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Section 8

Section 8

Improvement Integration and Prioritization

8.1 Introduction

This section of the WCSMP discusses integration of projects to achieve multiple objectives, including extending sewer service to new and existing development, improving capacity to serve existing and future customers, and reducing risk of catastrophic failure during a seismic event. The Springwater Plan Area and Pleasant Valley Plan Area sanitary sewer extensions proposed in the previous plan are updated and refined based on improved topographic data, better understanding of future land use and pipeline improvements that have been designed or completed. The section integrates seismic resilience and capacity improvements and guides prioritization and phasing of projects tabulated in Section 9.

The approach to the WCSMP includes integration of seismic risk as a key factor in improvement prioritization. The approach considers spatial overlay of infrastructure with poor condition, capacity deficiencies, and seismic risk. The project integration is intended to provide a cost-effective approach for holistically considering opportunities to improve resiliency and capacity.

8.2 Improvement Objectives

Several objectives were evaluated and integrated into the WCSMP. Each improvement objective or flow scenario required a slightly different approach in evaluation, described in Table 8-1 below.

Table 8-1
Evaluation Summary

Name	Description	Evaluation Approach
Barlow High School	Connect school to pump station and existing collection system in Kelly Creek Basin	Evaluate capacity by adding 200 gpm to model at SE Woodland Drive west of SE Hickory Place. Models with additional flow included alternative existing model and future condition model.
Springwater Plan Area Zoning Evaluation	Evaluate impact of residential versus industrial development	Develop alternative flow model scenarios. Compare model results residential versus industrial dominant zoning, including impact on downstream capacity. No alternative pipe sizing in the plan area developed.
Springwater Plan Area Extensions	Planned sewer service extensions in the Springwater Plan Area	Review feasibility of alignments using LiDAR, 10-foot contours and design criteria. Adjust planned alignments as necessary to achieve design criteria.
Pleasant Valley Plan Area Extensions	Planned sewer service extensions in the Pleasant Valley Plan Area	Evaluate feasibility of alignments using LiDAR, 10-foot contours, newly constructed pipes, designed pipes, and acquired easements. Adjust planned alignments as necessary to achieve design criteria.
Seismic Resilience	Incorporate recommendations of Resilience Study into plan and CIP	Overlay with system capacity recommendations. Address multiple objectives with single project recommendation.
Existing Collection System Capacity	Identify capacity improvements	Pipes requiring upsizing to eliminate capacity risk are identified by iterative modeling to minimize the number of pipes needing to be upsized in order to eliminate unacceptable freeboard or flooding.
Large Diameter Structural Evaluation	Cleaning, inspection with CCTV, sonar	All pipes greater than 18-inch diameter. Needed to understand structural risk for large diameter gravity mains.

8.3 Flow Evaluations

Two areas require additional flow evaluations to incorporate future flow assumptions that vary from the standard assumptions.

8.3.1 Barlow High School Sewer Extension

Barlow High School will be connecting to Gresham's Kelly Basin Trunk in the near future. The high school is located at Southeast Lusted Road and Southeast 302nd Avenue, outside of the Gresham city boundary and the study area. During the 2018-2019 school year, the school served 1,500

students from Gresham and unincorporated areas to the east of Gresham (Oregon Department of Education, 2019).

The school needs to connect to a municipal sewer service, which is proposed via a new pump station and force main connecting into the existing wastewater collection system at Southeast 282nd and Southeast Lusted Road, in the upper Kelly Creek Basin. In order to evaluate the impact of this additional flow on the gravity system downstream of the connection point, the assumed peak flow rate of 200 GPM was added to the hydraulic model at junction 3558-6-035, in addition to existing and future flows. This additional flow is considered in sizing recommendations for capacity and seismic improvements downstream in the Kelly Creek Trunk.

8.3.1.1 Barlow High School Hydraulic Impact with Existing Condition Flows

The increased flow resulted in a 1 to 2-foot decrease in freeboard downstream. The HGL is within 3 feet of the ground surface one additional manhole with the addition of the Barlow High School flows during the existing scenario. The added flow causes no additional flooding predicted during the 5-year design storm. The results for the existing flow scenario are illustrated on **Figure 8-1**.

8.3.1.2 Barlow High School Hydraulic Impact with 2040 Condition Flows

The increased flow resulted in a ½ to 1-foot decrease in freeboard downstream. The HGL is within 3 feet of the ground surface three additional manhole with the addition of the Barlow High School flows during the 2040 scenario. Although one manhole is predicted to flood during the 2040 scenario in the Kelly Creek Basin Trunk, the added flow causes no additional flooding predicted during the 5-year design storm. The results for the 2040 flow scenario with additional flows from Barlow High School are illustrated on **Figure 8-2**.

