\ARTIC\DWG\663082\REPORT\CARTONOAKS_FIGURE-1_VICMAP.DWG 11/9/2022 9:49:45 AM LAYOUT:8x11 USER:William

FIGURE 1

VICINITY MAP

CARLTON OAKS COUNTRY CLUB
AND RESORT

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The November 2021 Water Study analyzed 86 dwelling units for PA-1, 160 dwelling units for PA-2, and a 53-room resort facility and an onsite restaurant for PA-3.

The current Carlton Oaks development plan includes 86 dwelling units for PA-1 (Residential West), 150 dwelling units for PA-2 (Residential North), and a 42-room hotel, 10 cottages, a restaurant, club house, pro shop, learning center, cart barn, and tournament hall for PA-3 (Resort Area). Thus, the proposed map for the Carlton Oaks development project is generally consistent with the project which was analyzed by the HDR study dated November 2021. Therefore, the conclusions and recommendations of the November 2021 Water Study are applicable. This supplemental water study will identify how the currently proposed Carlton Oaks development project comports with the November 2021 Water Study.

Water Demand Estimate

Table 1 below shows the calculation of average water demand for the proposed Carlton Oaks project. Total average water demand for the project will be 70,920 gpd.

TABLE 1
CARLTON OAKS WATER DEMAND

Area	Quantity	Units	Demand Factor	ADWF (gpd)
PA-1 (Residential West)	86	DUs	275 gpd/DU	23,650
PA-2 (Residential North)	150	DUs	275 gpd/DU	41,250
PA-3 (Resort Area)	6.02	Acres	1,000 gpd/AC	6,020
TOTAL				**70,920**

The November 2021 Water Study calculated an average daily water demand of 74,550 gpd. The currently proposed Carlton Oaks project water demand is 3,630 gpd less than the November 2021 Water Study. This supports the conclusion that the water system hydraulic modeling that was done by the HDR study is conservatively applicable to the current proposed Carlton Oaks project.

Proposed Water Service Approach

Water service to the Carlton Oaks project will be provided by Padre Dam Municipal Water District from the District's 629 Pressure Zone. Elevations within the Carlton Oaks project range between 314 feet and 340 feet. Thus, maximum static pressures within the site will range between 125 psi and 137 psi. Since these pressures are greater than 80 psi, individual pressure regulators will be installed on all water services to maintain building pressures below 80 psi per the California Plumbing Code.

The Carlton Oaks project is proposing to provide water service by means of a dual private water system. One private water system will deliver domestic water, and the second private system will provide fire protection. Irrigation services will be provided to each planning area and will be separate from the domestic and fire services to each planning area.

The private domestic water systems will have master domestic water meters. Each planning area (PA-1, PA-2, and PA-3) will have its own master domestic water meter. Thus, the private domestic water systems for the three planning areas will be independent of each other.

At each public domestic water meter connection there will be a reduced pressure principle backflow preventer to separate the public water system from the private water system. Submeters will be installed on all residential units in PA-1 and PA-2 and individual buildings in PA-3.

One looped private fire protection system will serve all three planning areas. The private fire protection system for PA-1, PA-2, and PA-3 will be looped from the west end of PA-1 through the golf course to the north end of PA-2. A branch line extending from PA-2 will provide fire protection service to PA-3. At each fire service connection point to the public water system there will be a detector check backflow preventer.

November 2021 Water Study Hydraulic Modeling. The November 2021 Water Study included water system hydraulic modeling to confirm that the existing water system is adequate to support the Carlton Oaks project. The conclusions of the November 2021 Water Study were that the existing water system can support PA-1 and PA-2 residential development under maximum day demand plus a fire hydrant flow of 1,500 gpm with no existing water system improvements. Similarly for PA-3, the November 2021 Water Study found that the existing water system can support maximum day demand plus 2,500 gpm fire flow for the hotel site and all its amenities.

Thus, the overall public water system hydraulic modeling for the Carlton Oaks project has been performed and found to be adequate for the proposed project. The only difference between the November 2021 Water Study and the currently proposed project is that there will be dual water systems which will be private; however, the overall water demand delivered by the two private water systems is the same as if it was delivered by a single pipe system.

As noted earlier is this report, the total water demand for the currently proposed Carlton Oaks project is less than was evaluated in the November 2021 Water Study.

Offsite Public Water System Extension. As shown in the November 2021 Water Study, there is one extension of public water mains necessary to provide service to the Carlton Oaks project. The water main extension is in West Hills Parkway extending south from Carlton Oaks Drive to the domestic and fire protection services for the Carlton Oaks project on the west end of PA-1. The November 2021 Water Study identified a new 10" water line extension in West Hills Parkway. This is the only public water line improvement needed to provide service to the Carlton Oaks project. This public water line improvement is shown in Figure 2.

TWO 4" DOMESTIC METERS AND BACKFLOW PREVENTERS

TWO 2" DOMESTIC METERS AND BACKFLOW PREVENTERS

WEST HILLS PKWY

CADORETTE AVE

WETHERSFIELD RD

PEBBLE BEACH DR

CARLTON OAKS DR

DUNWOODIE RD

MASSOT AVE

INVERNESS RD

10"

EX.10"

EX.8"

4"

6"

PA-1

PA-2

PA-3

4" PRIVATE DOMESTIC WATER, TYP.

6"

THREE 2" DOMESTIC METERS AND BACKFLOW PREVENTERS

CARLTON OAKS PROJECT BOUNDARY

N

0 500 FEET

LEGEND

- CARLTON OAKS PROJECT BOUNDARY
- EXISTING PUBLIC WATER LINE (629 PRESSURE ZONE
- PROPOSED PUBLIC WATER LINE (629 PRESSURE ZONE)
- PROPOSED PRIVATE DOMESTIC WATER LINE
- PROPOSED METER
- PROPOSED BACKFLOW PREVENTER

FIGURE 2

EXISTING AND PROPOSED DOMESTIC WATER

CARLTON OAKS COUNTY CLUB AND RESORT

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Proposed Private Domestic Water System

Figure 2 shows the Carlton Oaks project proposed onsite private domestic water system. The following section of this report will discuss the water meter sizing for the three planning areas and the water system modeling that was performed to confirm the private domestic water distribution pipe sizes for each of the three planning areas which are shown in Figure 2.

Preliminary Water Meter Sizing for PA-1. Architectural plans for the dwelling unit products for PA-1 have not been prepared. To determine a preliminary domestic water master meter size we estimate that the 86 dwelling units will have an average of 33 Water Fixture Units each for a total of 2,838 Water Fixture Units. Using Chart A103.1(1) from the 2022 California Plumbing Code 2,838 WFUs results in a maximum expected demand of 410 gpm. This demand can be supplied by a 4" master meter with a maximum capacity of 600 gpm per AWWA C702 Compound Type Meters. To provide redundancy to the domestic water system, two 3" meters with a maximum capacity of 350 gpm each could be utilized. However, Padres Dam Municipal Water District does not supply 3" meters. Therefore, three (3) 2" meters are recommended for the PA-1 area. Per AWWA C700 Displacement Type Meters, a 2" meter has a maximum capacity of 160 gpm. Thus, three 2" meters will have a capacity of 480 gpm which is greater than the estimated 410 gpm required. These preliminary meter sizes will have to be confirmed when building plans are available.

Preliminary Water Meter Sizing for PA-2. Architectural plans for the dwelling unit products for PA-2 have not been prepared. To determine a preliminary domestic water master meter size we estimate that the 150 dwelling units will have an average of 33 Water Fixture Units each for a total of 4,950 Water Fixture Units. Using Chart A103.1(1) from the 2022 California Plumbing Code 4,950 WFUs results in a maximum expected demand of 593 gpm. This demand can be supplied by a 6" master meter with a maximum capacity of 1,350 gpm per AWWA C702 Compound Type Meters. To provide redundancy to the domestic water system, two 4" meters with a maximum capacity of 600 gpm each are recommended for the PA-2 area. This preliminary meter size will have to be confirmed when building plans are available.

Preliminary Water Meter Sizing for PA-3. Architectural building plans for the PA-3 Resort Area have not been prepared. To determine a preliminary domestic water master meter size we estimate the 42 hotel rooms, 10 cottages, a clubhouse, a cart barn, and a learning center will have a total of 674.5 Water Fixture Units. Using Chart A103.1(1) from the 2022 California Plumbing Code 674.5 WFUs results in a maximum expected demand of 161 gpm. This demand can be supplied by a 3" master meter with a maximum capacity of 350 gpm. To provide redundancy to the domestic water system, two 2" meters with a maximum capacity of 160 gpm each per AWWA C700 Displacement Type Meters are recommended for the PA-3 area. This preliminary meter size will have to be confirmed when building plans are available.

Private Submeters. Domestic water submeters will be installed at all the residential dwelling units within PA-1 and PA-2. For PA-3, private submeters will be installed at each building.

Private Domestic Water System Pipe Sizing. The private domestic water system piping is sized based on the maximum expected demand for the project. To establish the required private domestic water system pipe sizing, a computer model was generated for the project's private domestic water system.

Model Development. Analysis using the KYPIPE computer software program developed by the University of Kentucky determined residual pressures throughout the domestic water system. This computer software utilizes the Hazen-Williams equation for determining head loss in pipes. The Hazen-Williams "C" value used for all pipe sizes in the computer modeling 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. Meters and reduced pressure zone backflow preventer devices were modeled as loss element nodes. A loss element node uses a flow-versus-pressure-loss curve to determine the pressure loss at a given flow.

Available Hydraulic Grade Line. Fire hydrant fire flow tests dated June 12, 2024, were used to estimate the available hydraulic grade lines for the computer analyses for PA-1, PA-2, and PA-3. A copy of the fire hydrant flow tests and their corresponding extrapolation tables are included in Appendix B.

Test Hydrant #382 is northwest of the Inwood Drive and Carlton Oaks Drive intersection and has a static pressure of 127 psi at a hydrant elevation of 335 feet, the available static hydraulic grade line at Test Hydrant #382 is calculated to be 628 feet.

Test Hydrant #1017 is southwest of the Cadorette Avenue and Carlton Oaks Drive intersection and has a static pressure of 131 psi at a hydrant elevation of 326 feet, the available static hydraulic grade line at Test Hydrant #1017 is calculated to be 628 feet.

PA-1 Private Domestic Water System Analysis. Appendix C presents the computer modeling results for PA-1's private domestic water system analysis and Exhibit A presents the corresponding Node and Pipe Diagram. The maximum expected demand of 410 gpm for Residential West (PA-1) was distributed throughout the model. Test Hydrant #1017 (Node A in Exhibit A) is used for the available hydraulic grade line to the site.

According to the computer model results for the PA-1 private water system, the minimum residual pressure in the private system for PA-1 is 98 psi and occurs at Node 520 (see Exhibit A) at an elevation of 318 feet. Figure 3 shows the recommended private domestic water distribution system sizing and configuration for PA-1.

The candidate reduced pressure zone backflow preventer used for the PA-1 analysis is presented in Appendix G.

LEGEND

PROJECT BOUNDARY

EXISTING PUBLIC WATER LINE (629 PRESSURE ZONE)

PROPOSED PUBLIC WATER LINE (629 PRESSURE ZONE)

PROPOSED PRIVATE DOMESTIC WATER LINE

PROPOSED METER

PROPOSED BACKFLOW PREVENTER

LETICIA DR

EX.10"

CARLTON OAKS DR

10"

WEST HILLS PKWY

10"

4"

4"

4"

4"

4"

4"

4"

PA-1

PROPOSED FIRE SERVICE FOR CONTINUATION SEE FIGURE 6

10"

8"

6"

4"

10"

THREE 2" DOMESTIC METERS AND BACKFLOW PREVENTERS

CARLTON OAKS PROJECT BOUNDARY

52

N

0 100 FEET

NOTE: FINISH FLOOR ELEVATIONS RANGE FROM 313 FEET TO 319 FEET.

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FIGURE 3

PA-1 PROPOSED DOMESTIC WATER

CARLTON OAKS COUNTRY CLUB AND RESORT

PA-2 Private Domestic Water System Analysis. Appendix D presents the computer modeling results for PA-2's private domestic water system analysis and Exhibit B presents the corresponding Node and Pipe Diagram. The maximum expected demand of 593 gpm for Residential North (PA-2) was distributed throughout the model. Test Hydrant #382 (Node B in Exhibit B) is used for the available hydraulic grade line to the site.

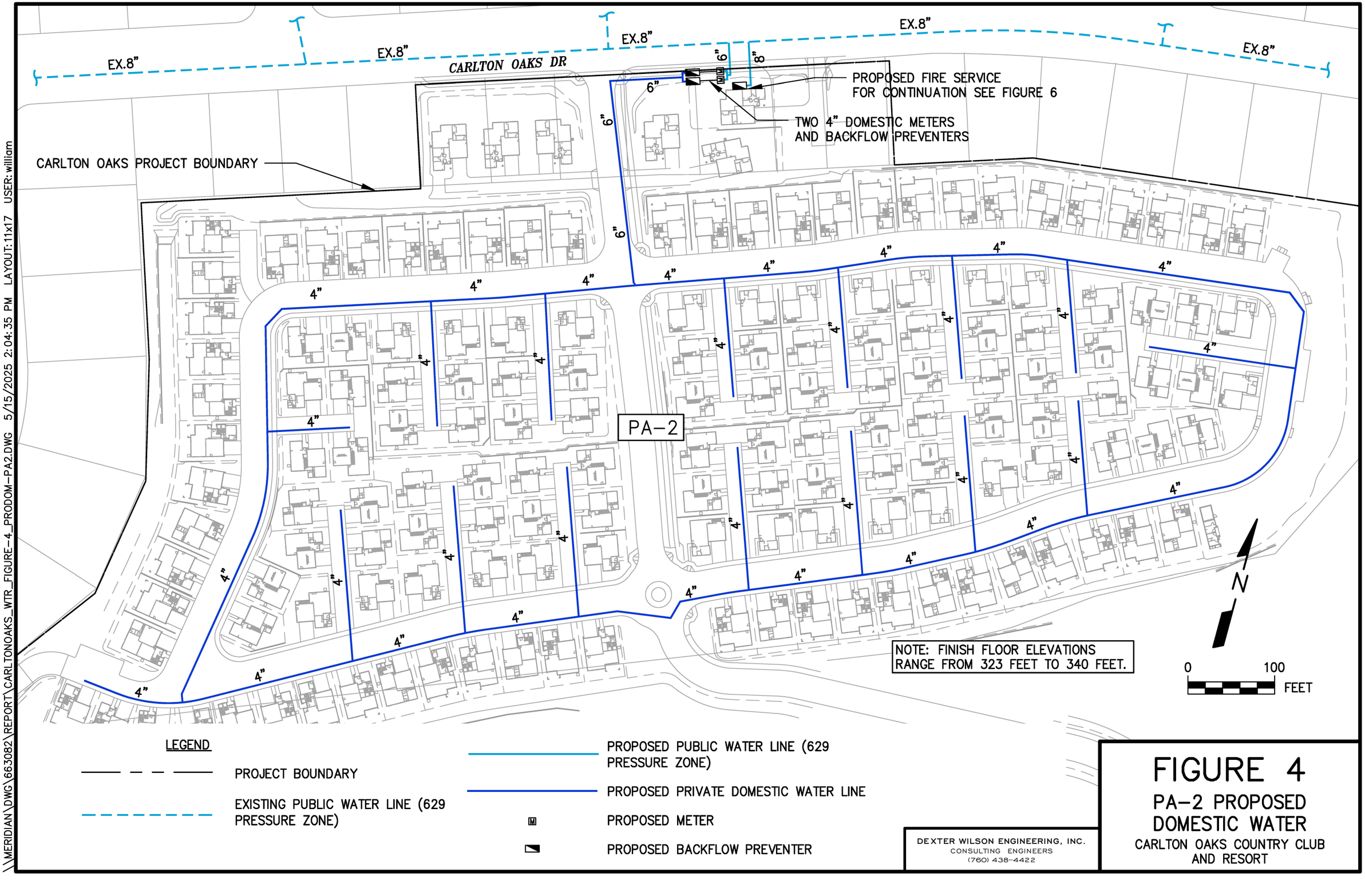
According to the computer model results for the PA-2 private water system, the minimum residual pressure in the private system for PA-2 is 86 psi and occurs at Node 760 (see Exhibit B) at an elevation of 332 feet. Figure 4 shows the recommended private domestic water distribution system sizing and configuration for PA-2.

The candidate reduced pressure zone backflow preventer used for the PA-2 analysis is presented in Appendix F.

PA-3 Private Domestic Water System Analysis. Appendix E presents the computer modeling results for PA-3's private domestic water system analysis and Exhibit C presents the corresponding Node and Pipe Diagram. The maximum expected demand of 161 gpm for the Resort Area (PA-3) was distributed throughout the model. Test Hydrant #382 (Node B in Exhibit C) is used for the available hydraulic grade line to the site.

According to the computer model results for the PA-3 private water system, the minimum residual pressure in the private system is 96 psi and occurs at Node 928 (see Exhibit C) at an elevation of 323 feet. Figure 5 shows the recommended private domestic water distribution system sizing and configuration for PA-3.

The candidate reduced pressure zone backflow preventer used for the PA-3 analysis is presented in Appendix G.



\\MERIDIAN\DWG\663082\REPORT\CARLTONOAKS_WTR_FIGURE-4_PRODOM-PA2.DWG 5/15/2025 2:04:35 PM LAYOUT:11x17 USER:william

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FIGURE 4

PA-2 PROPOSED DOMESTIC WATER

CARLTON OAKS COUNTRY CLUB AND RESORT

PEBBLE BEACH DR

CARLTON OAKS DR

EX.8"

EX.8"

EX.8"

A_4

A_5

TWO 2" DOMESTIC METERS AND BACKFLOW PREVENTERS

PA-2

PA-3

4"

4"

4"

4"

4"

FF=323.8'

FF=323.5'

FF=323.3'

FF=322.4'

FF=323.3'

CARLTON OAKS PROJECT BOUNDARY

LEGEND

PROJECT BOUNDARY

EXISTING PUBLIC WATER LINE (629 PRESSURE ZONE)

PROPOSED PUBLIC WATER LINE (629 PRESSURE ZONE)

PROPOSED PRIVATE DOMESTIC WATER LINE

PROPOSED METER

PROPOSED BACKFLOW PREVENTER

N

0 150 FEET

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FIGURE 5

PA-3 PROPOSED DOMESTIC WATER

CARLTON OAKS COUNTRY CLUB AND RESORT

Proposed Private Fire Protection System

Figure 6 shows the Carlton Oaks project proposed onsite private fire protection water system. For PA-1, PA-2, and PA-3, the proposed fire protection system is looped between a fire service from the public water line in West Hills Parkway and a second fire service from the public water line in Carlton Oaks Drive at PA-2. The fire protection system for PA-3 is a branch line extending from the proposed fire protection system within PA-2.

The fire flow analyzed for residential planning areas, PA-1 and PA-2, is 1,500 gpm. For PA-3, the fire flow analyzed is 2,500 gpm.

The following section of this report will discuss the private fire protection water system modeling that was performed to confirm that the private fire protection system will be able to deliver the required fire flow at greater than 20 psi residual pressure. As shown in Figure 6, the recommended fire protection system pipe size within PA-1 and PA-2 is 8" diameter. For PA-3 it is necessary to increase the pipe sizes to 10" and 12" diameter because of the higher fire flow for PA-3 (2,500 gpm) and the long length of piping needed.

The two 8" fire services for the Carlton Oaks project, one at the west end of PA-1 and the second at the north end of PA-2 will have 8" reduced pressure principle detector check assemblies at the right-of-way.

