

MEMO



TO: Tracy Coleman, Public Works Director, City of Woodland
FROM: Ken Alexander, P.E.
CC: Shayne Olson, Owner
Ed Greer, Planning Consultant
Emily Stephens, P.E.
DATE: July 12, 2023
SUBJECT: Sewer Service Analysis Logan's Landing
Shayne Olson
21132

INTRODUCTION

Shayne Olson (Applicant) is proposing to develop several parcels in Woodland, Washington. The City of Woodland (City) is requiring the Applicant to conduct a downstream sewer analysis as part of the application. Windsor Engineers (Windsor) was contracted by Shayne Olson to perform a Phase 2 stormwater analysis (which is addressed in a separate report) and the sewer analysis for the Logan's Landing development in Woodland, Washington. The analysis presented in this memo examines provisions for sewer service for the Logan's Landing development to support the Site Plan Review by the City based on the Logan's Landing Preliminary Site Plan dated June 27, 2023.

Additional references used in this analysis are listed below.

- General Sewer Plan, City of Woodland, Gray & Osborne, July 2017
- Belmont Loop Sewer Capacity Analysis, City of Woodland, Gray & Osborne, Inc., September 30, 2022
- Logan's Landing Preapplication Review, Gray & Osborne, Inc., June 15, 2021
- Topographic Survey, Logan Partners LLC Tract, Northern Land Surveying, LLC, May 19, 2021
- Record Drawings, Pacific Park Center, Lawson Surveying and Engineering, May 20, 1999
- Email communication from Travis Goddard, Community Development Director, City of Woodland, June 27, 2023
- Criteria for Sewage Works Design, Washington State Department of Ecology Publication 98-37 WQ, August 2008
- Water System Design Manual, Washington State Department of Health Publication 331-123, June 2020



BACKGROUND INFORMATION

Figure 1, attached, shows the proposed Logan's Landing development. A summary of key information from the latest Preliminary Site Plan is provided in Table 1.

Table 1: Logan's Landing Summary

Parameter	Value
Total Project Area	18.6 acres
Tax Lot Numbers	50680023, 50729, 50730
Zoning	C-2
Number of Buildings	8
Area All Buildings	350,460 ft ²
Office Space Per Building	5,080 ft ²
Total Office Space	40,640 ft ²
Apartments Per Building	34
Total Number of Apartments	272

Abbreviations:
ft² – square feet

CITY OF WOODLAND SEWER SYSTEM

As Figure 2 shows, Lift Station 12 serves a relatively small sewer basin that includes Logan's Landing. Figure 3 shows a schematic of the City's 14 sewage lift stations.

As Figure 3 shows, Lift Station 12 is downstream of Lift Station 10 and upstream of the final lift station prior to the City's wastewater treatment plant, Lift Station 4.

Because Lift Station 10 discharges into the same sewer force main as Lift Station 12, sewage flows from Lift Station 10 must also be considered in this evaluation. The combined flows from the City's sewer system discharge into Lift Station 4. Therefore, the discharge from Lift Station 12 will use capacity in Lift Station 4 and this impact must also be considered in this evaluation. Additionally, increased sewage flows from other developments within the City that will discharge into Lift Station 4 must also be factored into this evaluation.

SEWAGE FLOW PROJECTIONS FROM LOGAN'S LANDING

The first step in this evaluation is to calculate projected peak sewage flows from Logan's landing at buildout, assuming 272 apartments and full occupancy of commercial spaces. Sewer flow projections based on buildout of the Logan's Landing development are presented in Table 2. Inflow and infiltration are considered when calculating peak sewage flows.



