



MEMORANDUM

TO: DIANE LENIUS, P.E., CITY ENGINEER
ANTHONY BURGESS, SENIOR
ENGINEERING TECHNICIAN
FROM: KERRI SIDEBOTTOM, P.E.
RUSSELL PORTER, P.E.
DATE: OCTOBER 16, 2019
SUBJECT: REVISED WATER SYSTEM ANALYSIS
FOR OSLO BAY APARTMENTS
CITY OF POULSBO, KITSAP COUNTY,
WASHINGTON
G&O #19576.00

Oslo Bay Apartments is a planned development located near the intersection of SR 305 and SR 307, in the northern part of the City of Poulsbo. The development will include several townhouses totaling 467 apartment units, a 160-unit senior care center, and a small clubhouse. Commercial zoning exists along the west side of the development. The City has contracted with Gray & Osborne to provide an analysis of the proposed water system for this development.

This development was previously analyzed by Gray & Osborne in a memo dated September 4, 2019. This memo includes two new scenarios (Scenarios 3 and 4) and serves as an addition to the previous memo.

The following assumptions were entered into the hydraulic model to determine the static pressure and available fire flow:

- The available fire flow and pressure are measured at several nodes throughout the planned development, as indicated on Figure 1.
- Water system demands are based on 2034 demands established in the 2014 Water System Plan approved by the Washington State Department of Health (DOH).
- All pump stations (except for Poulsbo Place) and sources are idle.



October 16, 2019
Page 2

PROPOSED DEVELOPMENT

The proposed water mains added to the model are based on the preliminary site plan prepared by the developer's engineer, Team 4 Engineering, dated April 2019. The plan indicates 8-inch pipes looped through the development, connecting to the City's existing 12-inch main within SR 305. Two connections to the City's existing main are proposed along SR 305, separated by approximately 500 feet. The development is located in the 360 Zone, which is served by the Westside Well and Olhava Standpipe via the NW Commerce Street PRV Station.

The developer supplied estimated peak hour demand (PHD) and maximum day demand (MDD) for the development. These are provided for reference in Attachment A. The total PHD is estimated to be 506 gpm, while the MDD is estimated to be 220 gpm. These demands are based on actual water use data from a similar development and fixture count estimates.

The developer has assumed that the fire flow requirement for the apartments will be 1,500 gpm, and the City anticipates that the fire flow requirement to the care facility and commercially zoned area will be 2,000 gpm.

MODELING

Peak hour demand and fire flow availability were evaluated for the proposed development using the City of Poulsbo Water System Model. Modeling was performed using H₂ONet Version 14 which operates in an AutoCAD drawing environment.

The development was modeled under peak hour demands to determine if pressures exceed the minimum requirement of 30 psi, as well as under maximum day demands with fire flow. During fire flow, the minimum system pressure of 20 psi must be maintained and the maximum pipe velocity may not exceed 10 fps. These standards are set by the DOH and the City.

Peak Hour Demand

As stated in the previous memo, during peak hour demand, available pressure on site exceeds 58 psi. This pressure is measured at the ground elevation in accordance with DOH requirements that peak hour pressure be maintained at greater than 30 psi measured at the service meter.



Fire Flow

Analysis was performed to determine the maximum available fire flow to the development while maintaining a minimum pressure of 20 psi at each system node and a maximum pipeline velocity of 10 fps. The modeled fire flow analysis is measured at the meter elevation as dictated by DOH requirements.

Scenario 3 includes 8-inch piping throughout the development and along the proposed loop from Viking Avenue NW along NE Vetter Road and SR 305. The results are presented in Table 1.

TABLE 1

Scenario 3 Fire Flow Availability

Node	Modeled Fire Flow (gpm)
J2554	3,410 ⁽²⁾
J2555	2,870 ⁽¹⁾
J2556	2,230 ⁽¹⁾
J2557	2,300 ⁽¹⁾
J2558	2,410 ⁽¹⁾
J2559	2,340 ⁽¹⁾
J2560	2,330 ⁽¹⁾
J2561	2,340 ⁽¹⁾
J2562	1,560 ⁽¹⁾
J2563	2,340 ⁽¹⁾
J2564	2,300 ⁽²⁾
J2565	2,330 ⁽¹⁾
J2566	2,320 ⁽¹⁾
J2567	2,330 ⁽¹⁾
J2568	1,540 ⁽¹⁾
J2569	1,540 ⁽¹⁾
J2570	1,540 ⁽¹⁾
J2571	2,060 ⁽¹⁾
J2572	2,180 ⁽¹⁾
J2573	2,240 ⁽¹⁾
J3058	2,940 ⁽¹⁾

(1) Flow limited by maximum pipeline velocity constraint of 10 fps.

(2) Flow limited by minimum system pressure constraint of 20 psi.