PA-1, PA-2, and PA-3 Private Fire Protection System Analysis. Appendix H presents the computer modeling results for PA-1, PA-2, and PA-3 private fire protection system analysis and Exhibit D presents the corresponding Node and Pipe Diagram. Appendix I presents a candidate reduced pressure detector assembly backflow preventer for the system.

The fire flow requirement of 1,500 gpm was modeled at individual fire hydrants in the PA-1 and PA-2 projects. The fire flow requirement of 2,500 gpm was modeled as split between fire hydrants in the PA-3 project. Test Hydrant #1017 (Node A in Exhibit D) is used for the available hydraulic grade line to the site. Table 2 presents a summary of the computer modeling results.

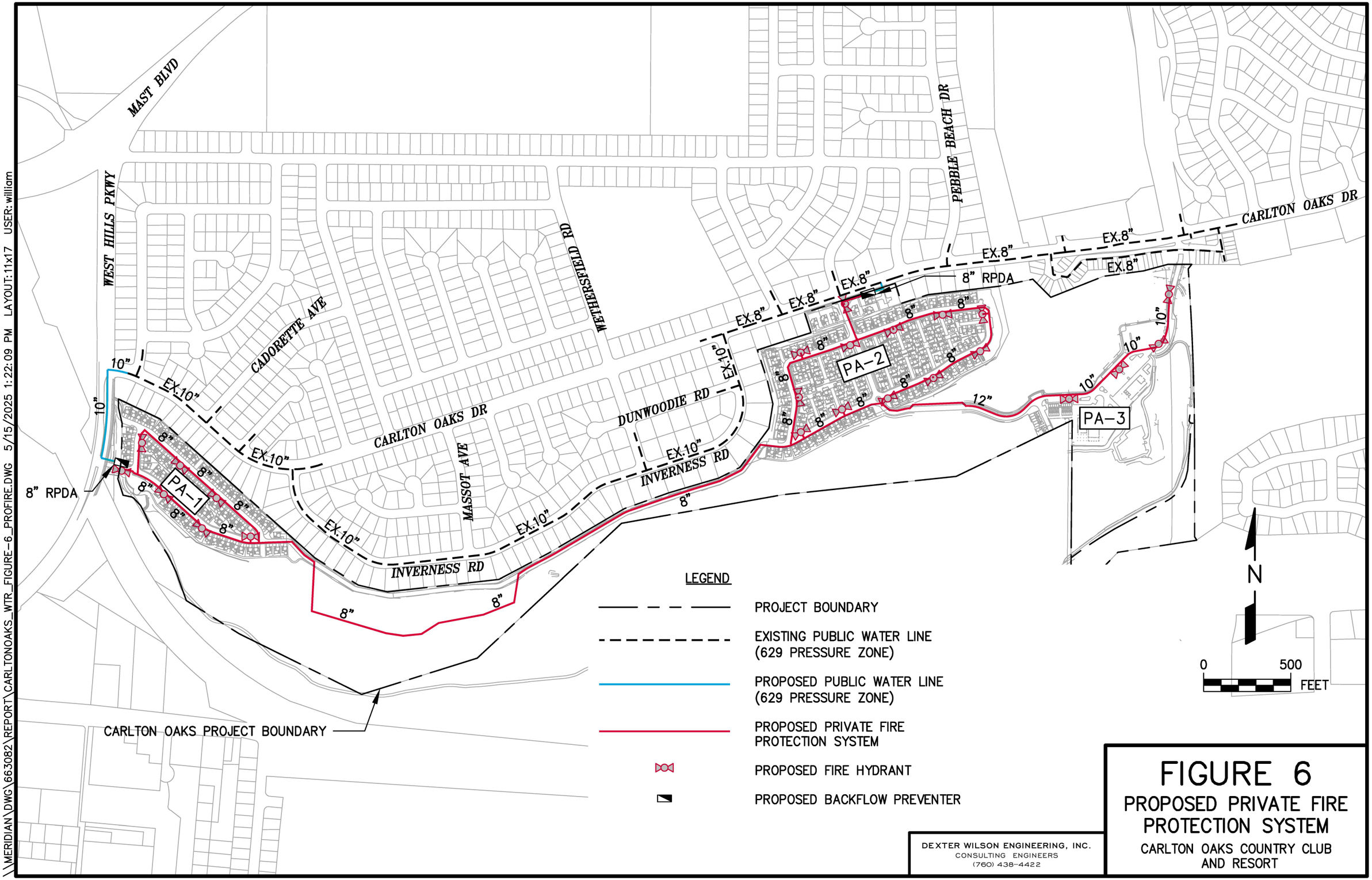

FIGURE 6
PROPOSED PRIVATE FIRE PROTECTION SYSTEM
CARLTON OAKS COUNTRY CLUB AND RESORT

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TABLE 2
FIRE FLOW ANALYSES FOR PA-1, PA-2, AND PA-3
COMPUTER MODELING SUMMARY

Planning Area	Fire Flow Node	Modeled Demand, gpm	Estimated Fire Hydrant Elevation, ft	Minimum Residual Pressure, psi
PA-1	Node 308	1,500	318	104
PA-1	Node 324	1,500	315	106
PA-2	Node 340	1,500	336	86
PA-2	Node 368	1,500	331	84
PA-3	Node 408 & Node 412	1,500 & 1,000	324 & 324	21 & 23
PA-3	Node 416 & Node 420	1,500 & 1,000	324 & 324	31 & 33

See Exhibit D for Node and Pipe Diagram

Under all fire flow scenarios, the fire flow requirement is being met with greater than 20 psi residual pressure at all locations within the project.

Conclusions and Recommendations

The following conclusions and recommendations are made relating to providing domestic and fire protection water service to the Carlton Oaks project.

1. The Carlton Oaks project will receive water service from the Padre Dam Municipal Water District. The water service pressure zone is the 629 Pressure Zone.

2. Maximum static water pressure within the Carlton Oaks project will range between 125 psi and 137 psi. Individual pressure regulators will be required on all water services to maintain building pressures below 80 psi per the Plumbing Code.

3. No existing water system improvements are needed for the Carlton Oaks project as was determined by the November 2021 Water Study prepared by HDR except for a 10" public water main extension in West Hills Parkway from Carlton Oaks Drive south to the location of services for Planning Area 1.

4. The onsite water system for the Carlton Oaks project is proposed to be a private system. Dual piping is proposed to provide separate service for private domestic water and private fire protection.

5. The private onsite domestic water distribution system will incorporate master water meters for each of the three planning areas for the Carlton Oaks project.

6. The master water meter installation for each planning area will be composed of at least two equally sized meters arranged in parallel to provide domestic service redundancy.

7. The preliminary sizing for domestic water meters results in the following recommendations. These domestic meter sizes will have to be confirmed when building plans are available for the individual Planning Areas.
    a. Planning Area 1 – three 2" meters
    b. Planning Area 2 – two 4" meters
    c. Planning Area 3 – two 2" meters

8. Private submeters will be installed on all dwelling units in PA-1 and PA-2, and at all buildings within PA-3.

9. The private fire protection water system is sized to provide 1,500 gpm fire flow for the residential development planning areas (PA-1 and PA-2), and 2,500 gpm fire flow for the hotel, cottages restaurant, and other amenities in PA-3.

10. Pipe materials for the private onsite domestic and fire protection systems are recommended to be in accordance with AWWA C900 PVC DR18 Class 235.

11. Public water line to be constructed by the Carlton Oaks project will be in accordance with the standards and specifications of the Padre Dam Municipal Water District.

Thank you for the opportunity to provide professional engineering services for the Carlton Oaks project. If you have any questions regarding the information or conclusions and recommendations presented in this report, please do not hesitate to call.

Dexter Wilson Engineering, Inc.

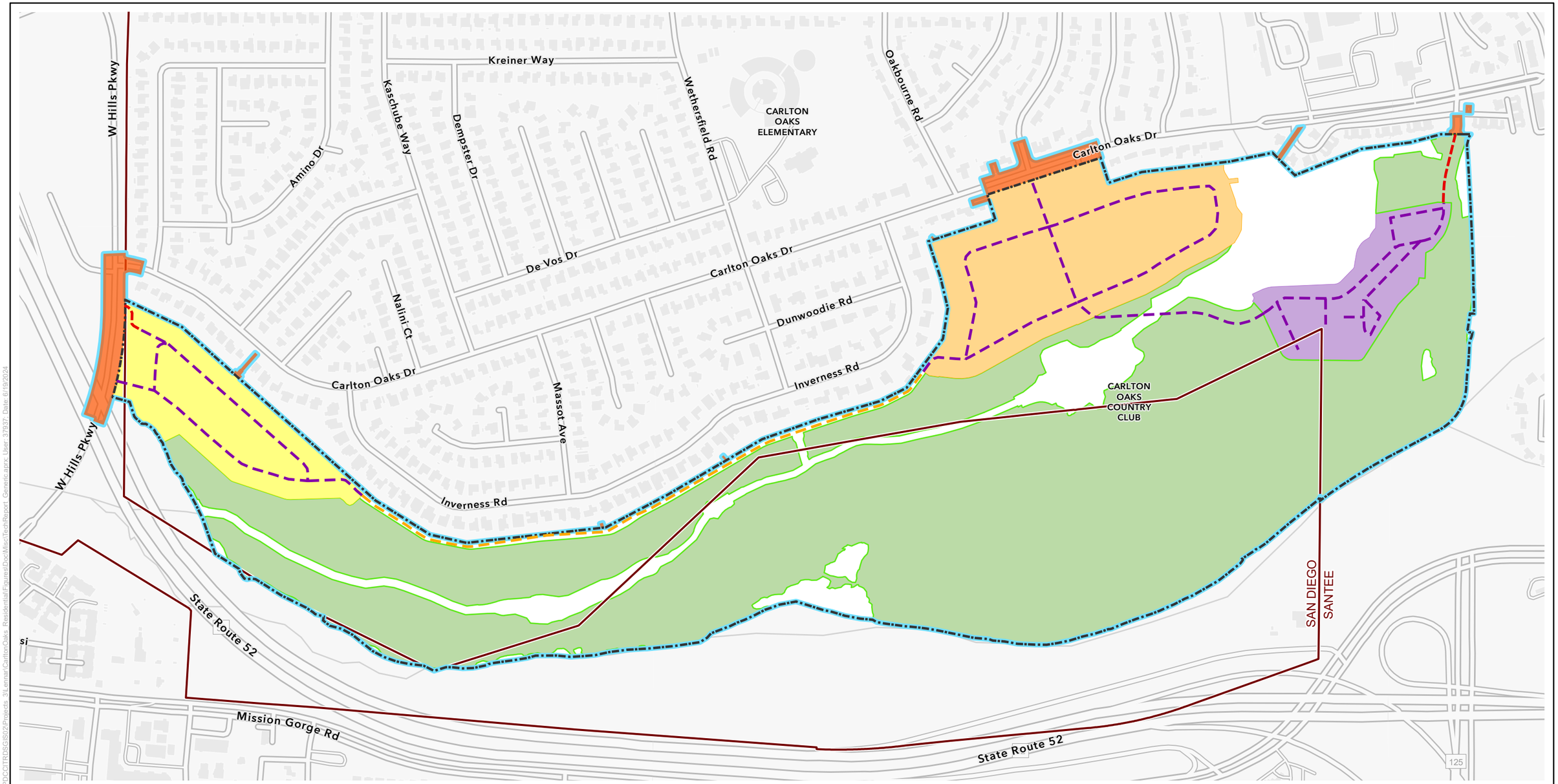
Andrew Oven, P.E.

AO:WT:ru:ah

cc: Marisa Lundstedt, Summit Planning Group
Troy Burns, Hunsaker & Associates San Diego

APPENDIX A

CARLTON OAKS SITE PLAN



Project Site
Off-Site Improvements
CEQA Study Area
City of Santee/San Diego Municipal Boundary
Residential North
Residential West
Golf Course Redesign
Hotel and Clubhouse
Emergency Vehicle Access Only
Private Utility Maintenance Road
Residential / Resort Circulation Roadway

Source: Site Plan-Hunsaker & Associates (2024)

ICF

N

0 225 450 Feet

1:5,400

Figure XX
Site Plan and Off-Site Improvements
Carlton Oaks Country Club and Resort

APPENDIX B

PADRE DAM MUNICIPAL WATER DISTRICT
FIRE HYDRANT FLOW TESTS &
EXTRAPOLATION CALCULATIONS

PADRE DAM
Municipal Water District

Fire Flow Request Form

1. FIRE FLOW TEST FEE IS $50 PER FIRE HYDRANT. PAYMENT CAN BE MADE OUT TO PADRE DAM MUNICIPAL WATER VIA CHECK OR MONEY ORDER.
2. PLEASE SUBMIT THE FORM ALONG WITH PAYMENT:
DROP OFF IN PERSON:
9300 FANITA PARKWAY
SANTEE, CA 92071
MAIL TO:
PO BOX 719003
SANTEE, CA 92072
3. NOTIFICATION OF APPROVAL OR REASONS FOR DENIAL WILL BE SENT VIA EMAIL.
4. THE RESULTS ARE VALID FOR 6 MONTHS.

Section A: TO BE COMPLETED BY CUSTOMER

Name: Andrew Oven

Project Name: Carlton Oaks

Project Address: 9200 Inwood Drive, Santee, CA (Carlton Oaks Golf Course)

Phone: 760-438-4422

E-mail: andrew@dwilsoneng.com

Comments: Requesting a fire flow test at Cadorette Ave & Carlton Oaks Dr

Fire Flow is defined as the rate of water flow in gallons per minute (GPM) at a specified residual pressure (20 PSI) during a major fire event. Our Fire Flow study was performed using a modeling application that simulated a fire flow demand on our potable distribution network at each node. Model nodes were placed throughout the network. Fire flows are computed at each node representative of flow available at that location. We match the location of the requested fire hydrant with the closest node. We do our due diligence to ensure that the certified flow is appropriate for the requested location. The results have been cross checked with physical flow tests performed in the field. The maximum allowable velocity in our main during a fire event is 10 feet per second (FPS). If the modeled results exceed 10 FPS, we will certify flow per calculated results based on pipe diameter and given velocity.

Section B: TO BE COMPLETED BY PADRE DAM

Water Purveyor: **Padre Dam Municipal Water District**

Location of Test: FH#1017 - West of intersection of Cadorette Ave & Carlton Oaks Dr

☑ Looped system ☐ Dead end system

Flow Test Results	
Hydrant Number[1]:	382
Static Pressure (PSI)[2]:	127
Residual Pressure at Fire Flow (PSI)[2]:	105
Model Flow (GPM) at 20 PSI Residual[2]:	4,538
Certified Flow (GPM) at 20 PSI Residual restricted by 10 ft/sec max velocity[3]:	1,567

1. *See attached plat for Hydrant location.*
2. *Information obtained using a computer model.*
3. *Calculated flow based on Pipe Diameter and Max Velocity.*

Comments: The results are valid for 6 months.

Max fire flow is limited from 8" ACP Watermain.

Name

Title

Signature

6/12/2024

Date

Section C: PAYMENT

Modeled Fire Flow fees are $50 per fire hydrant

Check # 4965

Date Paid 5/29/2024

PADRE DAM
Municipal Water District

FH# 382
Inwood Dr & Carlton Oaks Dr

Printed Date: 6/12/2024

Fire Hydrant Flow Test Date 6/12/2024
Fire Hydrant Number 382

Input Flow Test Results

Static Pressure	127 PSI			
Residual Pressure	105 PSI			
Hydrant Flow	1567 GPM			
Actual Hydrant Elevation	Feet	HGL	Feet	
Estimated Hydrant Elevation	335 Feet	HGL	628.1 Feet	

Equation $\Delta H = k\,Q^{1.85}$

k = 6.2342E-05

Extrapolated Calculations

Q, gpm	Residual Pressure	Available HGL
500	124.3 psi	622.0 ft
700	122.0 psi	616.7 ft
900	119.1 psi	609.9 ft
1100	115.6 psi	601.7 ft
1300	111.4 psi	592.2 ft
1500	106.7 psi	581.3 ft
1700	101.4 psi	569.1 ft
1900	95.6 psi	555.6 ft
2000	92.4 psi	548.4 ft
2100	89.2 psi	540.8 ft
2300	82.3 psi	524.8 ft
2500	74.8 psi	507.6 ft
2700	66.8 psi	489.2 ft
3000	53.8 psi	459.3 ft
3100	49.3 psi	448.7 ft
3300	39.7 psi	426.7 ft
3500	29.7 psi	403.6 ft
3700	19.2 psi	379.3 ft
3900	8.1 psi	353.8 ft
4000	2.4 psi	340.6 ft
4100	-3.4 psi	327.2 ft
4300	-15.4 psi	299.5 ft
4500	-27.9 psi	270.7 ft
4700	-40.9 psi	240.7 ft
4900	-54.3 psi	209.7 ft
5100	-68.2 psi	177.5 ft

Residual Pressure, psi	Available Flow, gpm
0 psi	4,042
10 psi	3,867
20 psi	3,685
30 psi	3,494
40 psi	3,295
50 psi	3,084
60 psi	2,861
70 psi	2,622
80 psi	2,362
90 psi	2,075
100 psi	1,750
110 psi	1,363
120 psi	844
130 psi	Residual Pressure Exceeds Static Pressure
140 psi	Residual Pressure Exceeds Static Pressure
150 psi	Residual Pressure Exceeds Static Pressure
160 psi	Residual Pressure Exceeds Static Pressure
170 psi	Residual Pressure Exceeds Static Pressure
180 psi	Residual Pressure Exceeds Static Pressure
190 psi	Residual Pressure Exceeds Static Pressure

PADRE DAM
Municipal Water District

Fire Flow Request Form

1. FIRE FLOW TEST FEE IS $50 PER FIRE HYDRANT. PAYMENT CAN BE MADE OUT TO PADRE DAM MUNICIPAL WATER VIA CHECK OR MONEY ORDER.
2. PLEASE SUBMIT THE FORM ALONG WITH PAYMENT:
DROP OFF IN PERSON:
9300 FANITA PARKWAY
SANTEE, CA 92071
MAIL TO:
PO BOX 719003
SANTEE, CA 92072
3. NOTIFICATION OF APPROVAL OR REASONS FOR DENIAL WILL BE SENT VIA EMAIL.
4. THE RESULTS ARE VALID FOR 6 MONTHS.

Section A: TO BE COMPLETED BY CUSTOMER

Name: Andrew Oven

Project Name: Carlton Oaks

Project Address: 9200 Inwood Drive, Santee, CA (Carlton Oaks Golf Course)

Phone: 760-438-4422

E-mail: andrew@dwilsoneng.com

Comments: Requesting a fire flow test at Cadorette Ave & Carlton Oaks Dr

Fire Flow is defined as the rate of water flow in gallons per minute (GPM) at a specified residual pressure (20 PSI) during a major fire event. Our Fire Flow study was performed using a modeling application that simulated a fire flow demand on our potable distribution network at each node. Model nodes were placed throughout the network. Fire flows are computed at each node representative of flow available at that location. We match the location of the requested fire hydrant with the closest node. We do our due diligence to ensure that the certified flow is appropriate for the requested location. The results have been cross checked with physical flow tests performed in the field. The maximum allowable velocity in our main during a fire event is 10 feet per second (FPS). If the modeled results exceed 10 FPS, we will certify flow per calculated results based on pipe diameter and given velocity.