Table 2: Sewer Flow Projection Estimates at Buildout

Source	Factor	Basis	Flow (gpd)	Reference
Residences	135 gpd/ERU	272 ERUs	36,720	(1)
Offices	15 gpd/worker	135 workers	2,025	(2)
Infiltration and Inflow	1,100 gal/acre-day	18.6 acres	20,460	(1)
Total			59,205	

Abbreviations:

ERU - Equivalent Residential Units
gal/acre-day – gallons per acre per day
gpd – gallons per day

The projected peak flow from Logan’s Landing will be 42 gallons per minute (gpm). = 42 gpm
(Calculation: $59,250 / (24 \times 60) = 42$ gpm)

References:

1. City of Woodland General Sewer Plan Chapter 5 (July 2017)
2. DOH Water System Design Manual Table 3-2 (DOH Pub 331-123 of June 2020)

ISSUES TO BE ADDRESSED IN THIS MEMO

Issues to be addressed in this memo include:

- Ability to serve the Logan’s Landing development with a gravity sewer extension.
- Capacity of the existing Lift Station 12 that currently serves the sewer basin W-12, which includes the Logan’s Landing development.
- Potential impacts of Logan’s Landing development and other anticipated developments on other lift stations in the City of Woodland.
- Additional engineering investigation required to confirm the optimal means of sewer service to the Logan’s Landing development.

ABILITY TO SERVE LOGAN’S LANDING WITH GRAVITY SEWER

Introduction

The original preapplication review conducted for the Logan’s Landing development in June 2021 stated the following as it regards providing sewer service to Logan’s Landing.

1. *An existing sewer manhole at the southern terminus of existing Franklin Street is the nearest point for gravity sewer discharge. The preferred approach to managing sewage from the site will likely be to extend the existing 10-inch gravity sewer to the proposed*



terminus of proposed Franklin Street, (if feasible), and to replace the existing Lift Station #12 (located along the northern portion of Belmont Loop) that sewage from the site will drain to with a higher capacity lift station.

- 2. Modeling of sewer collection system elements prepared for the most recent General Sewer Plan did not anticipate multifamily development at this location; therefore, additional assessment will be needed to verify capacity. Downstream sewer capacity improvements, including (but not necessarily limited to) upsizing the of the existing 6-inch force main which follows the westerly right of way of Old Pacific Highway, may be needed. Needed improvements should be determined as part of a comprehensive assessment of downstream sewer capacity.*
- 3. For any proposed new lift station, lift station design will meet criteria established by the Public Works Director for siting, depth, and capacity, and will be suitable to meet the needs of potential offsite development and expansion.*
- 4. Sewer connection charges will be assessed at the time of building permit issuance.*

Although some changes to the proposed development have occurred since the original preapplication review, including a reduction in the number of residential units from 408 to 272, the preapplication review comments relative to sewer service remain relevant and are considered in this evaluation.

As the preapplication review states, the preferred approach to managing sewage flows from the development will be via a gravity service (Alternative 1). However, if gravity service is not feasible, it will be necessary to construct a lift station and a force main to pump sewage flows to Lift Station 12 from Logan's Landing (Alternative 2). Figure 4 shows both the gravity and pumping alternatives for sewer service to Logan's Landing.

Gravity Sewer Service Analysis

Gravity sewers must be sized for hydraulic capacity, and they must be sloped to provide sufficient scouring velocities to avoid clogging the sewer line. Table 3 shows recommended sewer slopes for gravity sewers from the Washington State Department of Ecology Criteria for Sewage Works Design (Orange Book).



Table 3: Orange Book Recommendations for Minimum Slopes of Gravity Sewer Lines

Sewer Line Size (inches)	Minimum Slope (ft/100 ft)
8 *	0.4
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14

Note: *8-inch is the recommended minimum size for gravity sewers

(Reference: Table C1-1 Criteria for Sewage Works Design Washington State Department of Ecology Publication 98-37 WQ August 2008)

The Preliminary Site Plan shows a new sewer line going down the Franklin Street extension connecting to an existing manhole. The ground level difference from the start of the new sewer line in the proposed Franklin Street extension (25-foot [ft] elevation) to the existing manhole (21,82 elevation) is calculated as 3.18 ft. The length of this proposed sewer line is 1,561 ft., for a 3.18 ft drop that equates to a slope of 0.2 ft/100 ft.

(Calculation: $3.18 / (1561/100) = 0.2$)

To meet the Orange Book criteria for slope will require a 14-inch sewer line on this section of the proposed sewer line.

It is recommended, however, that during the engineering phase of this project that the existing segment of pipe in Franklin be evaluated for possible replacement. A shallower slope and/or a larger size could enable easier gravity service to Logans Landing.