8.3.2 Springwater Plan Area Zoning Evaluation

The 1,260-acre Springwater Plan Area will be eventually served by the Johnson Creek Trunk and downstream conveyance infrastructure, including Linneman Pump Station. Current zoning assigns 650 acres as industrial land use. However, to date, all properties annexed within the plan area have been developed for residential use. Residential land uses have higher wastewater demands ranging from 1,100 to 4,300 gallons per acre per day, compared to industrial uses at 380 gallons per acres per day. In order to ensure that pipes are adequately sized to accommodate future flows, alternative future land use assumptions are developed and tested in the model.

In the alternative scenario, 40 percent of the 640 acres zoned as industrial is assumed to develop as industrial use. The other 60 percent of the 640 acres industrial zone is assumed to be developed as residential use, broken down further into 25 percent multi-family residential and 57 percent low density residential. The resulting areas by land use and zone are detailed in **Table 8-2**.

Table 8-2
Springwater Zoning and Alternative Development Assumptions

Zone	Zone Area (net, acres)	Alternative Land Use (net, acres)
IND (Industrial)	650	0.4 x 650 = 260
COM (Commercial)	30	30
MFR (Multi-Family Residential)	40	40 + (0.25 x 0.6 x 650) = 140
SFR (Single Family Residential)	290	290 + (0.75 x 0.6 x 650) = 580
School	20	20
Total	1030	1030

The change in land use does not result in any additional capacity deficiencies downstream of the Springwater Plan Area. However, the proposed new pipes serving the Springwater Plan area are sized for the residential focused alternative scenario because it has higher projected flows. The proposed pipe diameters for the Springwater Plan Area sanitary sewer network should be verified as development density and land use are more definitively known.

8.4 Service Extensions for Plan Areas

The wastewater collection system network extensions to the Pleasant Valley and Springwater Plan areas were reviewed and refined. Since the previous WCSMP Update, some pipes have been constructed in the Pleasant Valley Plan Area. Also, development proposals are under consideration. Review and refinement of the alignments incorporated information from design projects currently underway, LiDAR topography, existing pipe alignments and elevations, optimizing pipe diameter, and alternative routing to avoid difficult construction conditions such as stream crossings.

8.5 Seismic Resilience Improvements

Seismic resilience improvements are integrated with other collection system planning objectives in two ways. The main form of integration is prioritizing improvements that address both capacity and seismic resilience deficiencies. Resilience is also integrated into any collection system improvement, whether driven by capacity deficiency, pipe age, RDII, pipe condition, or the need for extending service to new customers, because seismic resilience will be incorporated into the City's sewer design standards and will guide project implementation.

Seismic resilience improvements are to be implemented over a 45-year period and are divided into three phases. The Short-term phase will be implemented in the first 15 years, through 2032. The Mid-term phase will be implemented in the 16 to 30-year time frame, between 2033 and 2047. The remaining Long-Term projects will be implemented before 2062. The Short-term and half of Mid-term timeframe overlaps with the planning period and projects recommended in this WCSMP. All collection system projects are planned for completion by 2047, and only two of them are Mid-term phase projects. Although they may not all be targeted for completion during the

planning period for the WCSMP, all collection system seismic improvement projects are incorporated into the improvement integration analysis. Should a capacity improvement be recommended for a pipe that is also recommended for seismic resilience improvement, the improvements would be integrated and completed together as a single project.

The *Wastewater Seismic Resilience Plan* recommends specific changes to design standards, which include using reinforced CIPP lining and jointless pipe (solid wall HDPE) technology. Any improvements made in the collection system as a result of this plan will be subject to the design standards at the time of design. Therefore, any improvement to the collection system will potentially improve the seismic resilience of the system, even if it is not a targeted seismic resilience improvement recommended in the *Wastewater Seismic Resilience Plan* (2019).

Lining pipes with CIPP slightly reduces the size of the pipes, but with smoother interior and reduced roughness coefficient the capacity of the pipe can be increased. Also, lining the pipes with CIPP reduces the inflow and infiltration in the pipes. The net result of these factors is an overall increase in the capacity of the sewer pipes.

8.6 Capacity Improvements

Capacity improvements are recommended for pipes having design capacity less than peak flows and causing the HGL upstream to be within 3 feet of the critical elevation or manhole rim elevation. These improvements are needed to eliminate sanitary sewer overflow risk in the collection system. Most recommended improvements are in the Kelly Creek and East Basins. The recommended improvements are identified by iterating the model with improvements until no freeboard less than 3 feet is predicted upstream. This results in a smaller, more targeted set of recommended improvements compared to recommending upsizing of all pipes with modeled flow to design flow ratio (q/Q) greater than 1.