Section B: TO BE COMPLETED BY PADRE DAM

Water Purveyor: **Padre Dam Municipal Water District**

Location of Test: FH#1017 - West of intersection of Cadorette Ave & Carlton Oaks Dr

☑ Looped system ☐ Dead end system

Flow Test Results	
Hydrant Number[1]:	1017
Static Pressure (PSI)[2]:	131
Residual Pressure at Fire Flow (PSI)[2]:	122
Model Flow (GPM) at 20 PSI Residual[2]:	6,638
Certified Flow (GPM) at 20 PSI Residual restricted by 10 ft/sec max velocity[3]:	2,448

1. *See attached plat for Hydrant location.*
2. *Information obtained using a computer model.*
3. *Calculated flow based on Pipe Diameter and Max Velocity.*

Comments: The results are valid for 6 months.

Max fire flow is limited from 10" ACP Watermain.

Name

Title

Signature

6/12/2024

Date

Section C: PAYMENT

Modeled Fire Flow fees are $50 per fire hydrant

Check # 4965

Date Paid 5/29/2024

PADRE DAM
Municipal Water District

FH# 1017
W of Cadorette Ave & Carlton Oaks Dr

Printed Date: 6/12/2024

Fire Hydrant Flow Test Date 6/12/2024
Fire Hydrant Number 1017

Input Flow Test Results

Static Pressure	131 PSI		
Residual Pressure	122 PSI		
Hydrant Flow	2448 GPM		
Actual Hydrant Elevation	Feet	HGL	Feet
Estimated Hydrant Elevation	326 Feet	HGL	628.3 Feet

Equation $\Delta H = k Q^{1.85}$

k = 1.11732E-05

Extrapolated Calculations

Q, gpm	Residual Pressure	Available HGL
500	130.5 psi	627.2 ft
700	130.1 psi	626.3 ft
900	129.6 psi	625.1 ft
1100	129.0 psi	623.6 ft
1300	128.2 psi	621.9 ft
1500	127.4 psi	620.0 ft
1700	126.4 psi	617.8 ft
1900	125.4 psi	615.4 ft
2000	124.8 psi	614.1 ft
2100	124.2 psi	612.7 ft
2300	123.0 psi	609.8 ft
2500	121.6 psi	606.8 ft
2700	120.2 psi	603.4 ft
3000	117.9 psi	598.1 ft
3100	117.1 psi	596.2 ft
3300	115.4 psi	592.3 ft
3500	113.6 psi	588.1 ft
3700	111.7 psi	583.7 ft
3900	109.7 psi	579.2 ft
4000	108.7 psi	576.8 ft
4100	107.6 psi	574.4 ft
4300	105.5 psi	569.5 ft
4500	103.2 psi	564.3 ft
4700	100.9 psi	558.9 ft
4900	98.5 psi	553.4 ft
5100	96.0 psi	547.6 ft

Residual Pressure, psi	Available Flow, gpm
0 psi	10,411
10 psi	9,973
20 psi	9,519
30 psi	9,045
40 psi	8,550
50 psi	8,028
60 psi	7,476
70 psi	6,887
80 psi	6,252
90 psi	5,556
100 psi	4,777
110 psi	3,870
120 psi	2,728
130 psi	746
140 psi	Residual Pressure Exceeds Static Pressure
150 psi	Residual Pressure Exceeds Static Pressure
160 psi	Residual Pressure Exceeds Static Pressure
170 psi	Residual Pressure Exceeds Static Pressure
180 psi	Residual Pressure Exceeds Static Pressure
190 psi	Residual Pressure Exceeds Static Pressure

APPENDIX C

PA-1 DOMESTIC WATER ANALYSIS

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.
475	476	J9634	124.50	10.00	120.0000	0.55
477	478	476	30.40	4.00	120.0000	0.75
479	478	I-480	15.80	2.00	120.0000	0.55
481	O-480	I-482	16.20	2.00	120.0000	0.00
483	O-482	496	20.50	2.00	120.0000	0.25
485	I-486	478	16.20	2.00	120.0000	1.00
487	478	I-488	6.60	2.00	120.0000	1.00
489	I-490	O-486	17.20	2.00	120.0000	0.70
491	O-488	I-492	15.80	2.00	120.0000	0.00
493	496	O-490	18.30	2.00	120.0000	0.05
495	O-492	496	10.90	2.00	120.0000	0.25
501	504	496	93.50	6.00	120.0000	1.16
505	504	508	182.80	4.00	120.0000	1.05
509	512	508	78.80	4.00	120.0000	0.30
513	512	514	121.80	4.00	120.0000	0.48
515	516	512	285.70	4.00	120.0000	0.58
517	520	516	279.90	4.00	120.0000	0.30
521	524	520	368.30	4.00	120.0000	0.18
525	524	526	153.90	4.00	120.0000	0.60
527	524	528	46.70	4.00	120.0000	0.30
529	528	532	290.20	4.00	120.0000	0.30
533	532	536	293.40	4.00	120.0000	0.00
537	536	504	188.30	4.00	120.0000	0.48
2095	A	1838	356.90	10.00	120.0000	0.60
P2133	J6932	1838	171.10	10.00	120.0000	0.45
P2135	J9634	J6932	543.40	10.00	120.0000	0.70

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 480 DESCRIBED BY THE FOLLOWING DATA: (ID= 2)

HEAD (ft)	FLOWRATE (gpm)
-0.46	0.00
-2.31	80.00
-4.62	100.00
-16.15	200.00

THERE IS A DEVICE AT NODE 482 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)
-23.08	0.00
-28.85	120.00
-39.23	240.00

THERE IS A DEVICE AT NODE 486 .....> (ID= 2)

THERE IS A DEVICE AT NODE 488 .....> (ID= 2)

THERE IS A DEVICE AT NODE 490 .....> (ID= 1)

THERE IS A DEVICE AT NODE 492 .....> (ID= 1)

THERE IS A DEVICE AT NODE A DESCRIBED BY THE FOLLOWING DATA: (ID= 3)

HEAD (ft)	FLOWRATE (gpm)
302.31	0.00
281.54	2448.00
227.33	4896.00

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
476		0.00	314.00	
478		0.00	314.00	
O-480	SENSUS OMNI	0.00	314.00	
O-482	FEBCO LF825Y	0.00	314.00	
O-486	SENSUS OMNI	0.00	314.00	
O-488	SENSUS OMNI	0.00	314.00	
O-490	FEBCO LF825Y	0.00	314.00	
O-492	FEBCO LF825Y	0.00	314.00	
496		0.00	314.00	
504		41.00	314.00	
508		41.00	315.00	
512		41.00	315.00	
514		41.00	317.00	
516		41.00	318.00	
520		41.00	318.00	
524		41.00	316.00	
526		41.00	315.00	
528		0.00	315.00	
532		41.00	315.00	
536		41.00	314.00	
1838		0.00	330.00	
A		----	326.00	326.00
J6932		0.00	329.00	
J9634		0.00	323.00	
I-480	SENSUS OMNI	0.00	314.00	
I-482	FEBCO LF825Y	0.00	314.00	
I-486	SENSUS OMNI	0.00	314.00	
I-488	SENSUS OMNI	0.00	314.00	
I-490	FEBCO LF825Y	0.00	314.00	
I-492	FEBCO LF825Y	0.00	314.00	

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 = 5
MAXIMUM AND MINIMUM VELOCITIES = 5

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

NUMBER OF PIPES .....(P) = 26
NUMBER OF END NODES .....(J) = 23
NUMBER OF PRIMARY LOOPS .....(L) = 3
NUMBER OF SUPPLY NODES .....(F) = 1
NUMBER OF SUPPLY ZONES .....(Z) = 1

==========

Case: 1

Carlton Oaks Country Club and Resort
Maximum Expected Demand
PA-1 Private Domestic System Analysis

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
475	476	J9634	-410.03	0.17	0.02	1.67	1.56	1.37
477	478	476	-410.03	3.61	1.28	10.47	160.83	118.85
479	478	I-480	132.98	6.82	1.57	13.58	531.53	431.87
481	O-480	I-482	132.98	7.00	0.00	13.58	431.87	431.87
483	O-482	496	132.98	8.85	0.72	13.58	466.78	431.87
485	I-486	478	-128.82	6.60	2.69	13.15	573.03	407.18
487	478	I-488	148.23	3.49	3.56	15.14	1067.02	528.03
489	I-490	O-486	-128.82	7.00	1.88	13.15	516.53	407.18
491	O-488	I-492	148.23	8.34	0.00	15.14	528.03	528.03
493	496	O-490	-128.82	7.45	0.13	13.15	414.52	407.18
495	O-492	496	148.23	5.76	0.89	15.14	609.62	528.03
501	504	496	-410.03	1.54	0.39	4.65	20.67	16.50
505	504	508	203.50	5.94	0.44	5.20	34.88	32.47
509	512	508	-162.49	1.69	0.08	4.15	22.42	21.41
513	512	514	41.00	0.20	0.01	1.05	1.74	1.67
515	516	512	-80.49	1.67	0.04	2.05	5.96	5.83
517	520	516	-39.49	0.44	0.00	1.01	1.58	1.56
521	524	520	1.52	0.00	0.00	0.04	0.00	0.00
525	524	526	41.00	0.26	0.01	1.05	1.74	1.67
527	524	528	-83.52	0.29	0.02	2.13	6.69	6.24
529	528	532	-83.52	1.81	0.02	2.13	6.31	6.24
533	532	536	-124.52	3.84	0.00	3.18	13.08	13.08
537	536	504	-165.53	4.17	0.13	4.23	22.86	22.15
2095	A	1838	410.03	0.49	0.03	1.67	1.44	1.37
P2133	J6932	1838	-410.03	0.23	0.02	1.67	1.49	1.37
P2135	J9634	J6932	-410.03	0.75	0.03	1.67	1.43	1.37

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
480	132.98	298.52	290.10	-8.4
482	132.98	283.10	253.30	-29.8
486	128.82	297.64	289.69	-7.9
488	148.23	299.88	289.70	-10.2
490	128.82	280.81	251.32	-29.5
492	148.23	281.35	250.38	-31.0
A	410.03	0.00	301.55	301.5

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
476		0.00	625.81	314.00	311.81	135.12
478		0.00	620.92	314.00	306.92	133.00
O-480	SENSUS OMNI	0.00	604.10	314.00	290.10	125.71
O-482	FEBCO LF825Y	0.00	567.30	314.00	253.30	109.76
O-486	SENSUS OMNI	0.00	603.69	314.00	289.69	125.53
O-488	SENSUS OMNI	0.00	603.70	314.00	289.70	125.53
O-490	FEBCO LF825Y	0.00	565.32	314.00	251.32	108.90
O-492	FEBCO LF825Y	0.00	564.38	314.00	250.38	108.50
496		0.00	557.73	314.00	243.73	105.62
504		41.00	555.80	314.00	241.80	104.78
508		41.00	549.42	315.00	234.42	101.58
512		41.00	547.66	315.00	232.66	100.82
514		41.00	547.44	317.00	230.44	99.86
516		41.00	545.95	318.00	227.95	98.78
520		41.00	545.51	318.00	227.51	98.59
524		41.00	545.51	316.00	229.51	99.46
526		41.00	545.25	315.00	230.25	99.77
528		0.00	545.83	315.00	230.83	100.02
532		41.00	547.66	315.00	232.66	100.82
536		41.00	551.49	314.00	237.49	102.91
1838		0.00	627.03	330.00	297.03	128.71
A		----	627.55	326.00	301.55	130.67
J6932		0.00	626.78	329.00	297.78	129.04
J9634		0.00	626.00	323.00	303.00	131.30
I-480	SENSUS OMNI	0.00	612.52	314.00	298.52	129.36
I-482	FEBCO LF825Y	0.00	597.10	314.00	283.10	122.68
I-486	SENSUS OMNI	0.00	611.64	314.00	297.64	128.98
I-488	SENSUS OMNI	0.00	613.88	314.00	299.88	129.95
I-490	FEBCO LF825Y	0.00	594.81	314.00	280.81	121.68
I-492	FEBCO LF825Y	0.00	595.35	314.00	281.35	121.92

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
476	135.12	520	98.59
478	133.00	516	98.78
J9634	131.30	524	99.46
A	130.67	526	99.77
I-488	129.95	514	99.86

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
487	15.14	521	0.04
491	15.14	517	1.01
495	15.14	513	1.05
479	13.58	525	1.05
481	13.58	475	1.67

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
A	410.03	

NET SYSTEM INFLOW = 410.03
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 410.03

APPENDIX D

PA-2 DOMESTIC WATER ANALYSIS

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.
687	686	688	42.10	6.00	120.0000	1.30
689	688	I-692	14.60	4.00	120.0000	1.00
691	688	I-694	11.90	4.00	120.0000	1.00
693	O-692	I-696	31.00	4.00	120.0000	0.00
695	O-694	I-698	30.80	4.00	120.0000	0.00
697	O-696	700	17.90	4.00	120.0000	0.00
699	O-698	700	19.10	4.00	120.0000	0.00
701	704	700	320.80	6.00	120.0000	0.55
705	704	708	99.10	4.00	120.0000	1.05
709	708	712	133.70	4.00	120.0000	1.05
713	708	716	134.50	4.00	120.0000	0.38
717	716	720	136.80	4.00	120.0000	1.05
721	716	724	132.20	4.00	120.0000	0.78
725	724	728	137.70	4.00	120.0000	1.05
729	724	732	135.20	4.00	120.0000	0.78
733	732	736	126.70	4.00	120.0000	1.05
737	732	740	350.80	4.00	120.0000	0.96
741	740	744	167.40	4.00	120.0000	1.05
745	740	748	337.30	4.00	120.0000	0.78
749	748	752	132.80	4.00	120.0000	1.05
753	748	756	135.50	4.00	120.0000	0.90
757	756	760	156.80	4.00	120.0000	1.05
761	756	764	131.00	4.00	120.0000	0.60
765	764	768	165.80	4.00	120.0000	1.05
769	764	772	134.00	4.00	120.0000	0.60
773	772	776	165.50	4.00	120.0000	1.05
777	780	772	208.40	4.00	120.0000	0.84
781	780	784	173.50	4.00	120.0000	0.60
785	788	780	135.80	4.00	120.0000	0.60
789	788	792	167.80	4.00	120.0000	1.05
793	796	788	134.30	4.00	120.0000	0.60
797	796	800	171.30	4.00	120.0000	1.05
801	796	804	198.10	4.00	120.0000	0.38
805	804	808	117.50	4.00	120.0000	0.30
809	804	812	339.60	4.00	120.0000	1.53
813	812	816	94.40	4.00	120.0000	1.05
817	812	820	320.10	4.00	120.0000	0.96
821	820	824	142.00	4.00	120.0000	1.05
825	820	828	132.40	4.00	120.0000	0.30
829	828	832	142.60	4.00	120.0000	1.05
833	704	828	105.10	4.00	120.0000	0.60
P2197	B	686	13.70	8.00	120.0000	1.75

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 692 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)
-0.23	0.00
-2.31	300.00
-4.62	450.00
-9.23	600.00
-13.85	700.00
-20.77	1000.00

THERE IS A DEVICE AT NODE 694 .....> (ID= 1)

THERE IS A DEVICE AT NODE 696 DESCRIBED BY THE FOLLOWING DATA: (ID= 2)

HEAD (ft)	FLOWRATE (gpm)
-25.38	0.00
-25.62	700.00
-27.69	800.00

THERE IS A DEVICE AT NODE 698 .....> (ID= 2)

THERE IS A DEVICE AT NODE B DESCRIBED BY THE FOLLOWING DATA: (ID= 3)

HEAD (ft)	FLOWRATE (gpm)
293.08	0.00
242.31	1567.00
109.80	3134.00

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
686		0.00	339.00	
688		0.00	339.00	
I-692	SENSUS OMNI	0.00	339.00	
I-694	SENSUS OMNI	0.00	339.00	
I-696	FEBCO LF860	0.00	339.00	
I-698	FEBCO LF860	0.00	339.00	
700		0.00	339.00	
704		0.00	339.00	
708		19.15	339.00	
712		19.04	338.00	
716		19.15	335.00	
720		19.04	334.00	
724		19.15	331.00	
728		19.04	331.00	
732		19.15	330.00	
736		19.04	330.00	
740		19.15	326.00	
744		19.04	327.00	
748		19.15	330.00	
752		19.04	330.00	
756		19.15	331.00	
760		19.04	332.00	
764		19.15	330.00	
768		19.04	331.00	
772		19.15	329.00	
776		19.04	331.00	
780		19.15	329.00	
784		19.04	331.00	
788		19.15	329.00	
792		19.04	330.00	
796		19.15	327.00	
800		19.04	329.00	
804		19.15	326.00	
808		19.04	325.00	
812		19.15	333.00	
816		19.04	333.00	
820		19.15	337.00	
824		19.04	338.00	
828		19.15	339.00	
832		19.04	339.00	
B		----	335.00	335.00
O-692	SENSUS OMNI	0.00	339.00	
O-694	SENSUS OMNI	0.00	339.00	
O-696	FEBCO LF860	0.00	339.00	
O-698	FEBCO LF860	0.00	339.00	

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 = 5
MAXIMUM AND MINIMUM VELOCITIES = 5

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

NUMBER OF PIPES .....(P) = 42
NUMBER OF END NODES .....(J) = 40
NUMBER OF PRIMARY LOOPS .....(L) = 2
NUMBER OF SUPPLY NODES .....(F) = 1
NUMBER OF SUPPLY ZONES .....(Z) = 1

==========

Case: 1

Carlton Oaks Country Club and Resort
Maximum Expected Demand
PA-2 Private Domestic System Analysis

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
687	686	688	611.00	1.45	0.97	6.93	57.58	34.54
689	688	I-692	304.21	1.00	0.94	7.77	132.52	68.38
691	688	I-694	306.79	0.83	0.95	7.83	149.50	69.46
693	O-692	I-696	304.21	2.12	0.00	7.77	68.38	68.38
695	O-694	I-698	306.79	2.14	0.00	7.83	69.46	69.46
697	O-696	700	304.21	1.22	0.00	7.77	68.38	68.38
699	O-698	700	306.79	1.33	0.00	7.83	69.46	69.46
701	704	700	-611.00	11.08	0.41	6.93	35.82	34.54
705	704	708	316.33	7.28	1.06	8.08	84.24	73.51
709	708	712	19.04	0.05	0.00	0.49	0.43	0.40
713	708	716	278.14	7.79	0.30	7.10	60.14	57.92
717	716	720	19.04	0.06	0.00	0.49	0.43	0.40
721	716	724	239.95	5.83	0.45	6.13	47.50	44.06
725	724	728	19.04	0.06	0.00	0.49	0.43	0.40
729	724	732	201.76	4.32	0.32	5.15	34.34	31.96
733	732	736	19.04	0.05	0.00	0.49	0.43	0.40
737	732	740	163.58	7.60	0.26	4.18	22.41	21.67
741	740	744	19.04	0.07	0.00	0.49	0.43	0.40
745	740	748	125.39	4.47	0.12	3.20	13.61	13.25
749	748	752	19.04	0.05	0.00	0.49	0.43	0.40
753	748	756	87.20	0.92	0.07	2.23	7.27	6.76
757	756	760	19.04	0.06	0.00	0.49	0.43	0.40
761	756	764	49.01	0.30	0.01	1.25	2.44	2.33
765	764	768	19.04	0.07	0.00	0.49	0.43	0.40
769	764	772	10.83	0.02	0.00	0.28	0.15	0.14
773	772	776	19.04	0.07	0.00	0.49	0.43	0.40
777	780	772	27.36	0.16	0.01	0.70	0.82	0.79

