



## MEMORANDUM

TO: DIANE LENIUS, P.E., CITY ENGINEER  
ANTHONY BURGESS, SENIOR  
ENGINEERING TECHNICIAN  
FROM: KERRI SIDEBOTTOM, P.E.  
RUSSELL PORTER, P.E.  
DATE: SEPTEMBER 4, 2019  
SUBJECT: WATER SYSTEM ANALYSIS FOR  
OSLO BAY APARTMENTS  
CITY OF POULSBO, KITSAP COUNTY,  
WASHINGTON  
G&O #19576.00

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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.

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.

## 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



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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 H<sub>2</sub>O<sub>Net</sub> 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**

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.



**TABLE 1**

**Peak Hour Pressure**

<b>Node</b>	<b>Elevation (ft)</b>	<b>Pressure (psi)</b>
J2556	165	78
J2557	160	80
J2558	145	86
J2559	185	69
J2560	183	70
J2561	175	73
J2562	180	71
J2563	175	73
J2564	195	65
J2565	190	67
J2566	195	65
J2567	195	65
J2568	205	60
J2569	210	58
J2570	210	58
J2571	165	78
J2572	190	67
J2573	170	75

(1) Pressure as measured at ground level at the meter.

As noted, the pressures in Table 1 are determined for the ground elevation. The developer has indicated that the highest floor elevation will be 241 feet, 31 feet higher than the highest ground level elevation of 210 feet. The pressure at 241 feet will be decreased by approximately 13.5 psi to 44.5 psi. This estimated pressure is provided as a courtesy to the developer and is not guaranteed. DOH regulations require minimum pressures to be maintained at the 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. The results are presented in Table 2.



**TABLE 2**  
**Fire Flow Availability with 8-Inch Loop**

<b>Node</b>	<b>Modeled Fire Flow (gpm)</b>
<b>J2554</b>	<b>3,410</b> <sup>(2)</sup>
<b>J2555</b>	<b>3,430</b> <sup>(2)</sup>
<b>J2556</b>	<b>3,430</b> <sup>(2)</sup>
J2557	3,430 <sup>(2)</sup>
<b>J2558</b>	<b>3,440</b> <sup>(2)</sup>
J2559	2,960 <sup>(1)</sup>
J2560	2,590 <sup>(1)</sup>
J2561	2,900 <sup>(1)</sup>
J2562	1,560 <sup>(1)</sup>
J2563	2,880 <sup>(1)</sup>
J2564	2,390 <sup>(1)</sup>
J2565	2,340 <sup>(1)</sup>
J2566	2,410 <sup>(1)</sup>
J2567	2,360 <sup>(1)</sup>
J2568	1,540 <sup>(1)</sup>
J2569	1,540 <sup>(1)</sup>
J2570	1,540 <sup>(1)</sup>
J2571	2,040 <sup>(1)</sup>
J2572	2,180 <sup>(1)</sup>
J2573	2,240 <sup>(1)</sup>
<b>J3058</b>	<b>3,450</b> <sup>(2)</sup>

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

Bolded nodes 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 12-inch mains. 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.

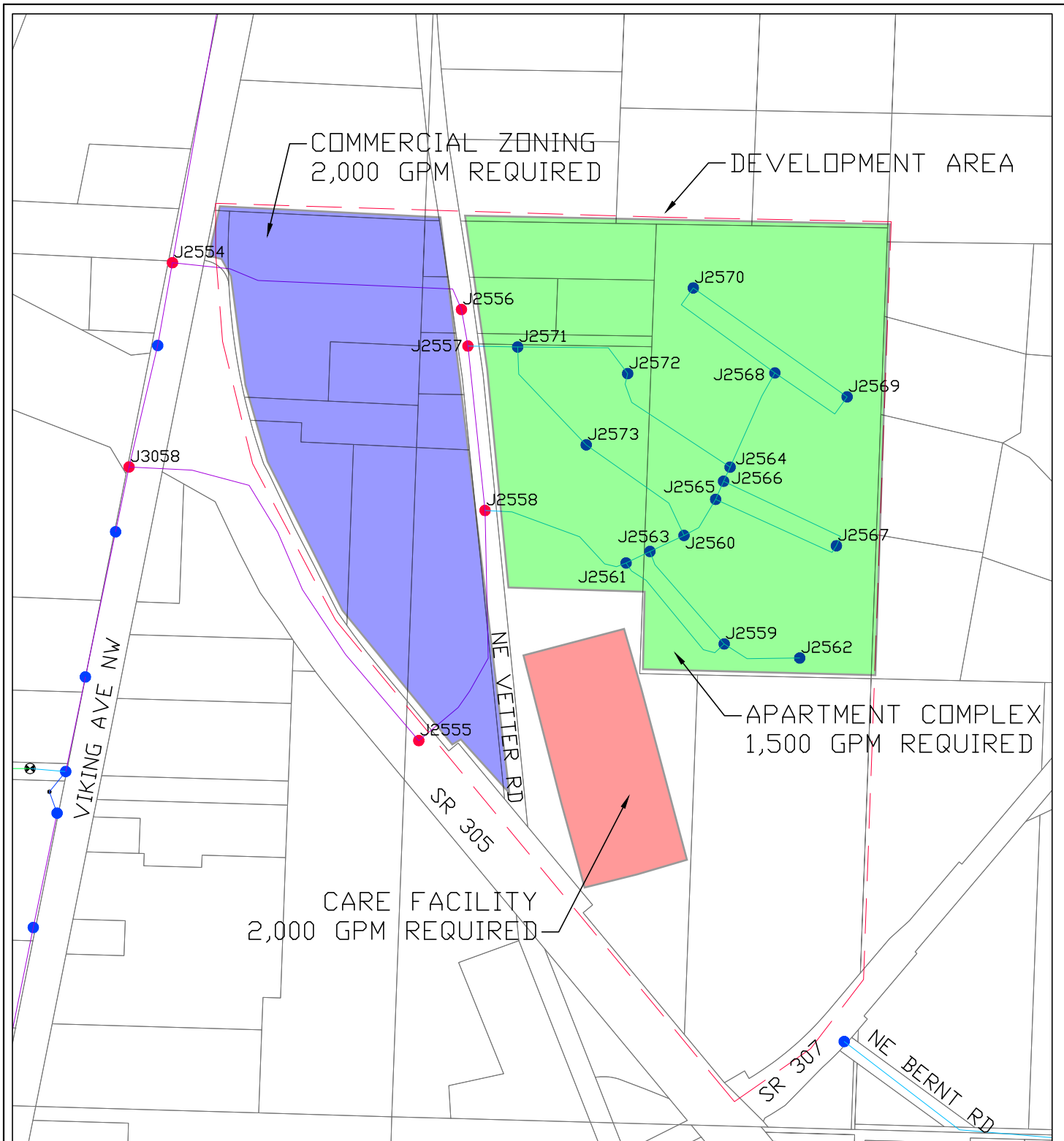


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## **WATER SYSTEM STANDARDS**

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
- PROPOSED DEVELOPMENT
- MODEL NODE
- MODEL NODE, 2,000 GPM REQUIRED

**CITY OF POULSBO**  
**OSLO BAY APARTMENTS**  
**WATER SYSTEM ANALYSIS**

**FIGURE 1**



**Gray & Osborne, Inc.**  
 CONSULTING ENGINEERS