Gravity service from the edge of the property at the existing manhole to Lift station 12 would extend to the existing 10-inch sewer line under Belmont Loop. The total length of a gravity sewer line from the existing manhole at the end of the Franklin Street stub to Lift Station 12 is 1,548 ft. According to the record drawings for the Pacific Park Center development, the ground elevation at Lift Station 12 is 15.25 ft. If this is correct, it would equate to an elevation drop of 6.57 ft and a slope of 0.42 ft/1000 ft, which exceeds the Orange Book criteria for a 10-inch gravity line.

(Calculation: $6.57 / (1548/100) = 0.42$ ft/100 ft)

It will be necessary to obtain a survey of the route from Logan's Landing to Lift Station 12 to verify this slope is accurate.



CAPACITY OF LIFT STATION 12

Background

As stated in the preapplication memo, the capacity of the sewage lift station serving the Belmont Loop area is a potential issue. Gray & Osborne recommended replacing the existing Lift Station 12 with a higher capacity lift station to manage sewer flows from the Logan's Landing development.

Belmont Loop Sewer Evaluation

To determine the actual capacity of Lift Station 12 as well as ascertain the impacts of future developments on Lift Station 12, the City contracted Gray & Osborne to evaluate the capacity of Lift Station 12 to accept additional sewer flows from two other developments in the basin; Belmont Loop RV Park and Oak Village Apartments. A copy of the Gray & Osborne evaluation of September 30, 2022 is attached as Appendix A to this memo.

For the Belmont Loop Sewer Evaluation, the City performed draw down tests at Lift Station 12 to determine its capacity with upstream Lift Station 10 operating at capacity. From these tests, Gray & Osborne determined that Lift Station 12 had a capacity of 170 gpm with one pump out of service, per the Orange Book criteria. The analysis by Gray & Osborne also showed that Lift Station 12 could serve the Belmont Loop RV Park and Oak Village Park Apartments based on projected flows from those sources.

Adding Logan's Landing Flows to Lift Station 12 Projected Flows

Table 4 provides a summary of projected peak flows to Lift Station 12 from each development. This summary is based on the analysis in the Belmont Loop Sewer Evaluation and adding projected flows from Logan's Landing found in Table 2 of this memo. Peak flows from Lift Station 10 must also be considered since Lift Station 10 and 12 discharge to the same force main.

Table 4: Projected Additional Flows to Lift Station 12

Scenario	Flow (gpm)
Development Based on General Sewer Plan Year 2033 Projections (1)	20
Add Belmont Loop RV Park (2)	52
Add Belmont Loop RV Park and Oak Ridge Apartments (2)	116
Add Belmont Loop RV Park, Oak Ridge Apartments and Logan's Landing (2, 3)	158
Lift Station 12 Capacity with one pump out of service and with LS 10 operating at 100 gpm (2)	170

Abbreviations:

gpm – gallons per minute

LS – Lift Station

RV – recreational vehicle



References:

1. General Sewer Plan, City of Woodland, Gray & Osborne, July 2017
2. Belmont Loop Sewer Capacity Analysis, City of Woodland, Gray & Osborne, Inc., September 30, 2022
3. Table 2 of this memo

Based on the scenario that Logan's Landing, Belmont Loop RV Park, and Oak Ridge Apartments are the only additional future contributors to sewage flows received at Lift Station 12, it appears that Lift Station 12 has the capacity to receive Logan's Landing projected build out flows without any upgrades to increase its capacity. However, as the next analysis indicates, impacts on the City's sewer system downstream of Lift Station 12 must also be considered in this evaluation.

IMPACTS OF LIFT STATION 12 FLOWS COUPLED WITH SEWER FLOWS OTHER ANTICIPATED DEVELOPMENTS ON LIFT STATION 4

The Belmont Loop Sewer Evaluation, also considered downstream, impacts the Oak Ridge Apartments and Belmont RV Park coupled with the Quail Meadows development.

Additional developments that were identified by the City of Woodland Community Development Director that will impact Lift Station 4 will also be potentially impacted and are shown on Figure 5. These additional developments are listed below.