781	780	784	19.04	0.07	0.00	0.49	0.42	0.40
785	788	780	65.55	0.54	0.03	1.67	4.18	3.98
789	788	792	19.04	0.07	0.00	0.49	0.43	0.40
793	796	788	103.74	1.25	0.07	2.65	9.81	9.32
797	796	800	19.04	0.07	0.00	0.49	0.43	0.40
801	796	804	-141.93	3.30	0.08	3.62	17.05	16.66
805	804	808	19.04	0.05	0.00	0.49	0.41	0.40
809	804	812	-180.11	8.80	0.50	4.60	27.38	25.90
813	812	816	19.04	0.04	0.00	0.49	0.44	0.40
817	812	820	-218.30	11.84	0.46	5.57	38.43	36.98
821	820	824	19.04	0.06	0.00	0.49	0.43	0.40
825	820	828	-256.49	6.60	0.20	6.55	51.36	49.85
829	828	832	19.04	0.06	0.00	0.49	0.43	0.40
833	704	828	294.68	6.78	0.53	7.52	69.48	64.46
P2197	B	686	611.00	0.12	0.41	3.90	38.67	8.51

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
692	304.21	275.32	272.95	-2.4
694	306.79	275.47	273.08	-2.4
696	304.21	270.83	245.45	-25.4
698	306.79	270.94	245.55	-25.4
B	611.00	0.00	284.20	284.2

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
686		0.00	618.67	339.00	279.67	121.19
688		0.00	616.25	339.00	277.25	120.14
I-692	SENSUS OMNI	0.00	614.32	339.00	275.32	119.30
I-694	SENSUS OMNI	0.00	614.47	339.00	275.47	119.37
I-696	FEBCO LF860	0.00	609.83	339.00	270.83	117.36
I-698	FEBCO LF860	0.00	609.94	339.00	270.94	117.41
700		0.00	583.22	339.00	244.22	105.83
704		0.00	571.74	339.00	232.74	100.85
708		19.15	563.39	339.00	224.39	97.23
712		19.04	563.33	338.00	225.33	97.64
716		19.15	555.30	335.00	220.30	95.46
720		19.04	555.24	334.00	221.24	95.87
724		19.15	549.02	331.00	218.02	94.48
728		19.04	548.96	331.00	217.96	94.45
732		19.15	544.38	330.00	214.38	92.90
736		19.04	544.32	330.00	214.32	92.87
740		19.15	536.51	326.00	210.51	91.22
744		19.04	536.44	327.00	209.44	90.76
748		19.15	531.92	330.00	201.92	87.50
752		19.04	531.87	330.00	201.87	87.47

756		19.15	530.94	331.00	199.94	86.64
760		19.04	530.87	332.00	198.87	86.18
764		19.15	530.62	330.00	200.62	86.93
768		19.04	530.55	331.00	199.55	86.47
772		19.15	530.60	329.00	201.60	87.36
776		19.04	530.53	331.00	199.53	86.46
780		19.15	530.77	329.00	201.77	87.43
784		19.04	530.70	331.00	199.70	86.54
788		19.15	531.34	329.00	202.34	87.68
792		19.04	531.27	330.00	201.27	87.21
796		19.15	532.65	327.00	205.65	89.12
800		19.04	532.58	329.00	203.58	88.22
804		19.15	536.03	326.00	210.03	91.01
808		19.04	535.98	325.00	210.98	91.43
812		19.15	545.33	333.00	212.33	92.01
816		19.04	545.29	333.00	212.29	91.99
820		19.15	557.63	337.00	220.63	95.61
824		19.04	557.57	338.00	219.57	95.15
828		19.15	564.43	339.00	225.43	97.69
832		19.04	564.37	339.00	225.37	97.66
B		----	619.20	335.00	284.20	123.15
O-692	SENSUS OMNI	0.00	611.95	339.00	272.95	118.28
O-694	SENSUS OMNI	0.00	612.08	339.00	273.08	118.33
O-696	FEBCO LF860	0.00	584.45	339.00	245.45	106.36
O-698	FEBCO LF860	0.00	584.55	339.00	245.55	106.41

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
B	123.15	760	86.18
686	121.19	776	86.46
688	120.14	768	86.47
I-694	119.37	784	86.54
I-692	119.30	756	86.64

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
705	8.08	769	0.28
695	7.83	709	0.49
691	7.83	717	0.49
699	7.83	725	0.49
693	7.77	733	0.49

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
B	611.00	

NET SYSTEM INFLOW = 611.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 611.00

APPENDIX E

PA-3 DOMESTIC WATER ANALYSIS

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.
901	904	900	42.00	4.00	120.0000	1.30
905	904	I-906	21.20	2.00	120.0000	1.00
907	904	I-908	23.40	2.00	120.0000	1.00
909	O-906	I-910	28.40	2.00	120.0000	0.00
911	I-912	O-908	27.40	2.00	120.0000	0.00
913	O-910	916	29.30	2.00	120.0000	0.25
915	O-912	916	29.90	2.00	120.0000	0.25
925	916	944	1624.20	4.00	120.0000	3.16
929	932	928	250.50	4.00	120.0000	0.48
933	936	932	202.80	4.00	120.0000	0.78
937	940	936	76.10	4.00	120.0000	0.30
941	944	940	214.90	4.00	120.0000	0.30
P2187	B	900	245.70	8.00	120.0000	0.60

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 906 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)
-0.46	0.00
-2.31	80.00
-4.62	100.00
-16.15	200.00

THERE IS A DEVICE AT NODE 908 .....> (ID= 1)

THERE IS A DEVICE AT NODE 910 DESCRIBED BY THE FOLLOWING DATA: (ID= 2)

HEAD (ft)	FLOWRATE (gpm)
-23.08	0.00
-28.85	120.00
-39.23	240.00

THERE IS A DEVICE AT NODE 912 .....> (ID= 2)

THERE IS A DEVICE AT NODE B DESCRIBED BY THE FOLLOWING DATA: (ID= 3)

HEAD (ft)	FLOWRATE (gpm)
293.08	0.00
242.31	1567.00
109.80	3134.00

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
900		0.00	324.00	
904		0.00	325.00	
I-906	SENSUS OMNI	0.00	325.00	
I-908	SENSUS OMNI	0.00	325.00	
I-910	FEBCO LF825Y	0.00	325.00	
O-912	FEBCO LF825Y	0.00	325.00	
916		0.00	325.00	
928		1.07	323.10	
932		6.40	322.80	
936		10.67	322.50	
940		98.16	322.50	
944		44.81	321.70	
B		----	335.00	335.00
O-906	SENSUS OMNI	0.00	325.00	
O-908	SENSUS OMNI	0.00	325.00	
O-910	FEBCO LF825Y	0.00	325.00	
I-912	FEBCO LF825Y	0.00	325.00	

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 = 5
MAXIMUM AND MINIMUM VELOCITIES = 5

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

NUMBER OF PIPES .....(P) = 13
NUMBER OF END NODES .....(J) = 12
NUMBER OF PRIMARY LOOPS .....(L) = 1
NUMBER OF SUPPLY NODES .....(F) = 1
NUMBER OF SUPPLY ZONES .....(Z) = 1

Case: 1

Carlton Oaks Country Club and Resort
Maximum Expected Demand
PA-3 Private Domestic System Analysis

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
901	904	900	-161.12	0.89	0.34	4.11	29.20	21.07
905	904	I-906	80.87	3.64	1.06	8.26	221.88	171.93
907	904	I-908	80.24	3.97	1.04	8.19	214.02	169.47
909	O-906	I-910	80.87	4.88	0.00	8.26	171.93	171.93
911	I-912	O-908	-80.24	4.64	0.00	8.19	169.47	169.47
913	O-910	916	80.87	5.04	0.26	8.26	180.96	171.93
915	O-912	916	80.24	5.07	0.26	8.19	178.18	169.47
925	916	944	161.12	34.23	0.83	4.11	21.58	21.07
929	932	928	1.07	0.00	0.00	0.03	0.00	0.00
933	936	932	7.47	0.01	0.00	0.19	0.07	0.07
937	940	936	18.14	0.03	0.00	0.46	0.38	0.37
941	944	940	116.30	2.48	0.04	2.97	11.71	11.52
P2187	B	900	161.12	0.18	0.01	1.03	0.76	0.72

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
906	80.87	296.21	293.83	-2.4
908	80.24	295.90	293.58	-2.3
910	80.87	288.94	262.66	-26.3
912	80.24	288.93	262.68	-26.3
B	161.12	0.00	292.33	292.3

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
900		0.00	627.14	324.00	303.14	131.36
904		0.00	625.91	325.00	300.91	130.40
I-906	SENSUS OMNI	0.00	621.21	325.00	296.21	128.36
I-908	SENSUS OMNI	0.00	620.90	325.00	295.90	128.23
I-910	FEBCO LF825Y	0.00	613.94	325.00	288.94	125.21
O-912	FEBCO LF825Y	0.00	587.68	325.00	262.68	113.83
916		0.00	582.35	325.00	257.35	111.52
928		1.07	544.74	323.10	221.64	96.04
932		6.40	544.74	322.80	221.94	96.17
936		10.67	544.75	322.50	222.25	96.31
940		98.16	544.78	322.50	222.28	96.32
944		44.81	547.30	321.70	225.60	97.76
B		----	627.33	335.00	292.33	126.67
O-906	SENSUS OMNI	0.00	618.83	325.00	293.83	127.32
O-908	SENSUS OMNI	0.00	618.58	325.00	293.58	127.22
O-910	FEBCO LF825Y	0.00	587.66	325.00	262.66	113.82
I-912	FEBCO LF825Y	0.00	613.93	325.00	288.93	125.20

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
900	131.36	928	96.04
904	130.40	932	96.17
I-906	128.36	936	96.31
I-908	128.23	940	96.32
O-906	127.32	944	97.76

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
905	8.26	929	0.03
909	8.26	933	0.19
913	8.26	937	0.46
907	8.19	P2187	1.03
911	8.19	941	2.97

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
B	161.12	

NET SYSTEM INFLOW = 161.12
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 161.12

APPENDIX F

PA-2 CANDIDATE DOMESTIC BACKFLOW PREVENTER

Job Name _____ Contractor _____

Job Location _____ Approval _____

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

Approval _____ Representative _____

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 LF909 is also available with SentryPlus™ Alert technology to detect catastrophic relief valve discharge that could potentially cause flooding, and issue a multi-channel alert (call, email, text) to selected users so they can take action to avoid potentially costly flooding.

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

MASTER series®

Series LF860 Reduced Pressure Zone Assembly

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 back-pressure 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

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

NOTICE

Inquire with governing authorities for local installation requirements

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

FEBCO®

A WATTS Brand

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

ALERT with SentryPlus™ Alert flood detection system

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

Materials

Below is a general materials list of the Series LF860. All assemblies size 2½" 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)

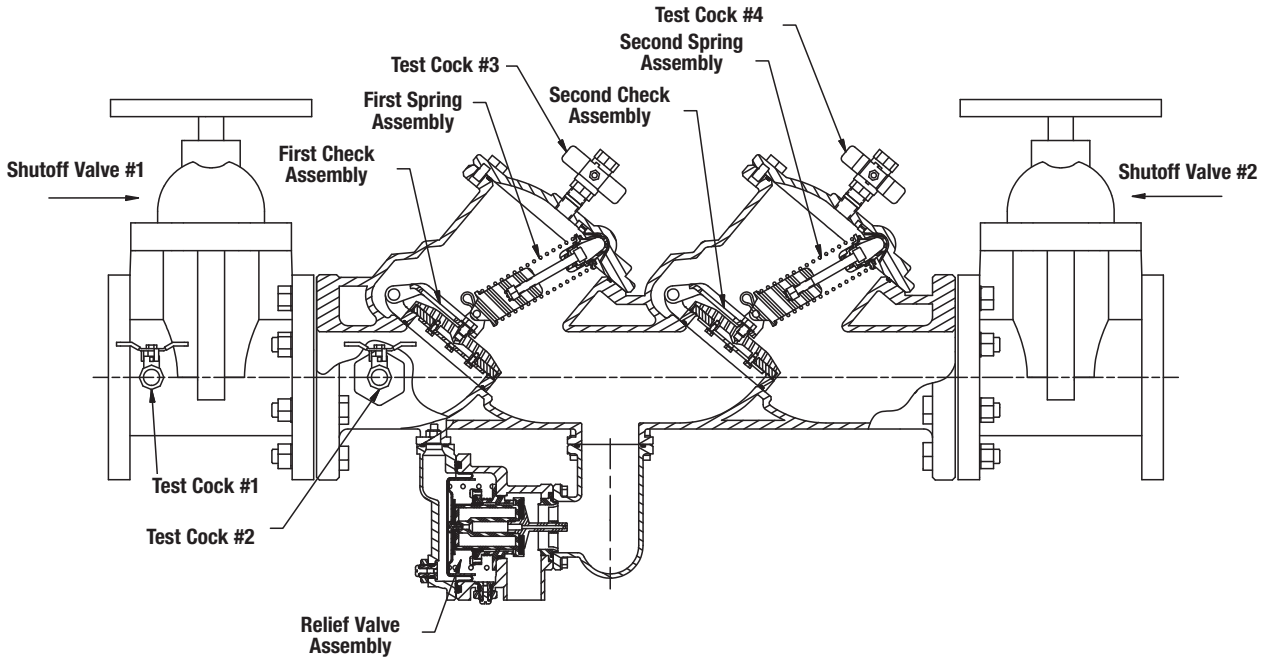
Approvals - Standards

- 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.

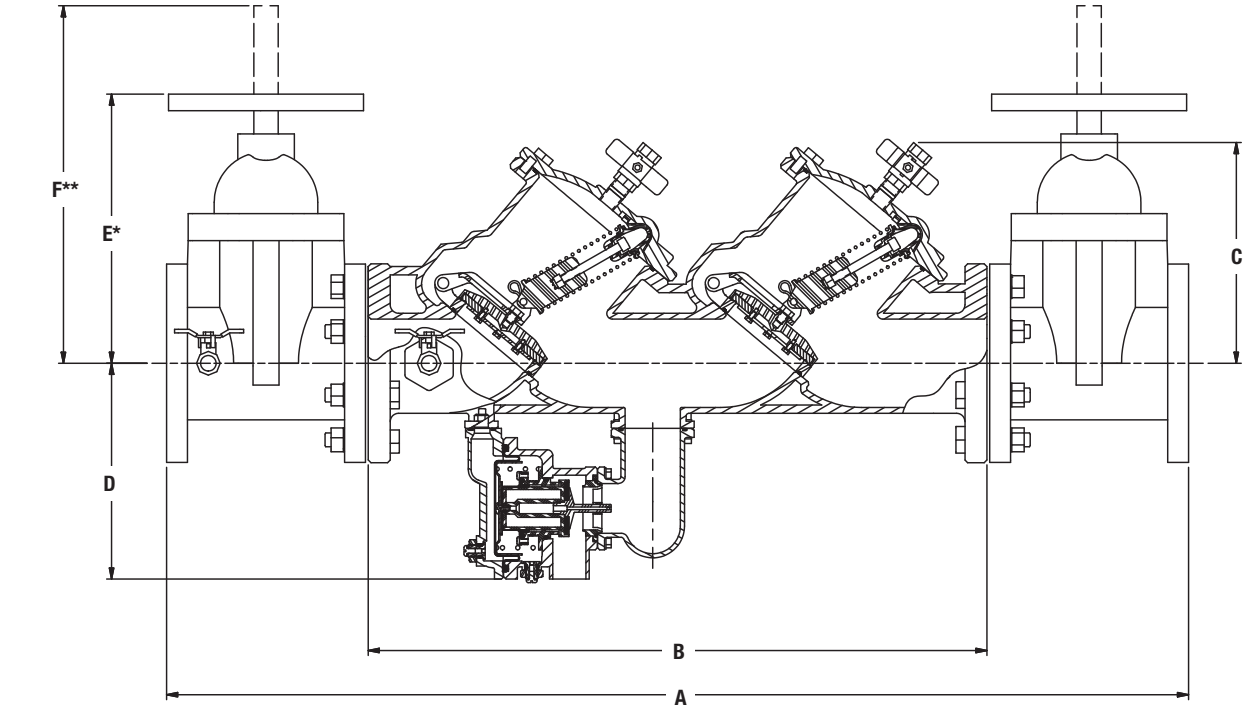
Pressure - Temperature

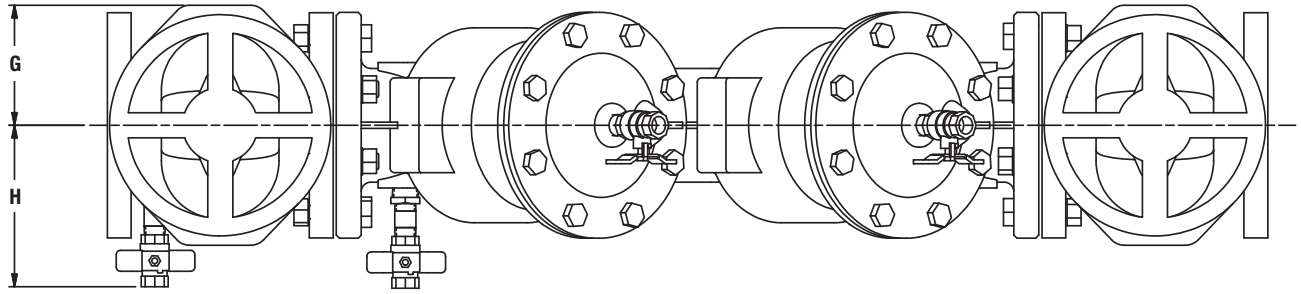
Max. Working Pressure:	175 psi (12.1 bar)
Min. Working Pressure:	20 psi (1.4 bar)
Hydrostatic Test Pressure:	350 psi (24.1 bar)
Hydrostatic Safety Pressure:	700 psi (48.3 bar)
Temperature Range:	33°F - 140°F (0.5°C - 60°C) Continuous



Dimensions & Weights

Below are the nominal dimensions and physical weights for the Series LF860 size 2½" 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

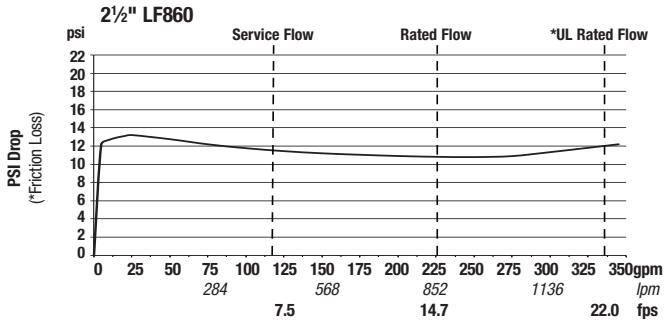
The gap drain is not designed to catch the maximum discharge possible from the relief valve. The installation of the FEBCO air gap with the drain line terminating above a floor drain will handle any normal discharge or nuisance spitting through the relief valve. However, floor drain size may need to 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.