Nodes in **bold** are those in the western part of the development in the vicinity of the commercial area and the proposed care facility, which are indicated by the City to require a fire flow of 2,000 gpm. Fire flow of greater than 2,000 gpm is available at these nodes if they are served by an 8-inch looped main. The available fire flow to the eastern part of the site is limited by the 10 fps velocity constraint through the proposed 8-inch mains.

Scenario 4 includes 8-inch piping throughout the development and a 10-inch main from Viking Avenue NW along NE Vetter Road. An existing 8-inch stub along NE Vetter Road north of the development is extended south to connect to the proposed piping. There is no looped main along SR 305 in this scenario. The results are presented in Table 2.

TABLE 2

Scenario 4 Fire Flow Availability

Node	Modeled Fire Flow (gpm)
J2554	3,350 ⁽²⁾
J2555	2,240 ⁽¹⁾
J2556	2,650 ⁽¹⁾
J2557	2,250 ⁽¹⁾
J2558	2,250 ⁽¹⁾
J2559	2,250 ⁽¹⁾
J2560	2,250 ⁽¹⁾
J2561	2,250 ⁽¹⁾
J2562	1,560 ⁽¹⁾
J2563	2,250 ⁽¹⁾
J2564	2,250 ⁽¹⁾
J2565	2,250 ⁽¹⁾
J2566	2,250 ⁽¹⁾
J2567	2,250 ⁽¹⁾
J2568	1,540 ⁽¹⁾
J2569	1,540 ⁽¹⁾
J2570	1,540 ⁽¹⁾
J2571	1,970 ⁽¹⁾
J2572	2,100 ⁽¹⁾
J2573	2,160 ⁽¹⁾
J3058	2,710 ⁽¹⁾

- (1) Flow limited by maximum pipeline velocity constraint of 10 fps.
- (2) Flow limited by minimum system pressure constraint of 20 psi.



October 16, 2019

Page 5

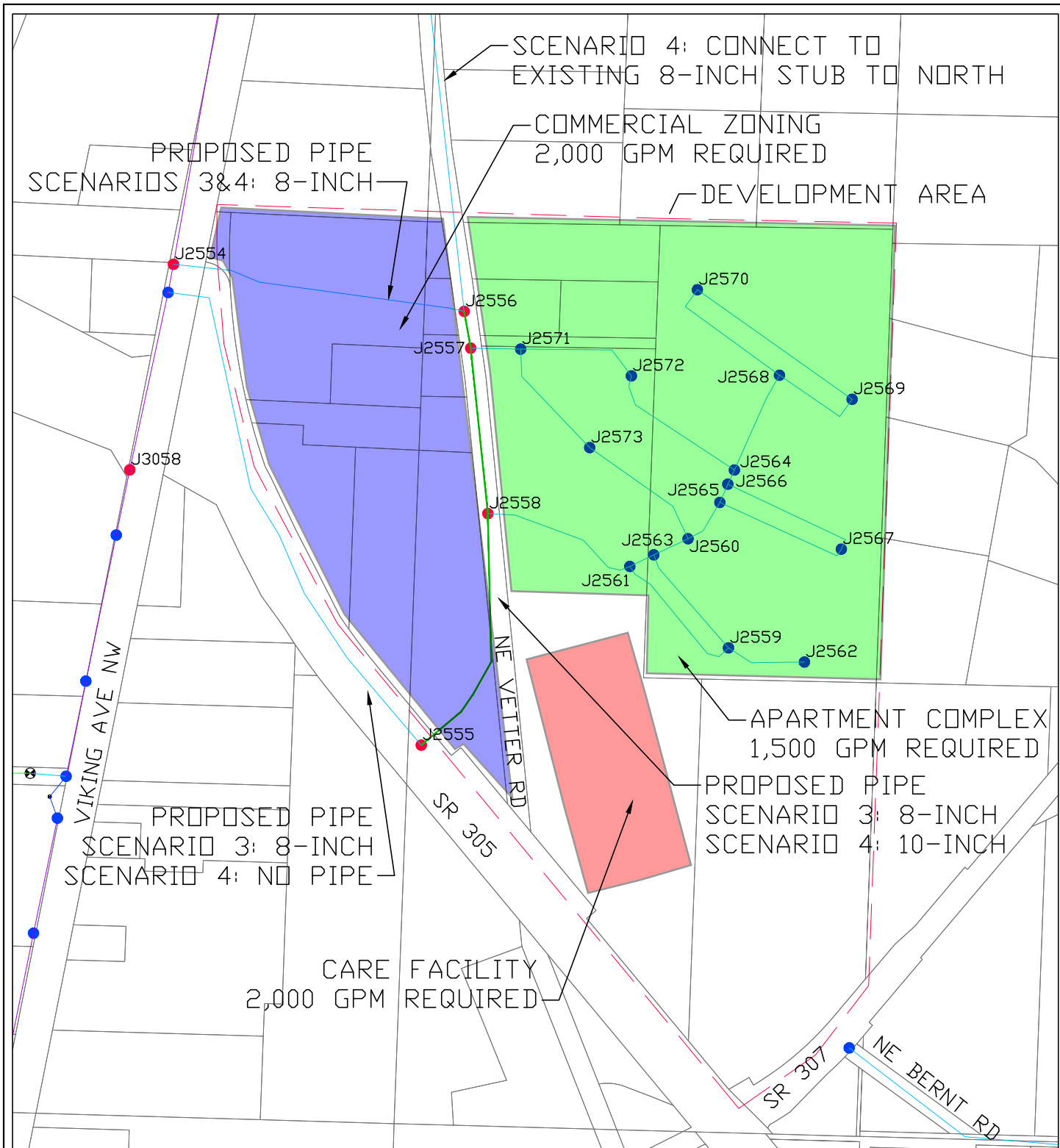
The proposed main that connects to the existing water system along Viking Avenue NW must be 10 inches or larger in order to provide at least 2,000 gpm of fire flow without looping. An 8-inch main would be limited by the maximum velocity of 10 fps to 1,560 gpm. A connection to the 8-inch stub north of the site on NE Vetter Road would allow for a section of the connecting main to Viking Avenue NW to be 8 inches, while the remainder of the new main along NE Vetter Road must be 10 inches. This is indicated on Figure 1.