- Scott Hill – 40 Equivalent Residential Units (ERUs)
- Woodland Creek Subdivision and Lewis River Apartments – 320 ERUs
- Apartment Complex on Goering Street – 30 ERUs
- Walt's Meats – Additional flow of 30,000 gallons per day (gpd)

Without obtaining additional information about the Scott Hill, Woodland Creek, and Lewis River apartment developments, it is not possible to accurately estimate the peak flow projections for all three developments but using 135 gpd/ERU as a base estimate, the combined flows from the three developments listed above, plus increased flows from Walt's Meats, will be on the order of 55 gpm.

(Calculation: $((390 * 135) + 40,000)/(60 * 24) = 65$ gpm peak flow)

The City conducted drawdown tests for Lift Station 4 and, with the information obtained from the draw down test, Gray & Osborne concluded that the capacity of Lift Station 4 with one pump out of service per Orange Book reliability criteria, was 760 gpm.

Gray & Osborne concluded that Lift Station 4 would need to be capable of pumping 1,100 gpm to accommodate 2033 flow projections plus the flow contributions from the Oak Ridge Apartments, Belmont Loop RV Park, and the Quail Ridge Development. Thus, when additional flows from Logan's Landing, the Scott Hill development, Lewis River Apartments, the Goering Street Apartments, Woodland Creek Subdivision and Walt's Meats are added to the



aforementioned projected flows, Lift Station 4 would need to have a capacity to pump a peak flow of 1,207 gpm, which is well in excess of its current capacity.

(Calculation: $1,100 + 42 + 65 = 1,207$ gpm)

The 2017 General Sewer Plan previously concluded that Lift Station 4 is inadequate to pump projected flows for the year 2033, which was prior to considering added flow contributions from Belmont Loop RV Park, Oak Ridge Apartments and Quail Meadows Subdivision.

Gray & Osborne recommended that, rather than upgrade the pumping capacity of Lift Station 4, the City instead replace and upsize the force main from Lift Station 4 to the City's wastewater treatment plant from 8 to 10 inches. This will reduce the head that the pumps must pump against and increase the capacity of Lift Station 4 to 1,580 gpm, which would potentially accommodate all current projected growth, including Logan's Landing.

Additionally, Gray & Osborne's assessment indicated that this force main is old and increased flows through this force main could greatly reduce its service life.

ADDITIONAL RECOMMENDED ACTIONS

Based on the analysis provided in this memo, it appears feasible to serve Logan's Landing with gravity sewer with the following provisions. It is proposed that the surveying and additional engineering detail described below be performed during the engineering phase of this project.

- A topographic survey of the proposed gravity alignment to be performed including the existing Franklin Street sewer line and the gravity line that flows to Lift Station 12. This will allow more detailed hydraulic analysis.
- The existing gravity in Franklin to be evaluated for potential replacement at a shallower slope to allow for the Logans Landing sewer to more easily reach Belmont Loop.
- The new gravity line in the Franklin Street extension into the Logan's Landing development is sized to provide adequate slope to meet Orange Book slope requirements. This assessment indicates this pipe would need to be 14-inch. Based on survey information and evaluation of the existing Franklin pipeline, it may be possible to reduce the size of the new pipeline.
- The 10-inch gravity line between the existing manhole at the edge of the Logan's Landing development to Lift Station 12 is verified to have an adequate slope. As described above, this will require a survey of the entire route of the gravity line to Lift Station 12 to make this verification.
- No developments other than the Belmont Loop RV Park, Oak Ridge Apartments, and Logan's Landing are allowed by the City within sewer basin W-12 without further analysis by future applicants.
- The City upgrades the capacity of Lift Station 4, either by upsizing the pumps or increasing the size of the force main from Lift Station 4 to the City's wastewater treatment plant, to accommodate all projected growth, including Logan's Landing.



Additional engineering investigations by the City will be required for evaluating methods of increasing the capacity of Lift Station 4. This evaluation is critical to allowing any additional growth to occur within the City of Woodland.

If the survey of the 10-inch gravity line between the Logan's Landing development and Lift Station 4 shows that there is insufficient drop in elevation to provide the necessary slope, an engineering evaluation that looks at alternatives for sewer service to the site should be performed. This evaluation could consider options that include constructing a small lift station from the Logan's Landing development to Lift Station 4 and elevating the entire Logan's Landing development.

Attachments:

- Figures 1-5
- Appendix A