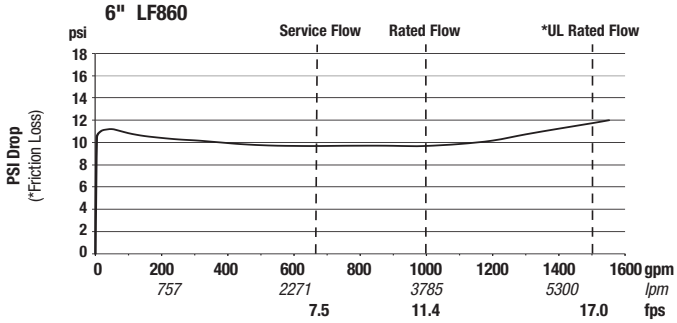
Performance

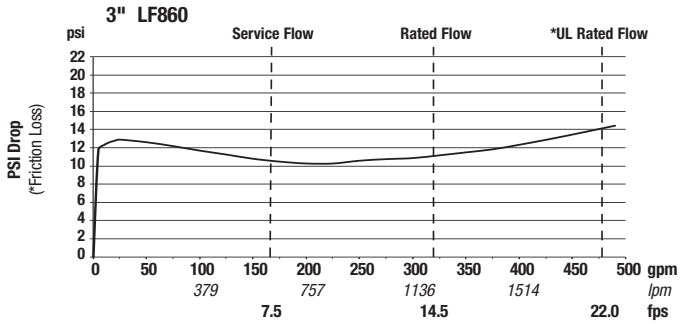
Flow capacity chart identifies valve performance based upon rated water Velocity up to 20fps

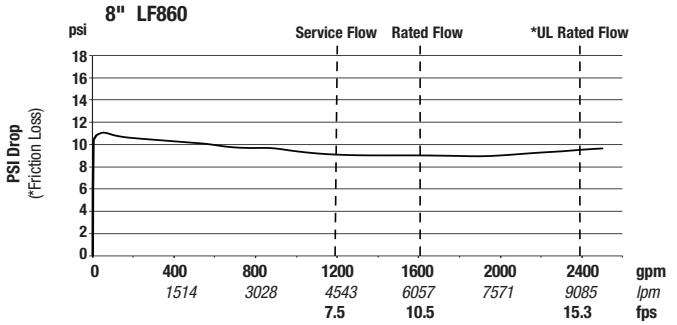
- Maximum service flow rate is determined by maximum rated Velocity of 7.5fps.
- AWWA Manual M-22 (Appendix C) recommends that the maximum water Velocity in the services be not more than 10fps.
- UL flow rate is determined by typically rated Velocity of 15 feet/sec.

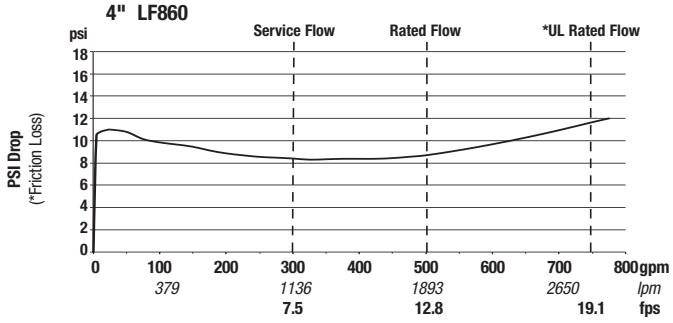
Capacity

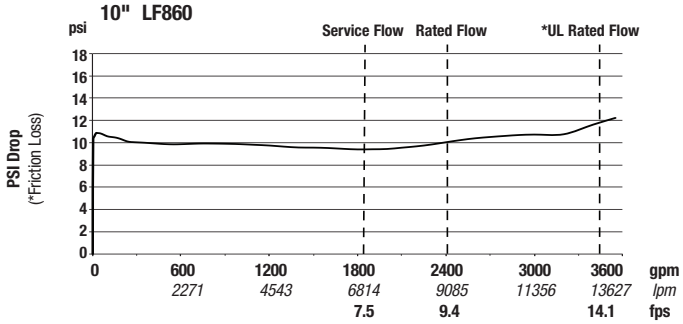












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APPENDIX G

PA-1 AND PA-3 CANDIDATE DOMESTIC BACKFLOW PREVENTER

For Health Hazard Applications

Job Name _____ Contractor _____

Job Location _____ Approval _____

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

Approval _____ Representative _____

LEAD FREE*

Series LF825Y

Reduced Pressure Zone Assemblies

Size: ¾" - 2"

The FEBCO Series LF825Y Reduced Pressure Zone Assemblies are used to protect against high hazard (toxic) fluids in water services to industrial plants, hospitals, morgues, mortuaries, and chemical plants. They are also used in irrigation systems, boiler feed, water lines and other installations requiring maximum protection. The LF825Y features Lead Free* construction to comply with Lead Free* installation requirements.

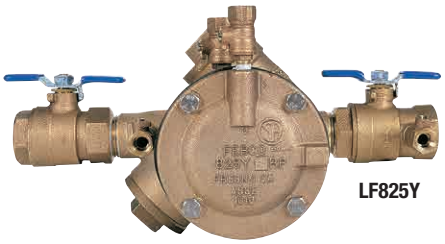
Features

- Ultimate mechanical protection of potable water, against hazards of cross-connection contamination.
- Meets all specifications of AWWA, ASSE, CSA and approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.
- Approved by the Foundation of Cross-Connection Control and Hydraulic Research at the University of Southern California.
- Modular relief valve for ease of maintenance.
- Simple Service procedures. All internal parts serviceable in line.
- Low head loss.
- Spring loaded "Y" type check valves.
- Internal relief valve pressure sensing passages.
- Replaceable seat rings on all sizes.
- End connection – NPT ANSI / ASME B1.20.1

Specifications

The reduced pressure zone assembly shall consist of two independently operating, spring loaded, "Y" pattern check valves and one hydraulically dependent differential relief valve. The assembly shall automatically reduce the pressure in the "zone" between the check valves to at least 5psi lower than inlet pressure. Should the differential between the upstream and the zone of the unit drop to 2psi, the differential relief valve shall open and maintain the proper differential.

Mainline valve body and caps including relief valve body and cover shall be Lead Free* cast copper silicon alloy. Check valve moving member shall be center stem guided. All hydraulic sensing passages shall be internally located within the mainline and relief valve bodies and relief valve cover. Diaphragm to seat area ratio shall be 10:1 minimum. Relief valve shall have a removable seat ring. Check valve and relief valve components shall be constructed so they may be serviced without removing the valve body from the line. All seat discs shall be reversible. Shutoff valves and test cocks shall be full ported ball valves.



The assembly shall be rated to 175psi (12.1 bar) working pressure and water temperature range from 32°F to 140°F (0ºC - 60ºC). The Lead Free* Reduced Pressure Zone Assemblies shall comply with state codes and standards, where applicable, requiring reduced lead content.

The assembly shall meet the requirements of ASSE Standard 1013; AWWA Standard Code C511; CSA Standard B64.4; and approved by the Foundation for Cross-Connection Control and Hydraulic Hydraulic Research at the University of Southern California.

Operation

In a flow condition the check valves are open with the pressure between the checks, called the zone, being maintained at least 5.0psi lower than the inlet pressure and the relief valve is maintained closed.

Should abnormal conditions arise under no flow or reversal of flow, the differential relief valve will open and discharge to maintain the zone at least 2psi lower than the supply.

When normal flow resumes, the zone's differential pressure will resume and the relief valve will close.

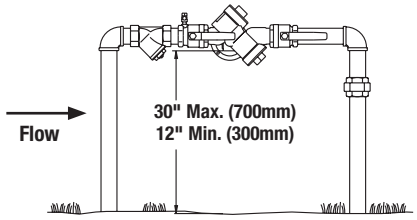
Typical Installation

Reduced pressure zone assemblies should be installed with minimum clearance of 12" (300mm) between relief valve discharge port and floor or grade. They must be installed where discharge will not be objectionable and can be positively drained away. They should be installed where easily accessible for testing and maintenance and must be protected from freezing. Thermal water expansion and/or water hammer downstream of the backflow preventer can cause excessive pressure. Excessive pressure situations should be eliminated to avoid possible damage to the system and assembly.

NOTICE

Refer to local codes for specific installation requirements. Some codes may prohibit vertical installation.

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



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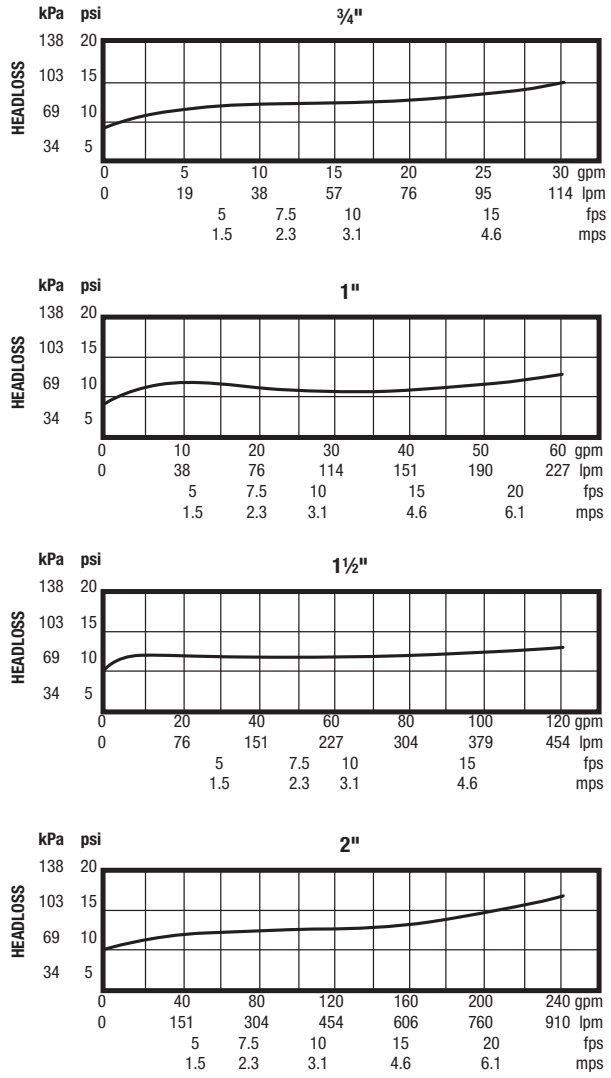
Capacity



Dimensions – Weights

Size: ¾" - 2"

SIZE	DIMENSIONS										WEIGHT	
	A		B*		C		D		E			
in.	*in.*	*mm*	*In.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*
¾	12	305	7¾	197	3¼	83	3¼	83	4⅛	105	11.5	5.2
1	12¾	324	7¾	197	3¼	83	3¼	83	4⅛	105	12.5	5.7
1½	17	432	10½	267	4½	114	4½	114	5	127	26.5	12.0
2	17¾	451	10½	267	4½	114	4½	114	5	127	29.0	13.0

* B Dimension is less shutoffs

Weights shown are approximate. Dimensions shown are nominal, allowance must be made for normal manufacturing tolerances.

Temperature – Pressure

Maximum working pressure:	175psi (12.1 bar)
Hydrostatic test pressure:	350psi (24.1 bar)
Temperature range:	32ºF to 140ºF (0ºC to 60ºC)

Materials

Main valve body:	Lead Free* Cast Copper Silicon Alloy
Relief valve body:	Lead Free* Cast Copper Silicon Alloy
Elastomers:	Nitrile Seat Discs
Diaphragms:	Nitrile, fabric reinforced
Springs:	Stainless Steel

Approvals – Standards

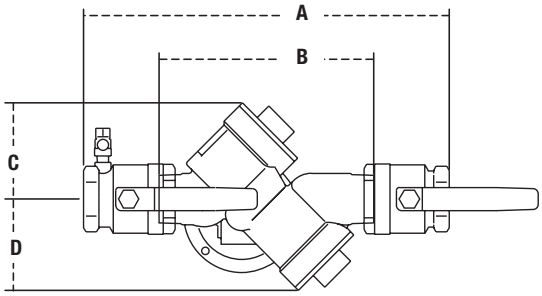
- Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.
- AWWA C511 Conformance

ASSE 1013 B64.4 UPC NSF Certified to NSF/ANSI 61-G

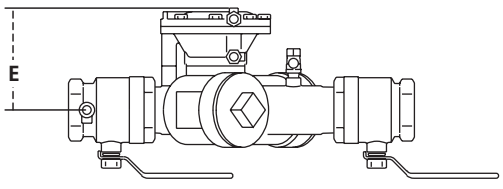
NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

Side View



Top View



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APPENDIX H

PA-1, PA-2 & PA3 PRIVATE FIRE PROTECTION SYSTEM ANALYSIS

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.
293	I-296	J6934	156.10	8.00	120.0000	0.70
297	300	O-296	134.80	8.00	120.0000	0.86
301	300	304	177.80	8.00	120.0000	1.05
305	308	304	369.40	8.00	120.0000	0.58
309	312	308	281.30	8.00	120.0000	0.30
313	328	312	370.20	8.00	120.0000	0.18
315	316	300	190.80	8.00	120.0000	0.48
317	320	316	295.80	8.00	120.0000	0.00
321	324	320	287.10	8.00	120.0000	0.30
325	328	324	45.60	8.00	120.0000	0.30
329	328	332	3814.60	8.00	120.0000	4.21
333	332	336	274.40	8.00	120.0000	1.23
341	340	344	281.40	8.00	120.0000	0.00
345	344	348	45.70	8.00	120.0000	0.60
349	348	350	235.00	8.00	120.0000	0.55
351	348	352	217.60	8.00	120.0000	1.05
353	352	356	300.50	8.00	120.0000	0.30
357	356	360	291.40	8.00	120.0000	0.66
361	360	364	238.10	8.00	120.0000	0.18
365	364	368	310.60	8.00	120.0000	0.30
369	368	372	284.70	8.00	120.0000	0.15
373	400	372	49.40	8.00	120.0000	1.23
375	376	400	226.50	8.00	120.0000	1.23
377	380	376	266.30	8.00	120.0000	0.08
381	332	380	83.50	8.00	120.0000	0.30
383	350	O-384	132.10	8.00	120.0000	0.00
385	I-384	338	62.50	8.00	120.0000	0.55
401	400	420	1155.10	12.00	120.0000	3.03
409	412	408	302.80	10.00	120.0000	0.25
413	416	412	288.00	10.00	120.0000	0.66
417	420	416	335.80	10.00	120.0000	0.18
2095.1	A	1838	355.80	10.00	120.0000	0.53
2095.2	A	1844	131.30	10.00	120.0000	0.60
2107	1844	1854	246.00	10.00	120.0000	0.60
2111	1854	1858	335.40	10.00	120.0000	0.23
2113	1858	1860	1022.70	10.00	120.0000	1.41
2121	1860	1868	302.20	10.00	120.0000	0.00
2155	1868	1896	1125.50	10.00	120.0000	0.84
2183	1896	J9680	1147.00	10.00	120.0000	0.48
2197.1	J9688	B	124.40	8.00	120.0000	0.00
2197.2	B	338	34.20	8.00	120.0000	0.00
3374	336	340	295.00	8.00	120.0000	0.66
P2133	J9632	1838	168.10	10.00	120.0000	0.45
P2135	J6934	J9632	541.60	10.00	120.0000	0.70
P2187	J9680	J9688	704.80	8.00	120.0000	1.75

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 296 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)
-32.31	0.00
-34.62	1900.00
-35.77	2000.00
-36.92	2250.00
-39.23	2500.00
-46.15	2750.00

THERE IS A DEVICE AT NODE 384 .....> (ID= 1)

THERE IS A DEVICE AT NODE A DESCRIBED BY THE FOLLOWING DATA: (ID= 2)

HEAD (ft)	FLOWRATE (gpm)
302.31	0.00
281.54	2448.00
227.33	4896.00

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
O-296	ZURN 375DA	0.00	314.00	
300		0.00	314.00	
304		0.00	315.00	
308		1500.00	318.00	
312		0.00	318.00	
316		0.00	314.00	
320		0.00	318.00	
324		0.00	315.00	
328		0.00	316.00	
332		0.00	326.00	
336		0.00	333.00	
338		0.00	340.00	
340		0.00	336.00	
344		0.00	339.00	
348		0.00	339.00	
350		0.00	339.00	
352		0.00	335.00	
356		0.00	330.00	
360		0.00	326.00	
364		0.00	328.00	
368		0.00	331.00	
372		0.00	328.00	
376		0.00	329.00	
380		0.00	328.00	
I-384	ZURN 375DA	0.00	339.00	
400		0.00	329.00	

408		0.00	324.00	
412		0.00	324.00	
416		0.00	324.00	
420		0.00	324.00	
1838		0.00	330.00	
1844		0.00	328.00	
1854		0.00	327.00	
1858		0.00	329.00	
1860		0.00	322.00	
1868		0.00	320.00	
1896		0.00	405.00	
A		----	326.00	326.00
B		0.00	335.00	
J6934		0.00	323.00	
J9632		0.00	329.00	
J9680		0.00	327.00	
J9688		0.00	335.00	
I-296	ZURN 375DA	0.00	314.00	
O-384	ZURN 375DA	0.00	339.00	

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 = 5
MAXIMUM AND MINIMUM VELOCITIES = 5

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

NUMBER OF PIPES .....(P) = 45
NUMBER OF END NODES .....(J) = 42
NUMBER OF PRIMARY LOOPS .....(L) = 3
NUMBER OF SUPPLY NODES .....(F) = 1
NUMBER OF SUPPLY ZONES .....(Z) = 1

==========

Case: 1

Carlton Oaks Country Club and Resort
Fire Flow of 1,500 GPM at Node 308
PA-1, PA-2 & PA-3 Private Fire Protection System Analysis

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
293	I-296	J6934	-1148.83	4.28	0.58	7.33	31.14	27.39
297	300	O-296	-1148.83	3.69	0.72	7.33	32.72	27.39
301	300	304	829.02	2.66	0.46	5.29	17.54	14.97
305	308	304	-829.02	5.53	0.25	5.29	15.65	14.97
309	312	308	670.98	2.85	0.09	4.28	10.42	10.12
313	328	312	670.98	3.75	0.05	4.28	10.26	10.12
315	316	300	-319.81	0.49	0.03	2.04	2.73	2.57
317	320	316	-319.81	0.76	0.00	2.04	2.57	2.57
321	324	320	-319.81	0.74	0.02	2.04	2.63	2.57
325	328	324	-319.81	0.12	0.02	2.04	2.99	2.57
329	328	332	-351.17	11.64	0.33	2.24	3.14	3.05
333	332	336	-218.16	0.35	0.04	1.39	1.40	1.26
341	340	344	-218.16	0.36	0.00	1.39	1.26	1.26
345	344	348	-218.16	0.06	0.02	1.39	1.66	1.26
349	348	350	-351.17	0.72	0.04	2.24	3.23	3.05
351	348	352	133.01	0.11	0.01	0.85	0.56	0.51
353	352	356	133.01	0.15	0.00	0.85	0.52	0.51
357	356	360	133.01	0.15	0.01	0.85	0.53	0.51
361	360	364	133.01	0.12	0.00	0.85	0.51	0.51
365	364	368	133.01	0.16	0.00	0.85	0.52	0.51
369	368	372	133.01	0.14	0.00	0.85	0.51	0.51
373	400	372	-133.01	0.02	0.01	0.85	0.78	0.51
375	376	400	-133.01	0.11	0.01	0.85	0.57	0.51
377	380	376	-133.01	0.13	0.00	0.85	0.51	0.51
381	332	380	-133.01	0.04	0.00	0.85	0.55	0.51
383	350	O-384	-351.17	0.40	0.00	2.24	3.05	3.05
385	I-384	338	-351.17	0.19	0.04	2.24	3.74	3.05
401	400	420	0.00	0.00	0.00	0.00	0.00	0.00
409	412	408	0.00	0.00	0.00	0.00	0.00	0.00
413	416	412	0.00	0.00	0.00	0.00	0.00	0.00
417	420	416	0.00	0.00	0.00	0.00	0.00	0.00
2095.1	A	1838	1148.83	3.29	0.18	4.69	9.75	9.24
2095.2	A	1844	351.17	0.14	0.02	1.43	1.17	1.03
2107	1844	1854	351.17	0.25	0.02	1.43	1.11	1.03
2111	1854	1858	351.17	0.35	0.01	1.43	1.05	1.03
2113	1858	1860	351.17	1.05	0.05	1.43	1.07	1.03
2121	1860	1868	351.17	0.31	0.00	1.43	1.03	1.03
2155	1868	1896	351.17	1.16	0.03	1.43	1.05	1.03
2183	1896	J9680	351.17	1.18	0.02	1.43	1.04	1.03
2197.1	J9688	B	351.17	0.38	0.00	2.24	3.05	3.05
2197.2	B	338	351.17	0.10	0.00	2.24	3.05	3.05
3374	336	340	-218.16	0.37	0.02	1.39	1.33	1.26
P2133	J9632	1838	-1148.83	1.55	0.15	4.69	10.16	9.24
P2135	J6934	J9632	-1148.83	5.00	0.24	4.69	9.68	9.24
P2187	J9680	J9688	351.17	2.15	0.14	2.24	3.24	3.05