8.7 Integrated Improvements

Improvement objectives are integrated as shown on **Figure 8-3** and described below.

1. Capacity improvement recommendations incorporate flows from the eminent connection of Barlow High School.

2. All capacity improvements recommended in this plan will be sized to convey additional future flows per the existing zoning information. This includes trunks downstream of the Pleasant Valley and Springwater plan areas.

3. Future pipes within the plan areas are sized to convey flows associated with zoning designations. Diameters should be re-evaluated given development varying from the zoning designation.

4. The sewer capacity improvements and service extensions recommended in this plan will meet seismically resilient design standards.

5. Where both capacity and seismic resilience improvements are recommended on the same pipes, the projects will be implemented in combination with structural improvements recommended in the *Wastewater Seismic Resilience Plan* (2019). Projects that include both capacity and seismic improvements are detailed in Subsection 8.7.1 below.

6. Timing of projects with both capacity and seismic resilience objectives will occur at the earliest phase identified in either the *Wastewater Seismic Resilience Plan* (2019) or the WCSMP. For example, when the capacity improvement is recommended prior to 2030 and the resilience improvement is recommended for 2038, the project would be planned for the first phase CIP (2020 to 2030).

8.7.1 Integrated Seismic Resilience and Capacity Improvements

Locations where both seismic and capacity improvements are needed in the existing collection system are as follows.

- Upper Kelly Creek Trunk: Tier 2 backbone structural CIP lining planned for after 2048 and Near-term (2020 to 2030) capacity improvements needed to address capacity deficiencies predicted

- Lower Kelly Creek Trunk: Tier 1 backbone structural CIP lining planned for 2027 and Medium-term (2030 to 2040) capacity improvements needed

Locations where seismic resilience improvements are recommended, but where capacity is near thresholds of deficiency are listed below. There are no capacity deficiencies in these pipes with existing pipe diameters and flows. Proposed structural reinforcement should include an evaluation of the impact to hydraulic capacity and capacity-related deficiencies, and consideration of the impact to capacity in selecting the reinforcement method. For example, slip lining with HDPE could be a cost-effective way to eliminate risk of failure at joints, but will significantly reduce hydraulic capacity of a given pipe when lined without pipe bursting. For the purposes of this plan, it is assumed that seismic improvement with a thin reinforced CIPP liner would both reduce RDII entering the collection system and not reduce pipe capacity, given the smoother material surface.

- Butler Creek/Heiney "A" Trunk: This pipe is recommended as a Tier 2, Long-Term seismic resilience improvement project. The pipes are predicted to surcharge, given existing diameters and 5-year design storm flows projected to 2040, but freeboard is in excess of three feet. These pipes were recommended for Long-Term capacity improvements in the 2012 WCSMP. The capacity given reduced diameter with structurally reinforced CIPP should be verified before any improvements are implemented.

- Burnside Trunk: This pipe is recommended as a Tier 1 seismic resilience improvement, scheduled for 2031. Several pipes in this trunk are predicted to surcharge with 2040 peak flows, but freeboard is in excess of three feet. In addition to the seismic improvements, upstream capacity improvements in the Kelly Creek and East Basin Trunks could result in a more efficient upstream conveyance system, thereby increasing peak flows in this major

interceptor. The capacity given reduced diameter with structurally reinforced CIPP should be verified before any improvements are implemented.

- Tier 2 structural reinforcement of the pipe on NE Cleveland Avenue north of NE 8th Street: This is an 18-inch pipe recommended for structural reinforcement. The maximum flow to full flow ratios exceed 1.9 for pipes between 3254-7-036 and 3354-7-004 with the 2040 design storm peak flow. The upstream end of the pipe, located at 3254-7-036, is surcharged 4 feet over the pipe crown, but still has 16 feet of freeboard.

- Tier 2 structural reinforcement of the East Basin Trunk at Gresham Station, north of NW Division Street: The maximum flow to full flow ratio is 1.6 in the 30-inch trunk. The pipe is predicted to have about 25 feet of freeboard during the 2040 design storm peak flow.

- Tier 1 structural reinforcement of the 15-inch pipe on NE 19th Street from NE Hood Court to NE Main Avenue and NE 18th Street: The maximum flow to full flow ratios of these five pipes range between 1.2 and 4.6. Surcharge of 1 foot is predicted at the upstream end, and 9 feet of freeboard during the 2040 design storm peak flow.