WATER SYSTEM STANDARDS

The DOH and City standards for water distribution systems are to meet the peak hourly demand of the system while providing a minimum pressure of 30 psi system-wide. Under peak daily demand with a fire flow, the system is designed to maintain a minimum pressure of 20 psi system-wide. Although the peak hourly demand pressure may currently be higher than these standards, the developer must recognize that the City may not provide pressure higher than 30 psi in the future.

KS/hh

Encl.




SCALE
1" = 200'

LEGEND

- 8-INCH DIAMETER
- 10-INCH DIAMETER
- 12-INCH DIAMETER
- DIAMETER VARIES
- PROPOSED DEVELOPMENT
- MODEL NODE
- MODEL NODE, 2,000 GPM REQUIRED

CITY OF POULSBO
OSLO BAY APARTMENTS
REVISED WATER SYSTEM ANALYSIS

FIGURE 1



Gray & Osborne, Inc.
 CONSULTING ENGINEERS

Attachment A - Oslo Bay Water Demand Estimate

OSLO BAY WATER DEMAND ESTIMATE				July 2019	
ADD = Poulsbo 2016 Comp Water Plan (CWP) Table 2-11 "ERU Value"					
ADD =	150	gpd/eru			
MDD= 2.5*ADD (use for booster sizing)					
MDD=	375	gpd/eru			
Apartment Demand: 467 Units					
Edward Rose Water Usage: 100 gpd/person ¹					
Use 2.3 person per apartment unit (2016 CWP)					
ADD = 1000 gpd x 467 units x 2.3 person per unit = 107,410 gpd					
#ERU's: 107,410 gpd / 150 gpd/eru (2016 CWP) = 716 ERU					
From above, MDD=	375	gpd/eru			
PHD=	375	gpm	(for sizing pipes, ES, & some pumps)		
where:		Range of N (eru's)	C	F	
N=	716	15-50	3	0	
C=	1.6	51-100	2.5	25	
F=	225	101-250	2	75	
		251-500	1.8	125	
		>500	1.6	225	
Senior Center Demand: 160 Units					
Water Usage 2009 DOH Table 5-2, Institutions: 75-125 gpd per person					
Assume 1.1 person per resident unit, 100 gpd/person ²					
ADD = 100 gpd x 160 units x 1.1 person per unit = 17,600 gpd					
#ERU's: 17,600 gpd / 150 gpd/eru (2016 CWP) = 117 ERU					
From above, MDD=	375	gpd/eru			
PHD=	98	gpm			
where:		Range of N (eru's)	C	F	
N=	117	15-50	3	0	
C=	2	51-100	2.5	25	
F=	75	101-250	2	75	
		251-500	1.8	125	
		>500	1.6	225	
Clubhouse, 6,000 SF, Non-Residential					
Clubhouse demand is non-residential, therefore has been estimated using UPC Fixture Unit Method. Clubhouse water use will not be a significant portion of overall project. 61 fixture units = 33 gpm. (See Attached Fixture Unit Analysis). Using Table 1, <i>Sizing Guidelines for Public Water Systems</i> , 1983, 33 gpm (MID) is equivalent to 10 ERU's					
Site Water Demand	ERUs	MDD	PHD		
467 Apartments	716	187	375		
160 Unit Senior Cntr	117	31	98		
6,000 sf Clubhouse	10	3	33		
SITE TOTAL	843	220	506		
¹ Calculated from existing Edward Rose apartment usage data. Note that 2009 DOH Table 5-2, Apartments estimates 50 gpd per person.					
² Unit occupancy ratio and water usage calculated from existing Edward Rose senior facilities.					