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
296	1148.83	290.64	258.29	-32.4
384	351.17	273.35	241.04	-32.3
A	1500.00	0.00	293.92	293.9

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-296	ZURN 375DA	0.00	572.29	314.00	258.29	111.93
300		0.00	567.88	314.00	253.88	110.01
304		0.00	564.76	315.00	249.76	108.23
308		1500.00	558.98	318.00	240.98	104.42
312		0.00	561.91	318.00	243.91	105.70
316		0.00	567.36	314.00	253.36	109.79
320		0.00	566.60	318.00	248.60	107.73
324		0.00	565.85	315.00	250.85	108.70
328		0.00	565.71	316.00	249.71	108.21
332		0.00	577.67	326.00	251.67	109.06
336		0.00	578.06	333.00	245.06	106.19
338		0.00	612.59	340.00	272.59	118.12
340		0.00	578.45	336.00	242.45	105.06
344		0.00	578.81	339.00	239.81	103.92
348		0.00	578.88	339.00	239.88	103.95
350		0.00	579.64	339.00	240.64	104.28
352		0.00	578.76	335.00	243.76	105.63
356		0.00	578.60	330.00	248.60	107.73
360		0.00	578.45	326.00	252.45	109.39
364		0.00	578.33	328.00	250.33	108.48
368		0.00	578.17	331.00	247.17	107.11
372		0.00	578.02	328.00	250.02	108.34
376		0.00	577.85	329.00	248.85	107.84
380		0.00	577.72	328.00	249.72	108.21
I-384	ZURN 375DA	0.00	612.35	339.00	273.35	118.45
400		0.00	577.98	329.00	248.98	107.89
408		0.00	577.98	324.00	253.98	110.06
412		0.00	577.98	324.00	253.98	110.06
416		0.00	577.98	324.00	253.98	110.06
420		0.00	577.98	324.00	253.98	110.06
1838		0.00	616.45	330.00	286.45	124.13
1844		0.00	619.77	328.00	291.77	126.43
1854		0.00	619.50	327.00	292.50	126.75
1858		0.00	619.14	329.00	290.14	125.73
1860		0.00	618.05	322.00	296.05	128.29
1868		0.00	617.74	320.00	297.74	129.02
1896		0.00	616.55	405.00	211.55	91.67
A		----	619.92	326.00	293.92	127.37
B		0.00	612.69	335.00	277.69	120.33
J6934		0.00	609.50	323.00	286.50	124.15

J9632		0.00	614.75	329.00	285.75	123.82
J9680		0.00	615.36	327.00	288.36	124.95
J9688		0.00	613.07	335.00	278.07	120.50
I-296	ZURN 375DA	0.00	604.64	314.00	290.64	125.94
O-384	ZURN 375DA	0.00	580.04	339.00	241.04	104.45

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
1868	129.02	1896	91.67
1860	128.29	344	103.92
A	127.37	348	103.95
1854	126.75	350	104.28
1844	126.43	308	104.42

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
293	7.33	351	0.85
297	7.33	353	0.85
301	5.29	357	0.85
305	5.29	361	0.85
2095.1	4.69	365	0.85

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
A	1500.00	

NET SYSTEM INFLOW = 1500.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 1500.00

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Case: 2

Carlton Oaks Country Club and Resort
Fire Flow of 1,500 GPM at Node 324
PA-1, PA-2 & PA-3 Private Fire Protection System Analysis

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
293	I-296	J6934	-1119.35	4.08	0.55	7.14	29.66	26.11
297	300	O-296	-1119.35	3.52	0.68	7.14	31.16	26.11
301	300	304	473.12	0.94	0.15	3.02	6.13	5.30
305	308	304	-473.12	1.96	0.08	3.02	5.52	5.30
309	312	308	-473.12	1.49	0.04	3.02	5.45	5.30
313	328	312	-473.12	1.96	0.03	3.02	5.37	5.30
315	316	300	-646.23	1.80	0.13	4.12	10.10	9.44
317	320	316	-646.23	2.79	0.00	4.12	9.44	9.44
321	324	320	-646.23	2.71	0.08	4.12	9.71	9.44
325	328	324	853.77	0.72	0.14	5.45	18.84	15.81
329	328	332	-380.65	13.51	0.39	2.43	3.64	3.54
333	332	336	-236.47	0.40	0.04	1.51	1.63	1.47
341	340	344	-236.47	0.41	0.00	1.51	1.47	1.47
345	344	348	-236.47	0.07	0.02	1.51	1.93	1.47
349	348	350	-380.65	0.83	0.05	2.43	3.76	3.54
351	348	352	144.18	0.13	0.01	0.92	0.65	0.59
353	352	356	144.18	0.18	0.00	0.92	0.60	0.59
357	356	360	144.18	0.17	0.01	0.92	0.62	0.59
361	360	364	144.18	0.14	0.00	0.92	0.60	0.59
365	364	368	144.18	0.18	0.00	0.92	0.60	0.59
369	368	372	144.18	0.17	0.00	0.92	0.59	0.59
373	400	372	-144.18	0.03	0.02	0.92	0.91	0.59
375	376	400	-144.18	0.13	0.02	0.92	0.66	0.59
377	380	376	-144.18	0.16	0.00	0.92	0.59	0.59
381	332	380	-144.18	0.05	0.00	0.92	0.63	0.59
383	350	O-384	-380.65	0.47	0.00	2.43	3.54	3.54
385	I-384	338	-380.65	0.22	0.05	2.43	4.35	3.54
401	400	420	0.00	0.00	0.00	0.00	0.00	0.00
409	412	408	0.00	0.00	0.00	0.00	0.00	0.00
413	416	412	0.00	0.00	0.00	0.00	0.00	0.00
417	420	416	0.00	0.00	0.00	0.00	0.00	0.00
2095.1	A	1838	1119.35	3.13	0.17	4.57	9.29	8.81
2095.2	A	1844	380.65	0.16	0.02	1.55	1.37	1.19
2107	1844	1854	380.65	0.29	0.02	1.55	1.29	1.19
2111	1854	1858	380.65	0.40	0.01	1.55	1.22	1.19
2113	1858	1860	380.65	1.22	0.05	1.55	1.25	1.19
2121	1860	1868	380.65	0.36	0.00	1.55	1.19	1.19
2155	1868	1896	380.65	1.34	0.03	1.55	1.22	1.19
2183	1896	J9680	380.65	1.37	0.02	1.55	1.21	1.19
2197.1	J9688	B	380.65	0.44	0.00	2.43	3.54	3.54
2197.2	B	338	380.65	0.12	0.00	2.43	3.54	3.54
3374	336	340	-236.47	0.43	0.02	1.51	1.55	1.47
P2133	J9632	1838	-1119.35	1.48	0.15	4.57	9.68	8.81
P2135	J6934	J9632	-1119.35	4.77	0.23	4.57	9.23	8.81
P2187	J9680	J9688	380.65	2.50	0.16	2.43	3.77	3.54

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
296	1119.35	291.36	259.02	-32.3
384	380.65	272.13	239.82	-32.3
A	1500.00	0.00	293.92	293.9

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-296	ZURN 375DA	0.00	573.02	314.00	259.02	112.24
300		0.00	568.82	314.00	254.82	110.42
304		0.00	567.73	315.00	252.73	109.52
308		0.00(0.00)	565.69	318.00	247.69	107.33
312		0.00	564.16	318.00	246.16	106.67
316		0.00	566.89	314.00	252.89	109.59
320		0.00	564.10	318.00	246.10	106.64
324		1500.00	561.31	315.00	246.31	106.74
328		0.00	562.17	316.00	246.17	106.67
332		0.00	576.07	326.00	250.07	108.36
336		0.00	576.51	333.00	243.51	105.52
338		0.00	611.40	340.00	271.40	117.61
340		0.00	576.97	336.00	240.97	104.42
344		0.00	577.38	339.00	238.38	103.30
348		0.00	577.47	339.00	238.47	103.34
350		0.00	578.35	339.00	239.35	103.72
352		0.00	577.33	335.00	242.33	105.01
356		0.00	577.15	330.00	247.15	107.10
360		0.00	576.97	326.00	250.97	108.75
364		0.00	576.83	328.00	248.83	107.82
368		0.00	576.64	331.00	245.64	106.44
372		0.00	576.47	328.00	248.47	107.67
376		0.00	576.28	329.00	247.28	107.15
380		0.00	576.12	328.00	248.12	107.52
I-384	ZURN 375DA	0.00	611.13	339.00	272.13	117.92
400		0.00	576.43	329.00	247.43	107.22
408		0.00	576.43	324.00	252.43	109.38
412		0.00	576.43	324.00	252.43	109.38
416		0.00	576.43	324.00	252.43	109.38
420		0.00	576.43	324.00	252.43	109.38
1838		0.00	616.62	330.00	286.62	124.20
1844		0.00	619.74	328.00	291.74	126.42
1854		0.00	619.43	327.00	292.43	126.72
1858		0.00	619.02	329.00	290.02	125.67
1860		0.00	617.74	322.00	295.74	128.16
1868		0.00	617.38	320.00	297.38	128.87
1896		0.00	616.01	405.00	211.01	91.44
A		----	619.92	326.00	293.92	127.37
B		0.00	611.52	335.00	276.52	119.83
J6934		0.00	609.99	323.00	286.99	124.36

J9632		0.00	614.99	329.00	285.99	123.93
J9680		0.00	614.62	327.00	287.62	124.63
J9688		0.00	611.96	335.00	276.96	120.02
I-296	ZURN 375DA	0.00	605.36	314.00	291.36	126.26
O-384	ZURN 375DA	0.00	578.82	339.00	239.82	103.92

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
1868	128.87	1896	91.44
1860	128.16	344	103.30
A	127.37	348	103.34
1854	126.72	350	103.72
1844	126.42	O-384	103.92

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
293	7.14	351	0.92
297	7.14	353	0.92
325	5.45	357	0.92
2095.1	4.57	361	0.92
P2133	4.57	365	0.92

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
A	1500.00	

NET SYSTEM INFLOW = 1500.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 1500.00

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Case: 3

Carlton Oaks Country Club and Resort
Fire Flow of 1,500 GPM at Node 340
PA-1, PA-2 & PA-3 Private Fire Protection System Analysis

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
293	I-296	J6934	-641.96	1.46	0.18	4.10	10.49	9.32
297	300	O-296	-641.96	1.26	0.22	4.10	10.99	9.32
301	300	304	287.30	0.37	0.05	1.83	2.41	2.10
305	308	304	-287.30	0.78	0.03	1.83	2.19	2.10
309	312	308	-287.30	0.59	0.02	1.83	2.16	2.10
313	328	312	-287.30	0.78	0.01	1.83	2.13	2.10
315	316	300	-354.66	0.59	0.04	2.26	3.31	3.11
317	320	316	-354.66	0.92	0.00	2.26	3.11	3.11
321	324	320	-354.66	0.89	0.02	2.26	3.19	3.11
325	328	324	-354.66	0.14	0.02	2.26	3.63	3.11
329	328	332	641.96	35.57	1.10	4.10	9.61	9.32
333	332	336	631.77	2.48	0.31	4.03	10.18	9.05
341	340	344	-868.23	4.59	0.00	5.54	16.31	16.31
345	344	348	-868.23	0.75	0.29	5.54	22.57	16.31
349	348	350	-858.04	3.75	0.26	5.48	17.05	15.96
351	348	352	-10.19	0.00	0.00	0.07	0.00	0.00
353	352	356	-10.19	0.00	0.00	0.07	0.00	0.00
357	356	360	-10.19	0.00	0.00	0.07	0.00	0.00
361	360	364	-10.19	0.00	0.00	0.07	0.00	0.00
365	364	368	-10.19	0.00	0.00	0.07	0.00	0.00
369	368	372	-10.19	0.00	0.00	0.07	0.00	0.00
373	400	372	10.19	0.00	0.00	0.07	0.01	0.00
375	376	400	10.19	0.00	0.00	0.07	0.00	0.00
377	380	376	10.19	0.00	0.00	0.07	0.00	0.00
381	332	380	10.19	0.00	0.00	0.07	0.00	0.00
383	350	O-384	-858.04	2.11	0.00	5.48	15.96	15.96
385	I-384	338	-858.04	1.00	0.26	5.48	20.05	15.96
401	400	420	0.00	0.00	0.00	0.00	0.00	0.00
409	412	408	0.00	0.00	0.00	0.00	0.00	0.00
413	416	412	0.00	0.00	0.00	0.00	0.00	0.00
417	420	416	0.00	0.00	0.00	0.00	0.00	0.00
2095.1	A	1838	641.96	1.12	0.06	2.62	3.30	3.15
2095.2	A	1844	858.04	0.71	0.11	3.50	6.25	5.38
2107	1844	1854	858.04	1.32	0.11	3.50	5.85	5.38
2111	1854	1858	858.04	1.81	0.04	3.50	5.51	5.38
2113	1858	1860	858.04	5.50	0.27	3.50	5.65	5.38
2121	1860	1868	858.04	1.63	0.00	3.50	5.38	5.38
2155	1868	1896	858.04	6.06	0.16	3.50	5.52	5.38
2183	1896	J9680	858.04	6.17	0.09	3.50	5.46	5.38
2197.1	J9688	B	858.04	1.98	0.00	5.48	15.96	15.96
2197.2	B	338	858.04	0.55	0.00	5.48	15.96	15.96
3374	336	340	631.77	2.67	0.17	4.03	9.62	9.05
P2133	J9632	1838	-641.96	0.53	0.05	2.62	3.43	3.15
P2135	J6934	J9632	-641.96	1.70	0.07	2.62	3.28	3.15
P2187	J9680	J9688	858.04	11.25	0.81	5.48	17.11	15.96

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
296	641.96	300.76	268.45	-32.3
384	858.04	241.09	208.78	-32.3
A	1500.00	0.00	293.92	293.9

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-296	ZURN 375DA	0.00	582.45	314.00	268.45	116.33
300		0.00	580.97	314.00	266.97	115.69
304		0.00	580.54	315.00	265.54	115.07
308		0.00(0.00)	579.73	318.00	261.73	113.42
312		0.00	579.12	318.00	261.12	113.15
316		0.00	580.34	314.00	266.34	115.41
320		0.00	579.42	318.00	261.42	113.28
324		0.00	578.50	315.00	263.50	114.18
328		0.00	578.33	316.00	262.33	113.68
332		0.00	541.67	326.00	215.67	93.46
336		0.00	538.88	333.00	205.88	89.21
338		0.00	581.34	340.00	241.34	104.58
340		1500.00	536.04	336.00	200.04	86.68
344		0.00	540.63	339.00	201.63	87.37
348		0.00	541.66	339.00	202.66	87.82
350		0.00	545.67	339.00	206.67	89.56
352		0.00	541.66	335.00	206.66	89.55
356		0.00	541.66	330.00	211.66	91.72
360		0.00	541.67	326.00	215.67	93.45
364		0.00	541.67	328.00	213.67	92.59
368		0.00	541.67	331.00	210.67	91.29
372		0.00	541.67	328.00	213.67	92.59
376		0.00	541.67	329.00	212.67	92.16
380		0.00	541.67	328.00	213.67	92.59
I-384	ZURN 375DA	0.00	580.09	339.00	241.09	104.47
400		0.00	541.67	329.00	212.67	92.16
408		0.00	541.67	324.00	217.67	94.32
412		0.00	541.67	324.00	217.67	94.32
416		0.00	541.67	324.00	217.67	94.32
420		0.00	541.67	324.00	217.67	94.32
1838		0.00	618.75	330.00	288.75	125.12
1844		0.00	619.10	328.00	291.10	126.14
1854		0.00	617.66	327.00	290.66	125.95
1858		0.00	615.81	329.00	286.81	124.29
1860		0.00	610.04	322.00	288.04	124.82
1868		0.00	608.41	320.00	288.41	124.98
1896		0.00	602.20	405.00	197.20	85.45
A		----	619.92	326.00	293.92	127.37
B		0.00	581.89	335.00	246.89	106.98
J6934		0.00	616.39	323.00	293.39	127.14

J9632		0.00	618.17	329.00	289.17	125.31
J9680		0.00	595.93	327.00	268.93	116.54
J9688		0.00	583.87	335.00	248.87	107.84
I-296	ZURN 375DA	0.00	614.76	314.00	300.76	130.33
O-384	ZURN 375DA	0.00	547.78	339.00	208.78	90.47

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
I-296	130.33	1896	85.45
A	127.37	340	86.68
J6934	127.14	344	87.37
1844	126.14	348	87.82
1854	125.95	336	89.21

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
341	5.54	351	0.07
345	5.54	353	0.07
385	5.48	357	0.07
2197.1	5.48	361	0.07
2197.2	5.48	365	0.07

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
A	1500.00	

NET SYSTEM INFLOW = 1500.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 1500.00

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Case: 4

Carlton Oaks Country Club and Resort
Fire Flow of 1,500 GPM at Node 368
PA-1, PA-2 & PA-3 Private Fire Protection System Analysis

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
293	I-296	J6934	-645.18	1.47	0.18	4.12	10.59	9.41
297	300	O-296	-645.18	1.27	0.23	4.12	11.09	9.41
301	300	304	288.74	0.38	0.06	1.84	2.43	2.12
305	308	304	-288.74	0.78	0.03	1.84	2.21	2.12
309	312	308	-288.74	0.60	0.02	1.84	2.18	2.12
313	328	312	-288.74	0.79	0.01	1.84	2.15	2.12
315	316	300	-356.44	0.60	0.04	2.27	3.34	3.14
317	320	316	-356.44	0.93	0.00	2.27	3.14	3.14
321	324	320	-356.44	0.90	0.02	2.27	3.22	3.14
325	328	324	-356.44	0.14	0.02	2.27	3.66	3.14
329	328	332	645.18	35.90	1.11	4.12	9.70	9.41
333	332	336	-167.38	0.21	0.02	1.07	0.85	0.77
341	340	344	-167.38	0.22	0.00	1.07	0.77	0.77
345	344	348	-167.38	0.04	0.01	1.07	1.01	0.77
349	348	350	-854.82	3.72	0.25	5.46	16.93	15.85
351	348	352	687.44	2.30	0.31	4.39	12.03	10.58
353	352	356	687.44	3.18	0.09	4.39	10.88	10.58
357	356	360	687.44	3.08	0.20	4.39	11.26	10.58
361	360	364	687.44	2.52	0.05	4.39	10.81	10.58
365	364	368	687.44	3.29	0.09	4.39	10.87	10.58
369	368	372	-812.56	4.11	0.06	5.19	14.65	14.43
373	400	372	812.56	0.71	0.51	5.19	24.82	14.43
375	376	400	812.56	3.27	0.51	5.19	16.69	14.43
377	380	376	812.56	3.84	0.03	5.19	14.55	14.43
381	332	380	812.56	1.20	0.13	5.19	15.93	14.43
383	350	O-384	-854.82	2.09	0.00	5.46	15.85	15.85
385	I-384	338	-854.82	0.99	0.25	5.46	19.91	15.85
401	400	420	0.00	0.00	0.00	0.00	0.00	0.00
409	412	408	0.00	0.00	0.00	0.00	0.00	0.00
413	416	412	0.00	0.00	0.00	0.00	0.00	0.00
417	420	416	0.00	0.00	0.00	0.00	0.00	0.00
2095.1	A	1838	645.18	1.13	0.06	2.64	3.33	3.17
2095.2	A	1844	854.82	0.70	0.11	3.49	6.21	5.35
2107	1844	1854	854.82	1.31	0.11	3.49	5.81	5.35
2111	1854	1858	854.82	1.79	0.04	3.49	5.47	5.35
2113	1858	1860	854.82	5.47	0.27	3.49	5.61	5.35
2121	1860	1868	854.82	1.62	0.00	3.49	5.35	5.35
2155	1868	1896	854.82	6.02	0.16	3.49	5.49	5.35
2183	1896	J9680	854.82	6.13	0.09	3.49	5.42	5.35
2197.1	J9688	B	854.82	1.97	0.00	5.46	15.85	15.85
2197.2	B	338	854.82	0.54	0.00	5.46	15.85	15.85
3374	336	340	-167.38	0.23	0.01	1.07	0.81	0.77
P2133	J9632	1838	-645.18	0.53	0.05	2.64	3.46	3.17
P2135	J6934	J9632	-645.18	1.72	0.08	2.64	3.31	3.17
P2187	J9680	J9688	854.82	11.17	0.81	5.46	16.99	15.85