8.8 Summary

The main improvement objectives for this WCSMP are to reduce capacity risk in the existing collection system and plan sewer service for future development in the future development areas. This section integrates additional improvements recommended by the *Wastewater Seismic Resilience Plan* (2019) and incorporates scenarios that would increase future flows in sizing recommended capacity improvements.

Increased capacity and structural reinforcement for seismic resilience are recommended together for two trunk sewers. There are five sewer locations where additional hydraulic evaluation will need to be done in conjunction with project design to assure that both capacity and structural objectives are met with the project.

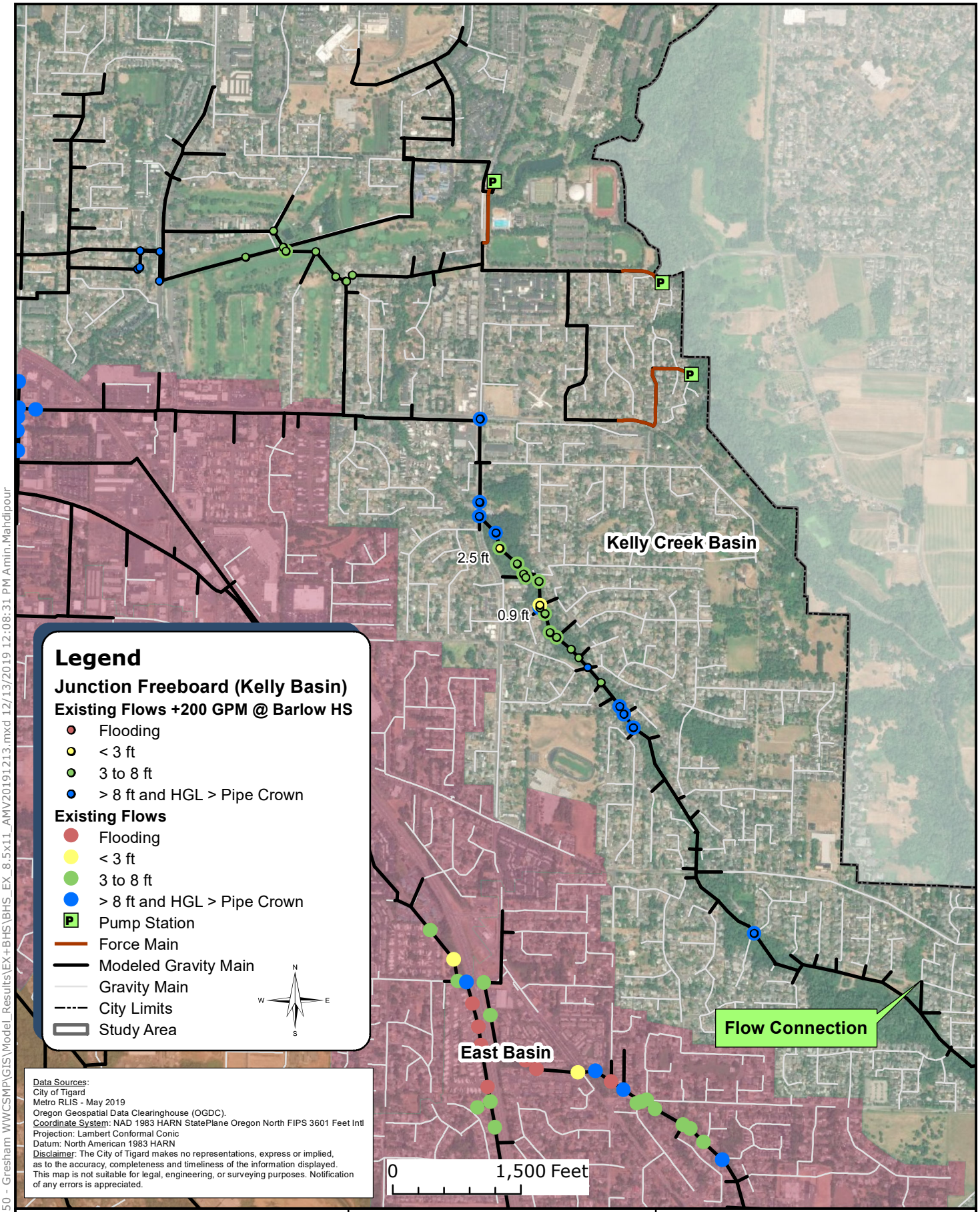
Capacity improvements recommended in the Kelly Creek Basin are adequately sized to convey additional anticipated flows.