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
296	645.18	300.71	268.40	-32.3
384	854.82	241.36	209.05	-32.3
A	1500.00	0.00	293.92	293.9

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-296	ZURN 375DA	0.00	582.40	314.00	268.40	116.31
300		0.00	580.90	314.00	266.90	115.66
304		0.00	580.47	315.00	265.47	115.04
308		0.00(0.00)	579.66	318.00	261.66	113.38
312		0.00	579.04	318.00	261.04	113.12
316		0.00	580.27	314.00	266.27	115.38
320		0.00	579.34	318.00	261.34	113.25
324		0.00	578.42	315.00	263.42	114.15
328		0.00	578.25	316.00	262.25	113.64
332		0.00	541.24	326.00	215.24	93.27
336		0.00	541.48	333.00	208.48	90.34
338		0.00	581.61	340.00	241.61	104.70
340		0.00	541.72	336.00	205.72	89.14
344		0.00	541.93	339.00	202.93	87.94
348		0.00	541.98	339.00	202.98	87.96
350		0.00	545.96	339.00	206.96	89.68
352		0.00	539.36	335.00	204.36	88.56
356		0.00	536.09	330.00	206.09	89.31
360		0.00	532.81	326.00	206.81	89.62
364		0.00	530.24	328.00	202.24	87.64
368		1500.00	526.86	331.00	195.86	84.87
372		0.00	531.03	328.00	203.03	87.98
376		0.00	536.04	329.00	207.04	89.72
380		0.00	539.91	328.00	211.91	91.83
I-384	ZURN 375DA	0.00	580.36	339.00	241.36	104.59
400		0.00	532.26	329.00	203.26	88.08
408		0.00	532.26	324.00	208.26	90.25
412		0.00	532.26	324.00	208.26	90.25
416		0.00	532.26	324.00	208.26	90.25
420		0.00	532.26	324.00	208.26	90.25
1838		0.00	618.74	330.00	288.74	125.12
1844		0.00	619.11	328.00	291.11	126.15
1854		0.00	617.68	327.00	290.68	125.96
1858		0.00	615.84	329.00	286.84	124.30
1860		0.00	610.11	322.00	288.11	124.85
1868		0.00	608.49	320.00	288.49	125.01
1896		0.00	602.32	405.00	197.32	85.51
A		----	619.92	326.00	293.92	127.37
B		0.00	582.15	335.00	247.15	107.10
J6934		0.00	616.36	323.00	293.36	127.12

J9632		0.00	618.15	329.00	289.15	125.30
J9680		0.00	596.10	327.00	269.10	116.61
J9688		0.00	584.12	335.00	249.12	107.95
I-296	ZURN 375DA	0.00	614.71	314.00	300.71	130.31
O-384	ZURN 375DA	0.00	548.05	339.00	209.05	90.59

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
I-296	130.31	368	84.87
A	127.37	1896	85.51
J6934	127.12	364	87.64
1844	126.15	344	87.94
1854	125.96	348	87.96

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
385	5.46	333	1.07
2197.1	5.46	341	1.07
2197.2	5.46	345	1.07
349	5.46	3374	1.07
383	5.46	301	1.84

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
A	1500.00	

NET SYSTEM INFLOW = 1500.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 1500.00

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Case: 5

Carlton Oaks Country Club and Resort
Fire Flow Total of 2,500 GPM; 1,500 GPM at Node 408 & 1,000 GPM at Node 412
PA-1, PA-2 & PA-3 Private Fire Protection System Analysis

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
293	I-296	J6934	-1084.40	3.84	0.52	6.92	27.95	24.62
297	300	O-296	-1084.41	3.32	0.64	6.92	29.36	24.62
301	300	304	485.20	0.99	0.16	3.10	6.43	5.55
305	308	304	-485.20	2.05	0.09	3.10	5.79	5.55
309	312	308	-485.20	1.56	0.04	3.10	5.71	5.55
313	328	312	-485.20	2.06	0.03	3.10	5.62	5.55
315	316	300	-599.20	1.57	0.11	3.82	8.78	8.21
317	320	316	-599.20	2.43	0.00	3.82	8.21	8.21
321	324	320	-599.20	2.36	0.07	3.82	8.44	8.21
325	328	324	-599.20	0.37	0.07	3.82	9.70	8.21
329	328	332	1084.41	93.91	3.13	6.92	25.44	24.62
333	332	336	-464.98	1.41	0.17	2.97	5.74	5.13
341	340	344	-464.98	1.44	0.00	2.97	5.13	5.13
345	344	348	-464.98	0.23	0.08	2.97	6.93	5.13
349	348	350	-1415.59	9.48	0.70	9.03	43.29	40.33
351	348	352	950.62	4.20	0.60	6.07	22.05	19.29
353	352	356	950.62	5.80	0.17	6.07	19.86	19.29
357	356	360	950.62	5.62	0.38	6.07	20.58	19.29
361	360	364	950.62	4.59	0.10	6.07	19.72	19.29
365	364	368	950.62	5.99	0.17	6.07	19.84	19.29
369	368	372	950.62	5.49	0.09	6.07	19.59	19.29
373	400	372	-950.62	0.95	0.70	6.07	33.52	19.29
375	376	400	1549.38	10.80	1.87	9.89	55.92	47.67
377	380	376	1549.38	12.69	0.12	9.89	48.13	47.67
381	332	380	1549.38	3.98	0.46	9.89	53.13	47.67
383	350	O-384	-1415.59	5.33	0.00	9.03	40.33	40.33
385	I-384	338	-1415.59	2.52	0.70	9.03	51.48	40.33
401	400	420	2500.00	18.54	2.37	7.09	18.10	16.05
409	412	408	1500.00	4.59	0.15	6.13	15.63	15.14
413	416	412	2500.00	11.23	1.07	10.21	42.71	39.00
417	420	416	2500.00	13.10	0.29	10.21	39.87	39.00
2095.1	A	1838	1084.40	2.95	0.16	4.43	8.76	8.30
2095.2	A	1844	1415.59	1.79	0.31	5.78	15.98	13.60
2107	1844	1854	1415.59	3.35	0.31	5.78	14.87	13.60
2111	1854	1858	1415.59	4.56	0.12	5.78	13.96	13.60
2113	1858	1860	1415.59	13.91	0.73	5.78	14.32	13.60
2121	1860	1868	1415.59	4.11	0.00	5.78	13.60	13.60
2155	1868	1896	1415.59	15.31	0.44	5.78	13.99	13.60
2183	1896	J9680	1415.59	15.60	0.25	5.78	13.82	13.60
2197.1	J9688	B	1415.59	5.02	0.00	9.03	40.33	40.33
2197.2	B	338	1415.59	1.38	0.00	9.03	40.33	40.33
3374	336	340	-464.98	1.51	0.09	2.97	5.44	5.13
P2133	J9632	1838	-1084.40	1.40	0.14	4.43	9.12	8.30
P2135	J6934	J9632	-1084.40	4.50	0.21	4.43	8.70	8.30
P2187	J9680	J9688	1415.59	28.42	2.22	9.03	43.48	40.33

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
296	1084.41	278.99	246.66	-32.3
384	1415.59	166.67	134.13	-32.5
A	2500.00	0.00	280.71	280.7

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-296	ZURN 375DA	0.00	560.66	314.00	246.66	106.88
300		0.00	556.70	314.00	242.70	105.17
304		0.00	555.55	315.00	240.55	104.24
308		0.00(0.00)	553.42	318.00	235.42	102.01
312		0.00	551.81	318.00	233.81	101.32
316		0.00	555.02	314.00	241.02	104.44
320		0.00	552.60	318.00	234.60	101.66
324		0.00	550.17	315.00	235.17	101.91
328		0.00	549.73	316.00	233.73	101.28
332		0.00	452.69	326.00	126.69	54.90
336		0.00	454.27	333.00	121.27	52.55
338		0.00	508.88	340.00	168.88	73.18
340		0.00	455.87	336.00	119.87	51.94
344		0.00	457.31	339.00	118.31	51.27
348		0.00	457.63	339.00	118.63	51.41
350		0.00	467.81	339.00	128.81	55.82
352		0.00	452.83	335.00	117.83	51.06
356		0.00	446.87	330.00	116.87	50.64
360		0.00	440.87	326.00	114.87	49.78
364		0.00	436.17	328.00	108.17	46.87
368		0.00	430.01	331.00	99.01	42.90
372		0.00	424.43	328.00	96.43	41.79
376		0.00	435.44	329.00	106.44	46.12
380		0.00	448.26	328.00	120.26	52.11
I-384	ZURN 375DA	0.00	505.67	339.00	166.67	72.22
400		0.00	422.77	329.00	93.77	40.64
408		1500.00	371.45	324.00	47.45	20.56
412		1000.00	376.18	324.00	52.18	22.61
416		0.00	388.48	324.00	64.48	27.94
420		0.00	401.87	324.00	77.87	33.74
1838		0.00	603.60	330.00	273.60	118.56
1844		0.00	604.62	328.00	276.62	119.87
1854		0.00	600.96	327.00	273.96	118.72
1858		0.00	596.28	329.00	267.28	115.82
1860		0.00	581.63	322.00	259.63	112.51
1868		0.00	577.52	320.00	257.52	111.59
1896		0.00	561.77	405.00	156.77	67.94
A		----	606.71	326.00	280.71	121.64
B		0.00	510.26	335.00	175.26	75.95
J6934		0.00	597.35	323.00	274.35	118.89

J9632		0.00	602.06	329.00	273.06	118.33
J9680		0.00	545.92	327.00	218.92	94.87
J9688		0.00	515.28	335.00	180.28	78.12
I-296	ZURN 375DA	0.00	592.99	314.00	278.99	120.90
O-384	ZURN 375DA	0.00	473.13	339.00	134.13	58.12

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
A	121.64	408	20.56
I-296	120.90	412	22.61
1844	119.87	416	27.94
J6934	118.89	420	33.74
1854	118.72	400	40.64

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
413	10.21	333	2.97
417	10.21	341	2.97
375	9.89	345	2.97
377	9.89	3374	2.97
381	9.89	301	3.10

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
A	2500.00	

NET SYSTEM INFLOW = 2500.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 2500.00

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Case: 6

Carlton Oaks Country Club and Resort
Fire Flow Total of 2,500 GPM; 1,500 GPM at Node 416 & 1,000 GPM at Node 420
PA-1, PA-2 & PA-3 Private Fire Protection System Analysis

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

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

P I P E N A M E	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
293	I-296	J6934	-1084.40	3.84	0.52	6.92	27.95	24.62
297	300	O-296	-1084.41	3.32	0.64	6.92	29.36	24.62
301	300	304	485.20	0.99	0.16	3.10	6.43	5.55
305	308	304	-485.20	2.05	0.09	3.10	5.79	5.55
309	312	308	-485.20	1.56	0.04	3.10	5.71	5.55
313	328	312	-485.20	2.06	0.03	3.10	5.62	5.55
315	316	300	-599.20	1.57	0.11	3.82	8.78	8.21
317	320	316	-599.20	2.43	0.00	3.82	8.21	8.21
321	324	320	-599.20	2.36	0.07	3.82	8.44	8.21
325	328	324	-599.20	0.37	0.07	3.82	9.70	8.21
329	328	332	1084.41	93.91	3.13	6.92	25.44	24.62
333	332	336	-464.98	1.41	0.17	2.97	5.74	5.13
341	340	344	-464.98	1.44	0.00	2.97	5.13	5.13
345	344	348	-464.98	0.23	0.08	2.97	6.93	5.13
349	348	350	-1415.59	9.48	0.70	9.03	43.29	40.33
351	348	352	950.62	4.20	0.60	6.07	22.05	19.29
353	352	356	950.62	5.80	0.17	6.07	19.86	19.29
357	356	360	950.62	5.62	0.38	6.07	20.58	19.29
361	360	364	950.62	4.59	0.10	6.07	19.72	19.29
365	364	368	950.62	5.99	0.17	6.07	19.84	19.29
369	368	372	950.62	5.49	0.09	6.07	19.59	19.29
373	400	372	-950.62	0.95	0.70	6.07	33.52	19.29
375	376	400	1549.38	10.80	1.87	9.89	55.92	47.67
377	380	376	1549.38	12.69	0.12	9.89	48.13	47.67
381	332	380	1549.38	3.98	0.46	9.89	53.13	47.67
383	350	O-384	-1415.59	5.33	0.00	9.03	40.33	40.33
385	I-384	338	-1415.59	2.52	0.70	9.03	51.48	40.33
401	400	420	2500.00	18.54	2.37	7.09	18.10	16.05
409	412	408	0.00	0.00	0.00	0.00	0.00	0.00
413	416	412	0.00	0.00	0.00	0.00	0.00	0.00
417	420	416	1500.00	5.09	0.10	6.13	15.46	15.14
2095.1	A	1838	1084.41	2.95	0.16	4.43	8.76	8.30
2095.2	A	1844	1415.59	1.79	0.31	5.78	15.98	13.60
2107	1844	1854	1415.59	3.35	0.31	5.78	14.87	13.60
2111	1854	1858	1415.59	4.56	0.12	5.78	13.96	13.60
2113	1858	1860	1415.59	13.91	0.73	5.78	14.32	13.60
2121	1860	1868	1415.59	4.11	0.00	5.78	13.60	13.60
2155	1868	1896	1415.59	15.31	0.44	5.78	13.99	13.60
2183	1896	J9680	1415.59	15.60	0.25	5.78	13.82	13.60
2197.1	J9688	B	1415.59	5.02	0.00	9.03	40.33	40.33
2197.2	B	338	1415.59	1.38	0.00	9.03	40.33	40.33
3374	336	340	-464.98	1.51	0.09	2.97	5.44	5.13
P2133	J9632	1838	-1084.41	1.40	0.14	4.43	9.12	8.30
P2135	J6934	J9632	-1084.41	4.50	0.21	4.43	8.70	8.30
P2187	J9680	J9688	1415.59	28.42	2.22	9.03	43.48	40.33

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
296	1084.41	278.99	246.66	-32.3
384	1415.59	166.67	134.13	-32.5
A	2500.00	0.00	280.71	280.7

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-296	ZURN 375DA	0.00	560.66	314.00	246.66	106.88
300		0.00	556.70	314.00	242.70	105.17
304		0.00	555.55	315.00	240.55	104.24
308		0.00(0.00)	553.42	318.00	235.42	102.01
312		0.00	551.81	318.00	233.81	101.32
316		0.00	555.02	314.00	241.02	104.44
320		0.00	552.60	318.00	234.60	101.66
324		0.00	550.17	315.00	235.17	101.91
328		0.00	549.73	316.00	233.73	101.28
332		0.00	452.69	326.00	126.69	54.90
336		0.00	454.27	333.00	121.27	52.55
338		0.00	508.88	340.00	168.88	73.18
340		0.00	455.87	336.00	119.87	51.94
344		0.00	457.31	339.00	118.31	51.27
348		0.00	457.63	339.00	118.63	51.41
350		0.00	467.81	339.00	128.81	55.82
352		0.00	452.83	335.00	117.83	51.06
356		0.00	446.87	330.00	116.87	50.64
360		0.00	440.87	326.00	114.87	49.78
364		0.00	436.17	328.00	108.17	46.87
368		0.00	430.01	331.00	99.01	42.90
372		0.00	424.43	328.00	96.43	41.79
376		0.00	435.44	329.00	106.44	46.12
380		0.00	448.26	328.00	120.26	52.11
I-384	ZURN 375DA	0.00	505.67	339.00	166.67	72.22
400		0.00	422.77	329.00	93.77	40.64
408		0.00	396.68	324.00	72.68	31.49
412		0.00	396.68	324.00	72.68	31.49
416		1500.00	396.68	324.00	72.68	31.49
420		1000.00	401.87	324.00	77.87	33.74
1838		0.00	603.60	330.00	273.60	118.56
1844		0.00	604.62	328.00	276.62	119.87
1854		0.00	600.96	327.00	273.96	118.72
1858		0.00	596.28	329.00	267.28	115.82
1860		0.00	581.63	322.00	259.63	112.51
1868		0.00	577.52	320.00	257.52	111.59
1896		0.00	561.77	405.00	156.77	67.94
A		----	606.71	326.00	280.71	121.64
B		0.00	510.26	335.00	175.26	75.95
J6934		0.00	597.35	323.00	274.35	118.89

J9632		0.00	602.06	329.00	273.06	118.33
J9680		0.00	545.92	327.00	218.92	94.87
J9688		0.00	515.28	335.00	180.28	78.12
I-296	ZURN 375DA	0.00	592.99	314.00	278.99	120.90
O-384	ZURN 375DA	0.00	473.13	339.00	134.13	58.12

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
A	121.64	408	31.49
I-296	120.90	412	31.49
1844	119.87	416	31.49
J6934	118.89	420	33.74
1854	118.72	400	40.64

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
375	9.89	333	2.97
377	9.89	341	2.97
381	9.89	345	2.97
P2187	9.03	3374	2.97
349	9.03	301	3.10

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
A	2500.00	

NET SYSTEM INFLOW = 2500.00
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 2500.00

APPENDIX I

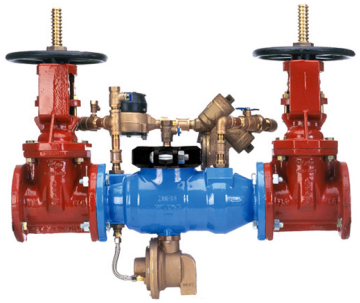
PA-1, PA-2, AND PA-3 CANDIDATE FIRE SERVICE DETECTOR CHECK BACKFLOW ASSEMBLY

Model 375DA

Reduced Pressure Detector Assembly

Application

Designed for installation on water lines in fire protection systems to protect against both backsiphonage and back-pressure of contaminated water into the potable water supply. The Model 375DA shall provide protection where a potential health hazard exists. Incorporates metered by-pass to detect leaks and unauthorized water use.



LEAD FREE

NSF/ANSI/CAN 61

Standards Compliance

(Unless otherwise noted, applies to sizes 2 1/2" thru 10")

- ASSE® Listed 1047
- UL® Classified
- AWWA Compliant C550
- CSA® Certified B64.4 (4" & 6")
- C-UL® Classified
- FM® Approved
- NYC MEA 218-01-M VOL 3
- Approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California
- Meets the requirements of NSF/ANSI/CAN 61*

*(0.25% MAX. WEIGHTED AVERAGE LEAD CONTENT)

By-Pass Backflow Assembly 3/4" Model 975XLD

Materials

Main valve body	Ductile Iron ASTM A 536
Access covers	Ductile Iron ASTM A 536
Coatings	NSF Approved fusion epoxy finish
Internals	Stainless steel, 300 Series NORYL™
Fasteners	Stainless Steel, 300 Series
Elastomers	EPDM (FDA approved) Buna Nitrile (FDA approved)
Polymers	NORYL™
Springs	Stainless steel, 300 series
Sensing line	Stainless steel, braided hose

Features

Sizes:	2 1/2", 3", 4", 6", 8", 10"
Maximum working water pressure	175 PSI
Maximum working water temperature	140°F
Hydrostatic test pressure	350 PSI
End connections (Grooved for steel pipe)	AWWA C606
(Flanged bolt pattern)	ASME B16.42 Class 150

Options (Suffixes can be combined)

- ☐ - with OS & Y gate valves (standard)
- ☐ L - less shut-off valves (flanged body connections)
- ☐ LM - less water meter
- ☐ - with gpm meter (standard)
- ☐ CFM - with cu ft/min meter
- ☐ G - with groove end gate valves
- ☐ FG - with flanged inlet gate connection and grooved outlet gate connection
- ☐ PI - with Post Indicator Gate Valve
- ☐ GF - with flanged inlet connection and grooved outlet connection
- ☐ BG - with grooved end butterfly valves with integral monitor switches (2 1/2" - 10")

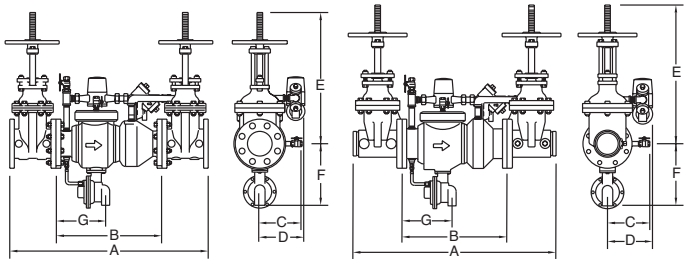
Accessories

- ☐ Air gap (Model AG)
- ☐ Repair kit (rubber only)
- ☐ Thermal expansion tank (Model XT)
- ☐ OS & Y Gate valve tamper switch (OSY-40)
- ☐ QT-SET Quick Test Fitting Set

Attention:
Model 375DA (flange body) and
Model 375ADA
(grooved body) have different lay lengths.

Relief Valve discharge port:
2 1/2" - 6" - 2.75 sq. in.
8" - 10" - 3.69 sq. in.

Model 375DAG SHOWN BELOW



Dimensions & Weights (do not include pkg.)

MODEL 375DA SIZE		DIMENSION (approximate)																				WEIGHT							
		A		A WITH BUTTERFLY VALVES		B LESS GATE VALVES		C		D		E OS&Y OPEN		E OS&Y CLOSED		E WITH BUTTERFLY VALVES		F		G		LESS SHUT-OFF VALVES		OS&Y GATE VALVES FLANGED		OS&Y GATE VALVES GROOVED		BUTTERFLY VALVES GROOVED	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
2 1/2	65	31	787	28	711	15 7/8	403	7 1/4	184	9	229	17 3/4	451	15 3/8	391	13 3/4	349	9 1/2	241	8 3/8	213	75	34	185	84	167	76	147	67
3	80	32	813	28 1/2	724	15 7/8	403	7 1/4	184	9	229	20 1/4	514	17	432	13 3/4	349	9 1/2	241	8 3/8	213	78	35	208	94	160	73	130	59
4	100	37 5/8	956	32 8/9	835	19 1/2	495	8	203	9	229	22 1/2	572	18 1/4	464	17	432	11	279	9 1/4	235	116	53	306	139	292	132	200	91
6	150	44 5/8	1133	37 5/8	956	23 1/2	597	10	254	10 1/2	267	30 1/2	775	24 1/4	616	17 1/2	445	12 3/8	314	9 1/4	235	194	88	494	224	468	212	312	142
8	200	60 7/8	1546	53 7/8	1369	37 3/4	959	11	279	15 1/2	394	37	940	28 1/2	724	16 15/16	430	15 3/8	391	16 3/4	426	382	173	858	389	810	367	556	252
10	250	63 7/8	1622	57 7/8	1470	37 3/4	959	11	279	15 1/2	394	45 5/8	1159	34 3/4	883	16 15/16	430	15 3/8	391	16 3/4	426	412	187	1230	558	1164	528	800	363

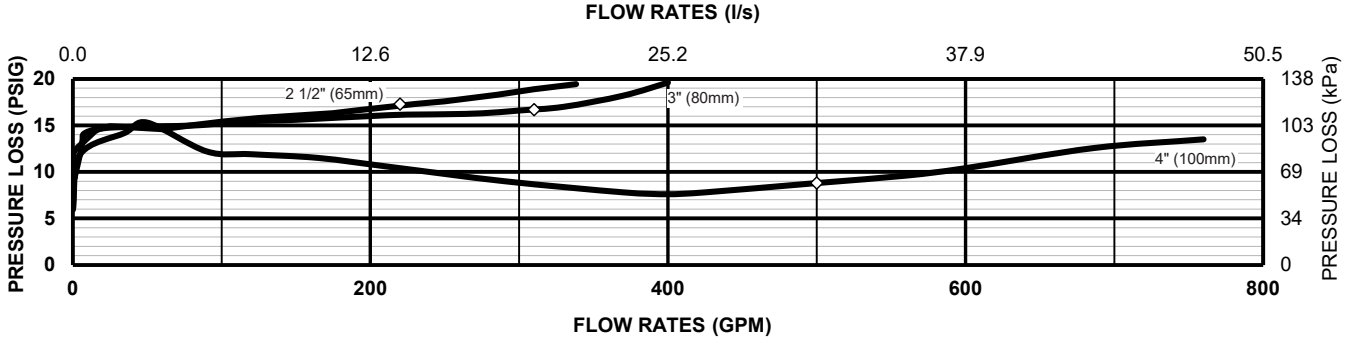
Zurn Industries, LLC | Wilkins
1747 Commerce Way, Paso Robles, CA U.S.A. 93446 Ph. 855-663-9876, Fax 805-238-5766
In Canada | **Zurn Industries Limited**
7900 Goreway Drive, Unit 10, Brampton, Ontario L6T 5W6, 877-892-5216
www.zurn.com

Rev. P
Date: 08/20
Document No. BF-375DA
Product No. Model 375DA
Patent zurn.com/patents

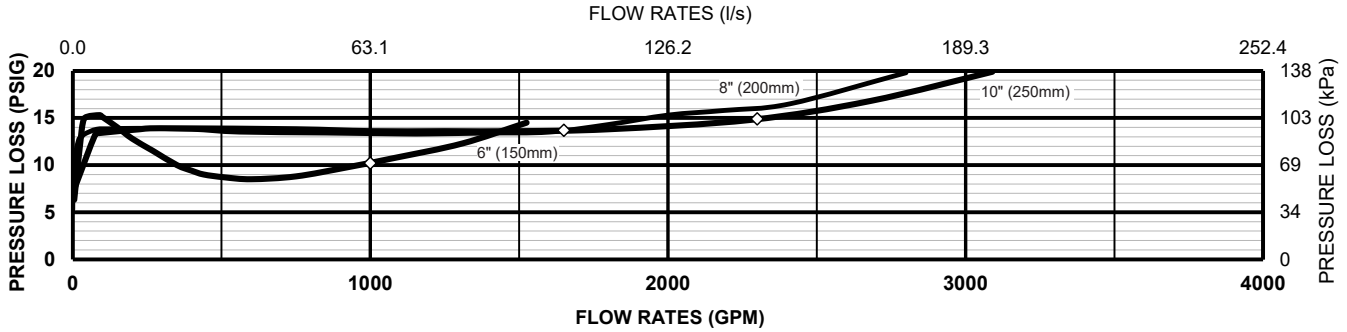
Flow Characteristics

◇Rated Flow (established by approval agencies)

MODEL 375DA 2 1/2", 3" & 4" (STANDARD & METRIC)



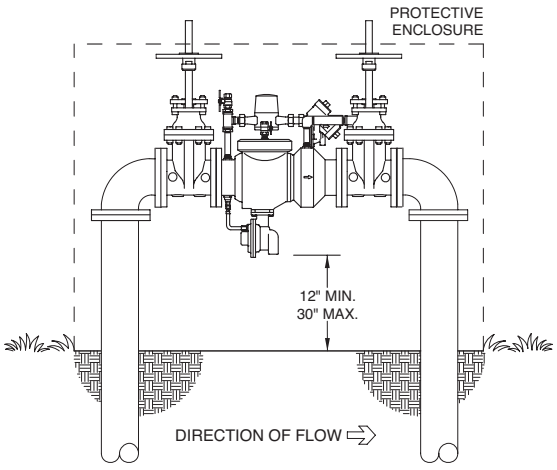
MODEL 375DA 6", 8" & 10" (STANDARD & METRIC)



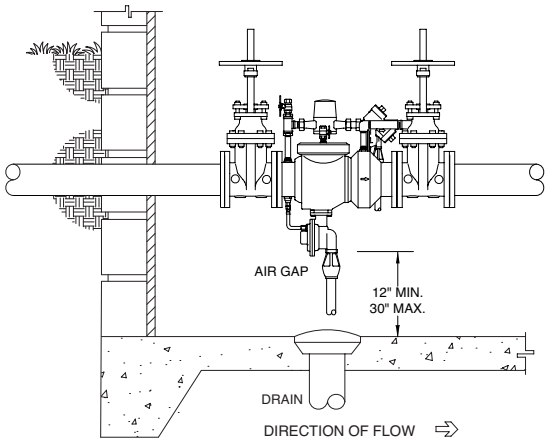
Typical Installation

Local codes shall govern installation requirements. To be installed in accordance with the manufacturer's instructions and the latest edition of the Uniform Plumbing Code. Unless otherwise specified, the assembly shall be mounted at a minimum of 12" (305mm) and a maximum of 30" (762mm) above adequate drains with sufficient side clearance for testing and maintenance. The installation shall be made so that no part of the unit can be submerged.

Capacity thru Schedule 40 Pipe (GPM)				
Pipe size	5 ft/sec	7.5 ft/sec	10 ft/sec	15 ft/sec
2 1/2"	75	112	149	224
3"	115	173	230	346
4"	198	298	397	595
6"	450	675	900	1351
8"	780	1169	1559	2339
10"	1229	1843	2458	3687
12"	1763	2644	3525	5288



OUTDOOR INSTALLATION



INDOOR INSTALLATION

Specifications

The Reduced Pressure Detector Backflow Prevention Assembly shall be certified to NSF/ANSI/CAN 61, ASSE® Listed 1047, and supplied with full port OS & Y gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTM A 536), the seat ring and check valve shall be NORYL™, the stem shall be stainless steel (ASTM A 276) and the seat disc elastomers shall be EPDM. The checks and the relief valve shall be accessible for maintenance without removing the device from the line. The Reduced Pressure Detector Backflow Prevention Assembly shall be a ZURN WILKINS Model 375DA.

Zurn Industries, LLC | Wilkins
1747 Commerce Way, Paso Robles, CA U.S.A. 93446 Ph. 855-663-9876, Fax 805-238-5766
In Canada | **Zurn Industries Limited**
7900 Goreway Drive, Unit 10, Brampton, Ontario L6T 5W6, 877-892-5216
www.zurn.com

EXHIBIT A

PA-1 PRIVATE DOMESTIC WATER
NODE AND PIPE DIAGRAM

LEGEND

- PROJECT BOUNDARY
- EXISTING PUBLIC WATER LINE (629 PRESSURE ZONE)
- PROPOSED PUBLIC WATER LINE (629 PRESSURE ZONE)
- PROPOSED PRIVATE DOMESTIC WATER LINE
- PROPOSED METER
- PROPOSED BACKFLOW PREVENTER
- (2) COMPUTER MODEL NODE NUMBER
- [3] COMPUTER MODEL PIPE NUMBER

LETICIA DR

CARLTON OAKS DR

EX.10" 2095

1838

A

10" P2133

J6932

WEST HILLS PKWY

10" P2135

PA-1

512 514 516 520 526 524 525 527 528

4" 513 4" 515 4" 517 4" 521 4" 527 4" 529 4" 525

509 505 504 508

4" 537 4" 533 532 536

6" 501

476 475 10"

J6934

490 493 496 486 489 492 485 491 482 478 488 481 495 480 483 477 487 479

2" 2" 2" 2" 2" 2" 2" 2" 2" 2" 2" 2" 2" 4" 6"

0 100 FEET

N

CARLTON OAKS PROJECT BOUNDARY

NOTE: FINISH FLOOR ELEVATIONS RANGE FROM 313 FEET TO 319 FEET.

52

EXHIBIT A

PA-1 NODE AND PIPE DIAGRAM

CARLTON OAKS COUNTRY CLUB AND RESORT

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

EXHIBIT B

PA-2 PRIVATE DOMESTIC WATER
NODE AND PIPE DIAGRAM

CARLTON OAKS PROJECT BOUNDARY

CARLTON OAKS DR

CARLTON OAKS DR

PA-2

EX.8" P2197

6"

NOTE: BUILDING PAD ELEVATIONS RANGE FROM 323 FEET TO 339 FEET.

N

0 100 FEET

LEGEND

- PROJECT BOUNDARY
- EXISTING PUBLIC WATER LINE (629 PRESSURE ZONE)
- PROPOSED PUBLIC WATER LINE (629 PRESSURE ZONE)
- PROPOSED PRIVATE DOMESTIC WATER LINE
- M PROPOSED METER
- PROPOSED BACKFLOW PREVENTER
- (2) COMPUTER MODEL NODE NUMBER
- [3] COMPUTER MODEL PIPE NUMBER

EXHIBIT B

PA-2 NODE AND PIPE DIAGRAM

CARLTON OAKS COUNTRY CLUB AND RESORT

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

EXHIBIT C

PA-3 PRIVATE DOMESTIC WATER
NODE AND PIPE DIAGRAM

PEBBLE BEACH DR

CARLTON OAKS DR

EX.8"

EX.8"

EX.8"

EX.8"

P2187

B

PA-2

925

4"

0 150 FEET

N

LEGEND

PROJECT BOUNDARY

EXISTING PUBLIC WATER LINE (629 PRESSURE ZONE)

PROPOSED PUBLIC WATER LINE (629 PRESSURE ZONE)

PROPOSED PRIVATE DOMESTIC WATER LINE

M PROPOSED METER

PROPOSED BACKFLOW PREVENTER

2 COMPUTER MODEL NODE NUMBER

3 COMPUTER MODEL PIPE NUMBER

928

932

4"

929

933

4"

936

4"

937

940

4"

941

944

4"

925

FF=323.8'

FF=323.5'

FF=323.3'

PA-3

FF=322.4'

FF=323.3'

900

EX.8"

P2187

910

2"

913

916

4"

925

2"

905

2"

909

906

4"

901

904

907

2"

908

911

2"

915

2"

912

CARLTON OAKS
PROJECT BOUNDARY

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

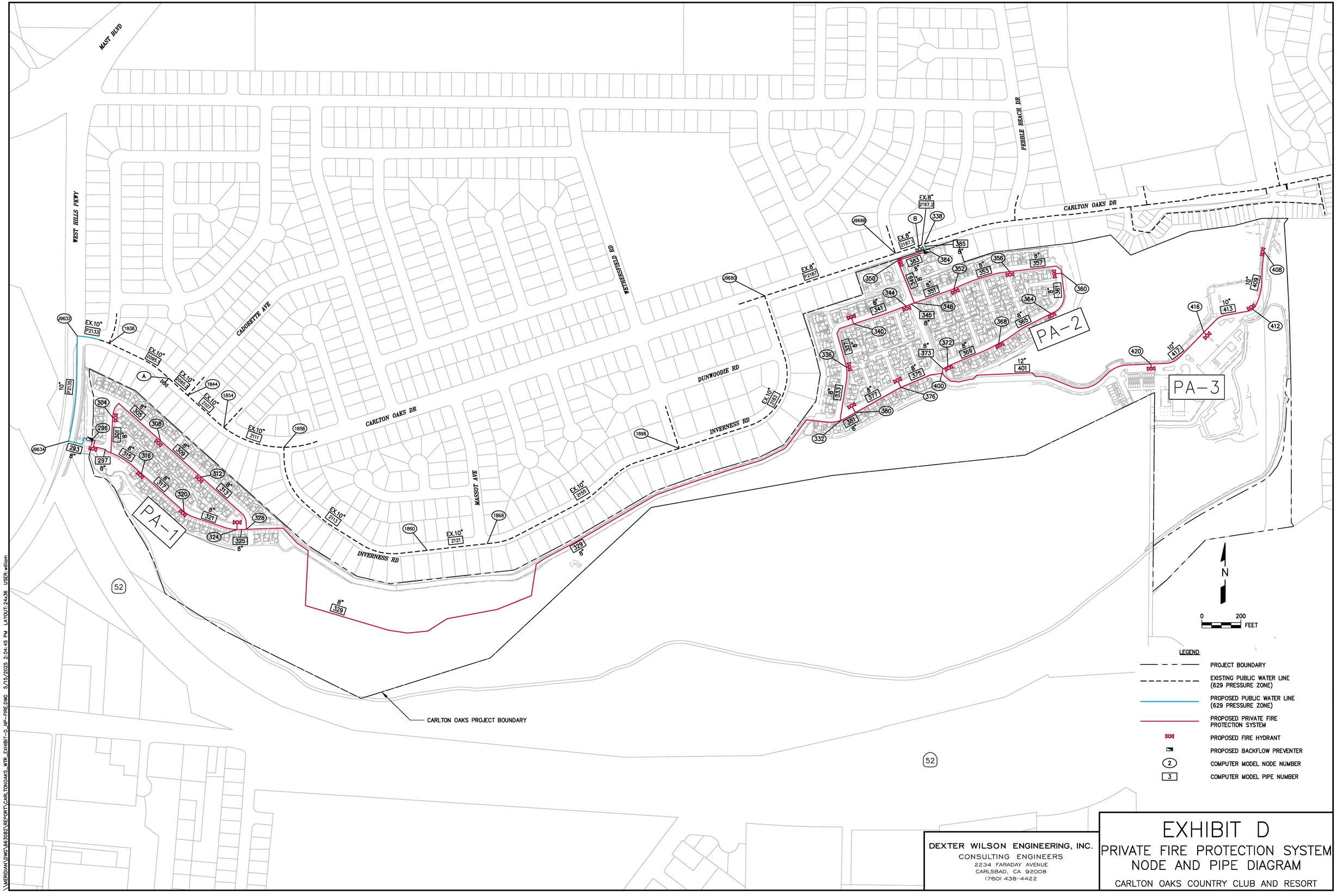
EXHIBIT C

PA-3 NODE AND PIPE DIAGRAM

CARLTON OAKS COUNTRY CLUB AND RESORT

EXHIBIT D

PA-1, PA-2, AND PA-3 PRIVATE FIRE PROTECTION SYSTEM NODE AND PIPE DIAGRAM



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DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
2234 FARADAY AVENUE
CARLSBAD, CA 92008
(760) 438-4422

EXHIBIT D

PRIVATE FIRE PROTECTION SYSTEM NODE AND PIPE DIAGRAM

CARLTON OAKS COUNTRY CLUB AND RESORT