Further hydraulic evaluation will be needed to size sewer extensions serving the Springwater or Pleasant Valley plan areas, should planned development be inconsistent with zoning designations. Alternative development scenarios and associated flows from the Springwater Plan area were reviewed to evaluate the impact on capacity in the Johnson Creek Trunk, with no additional predicted capacity risk given higher future flows.

8.9 References

Department of Environmental Services. (2019). *Public Works Standards*. City of Gresham, Oregon.

Department of Environmental Services. (2019). *Wastewater Seismic Resilience Plan*. Section 6 Wastewater Collection System. City of Gresham, Oregon.



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City of Gresham Wastewater System Facility Plan

Figure 8-1 Barlow High School Existing Flow Evaluation

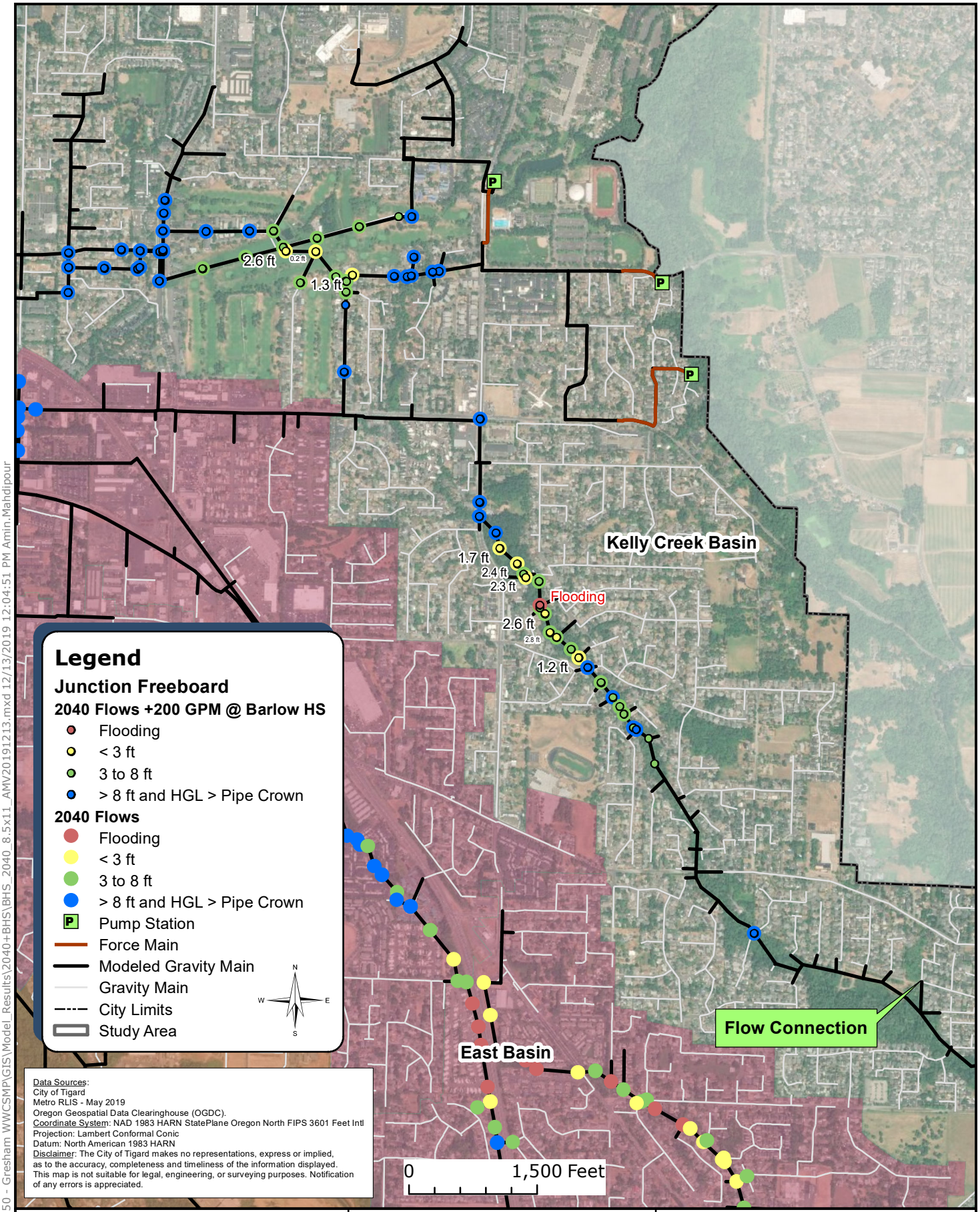

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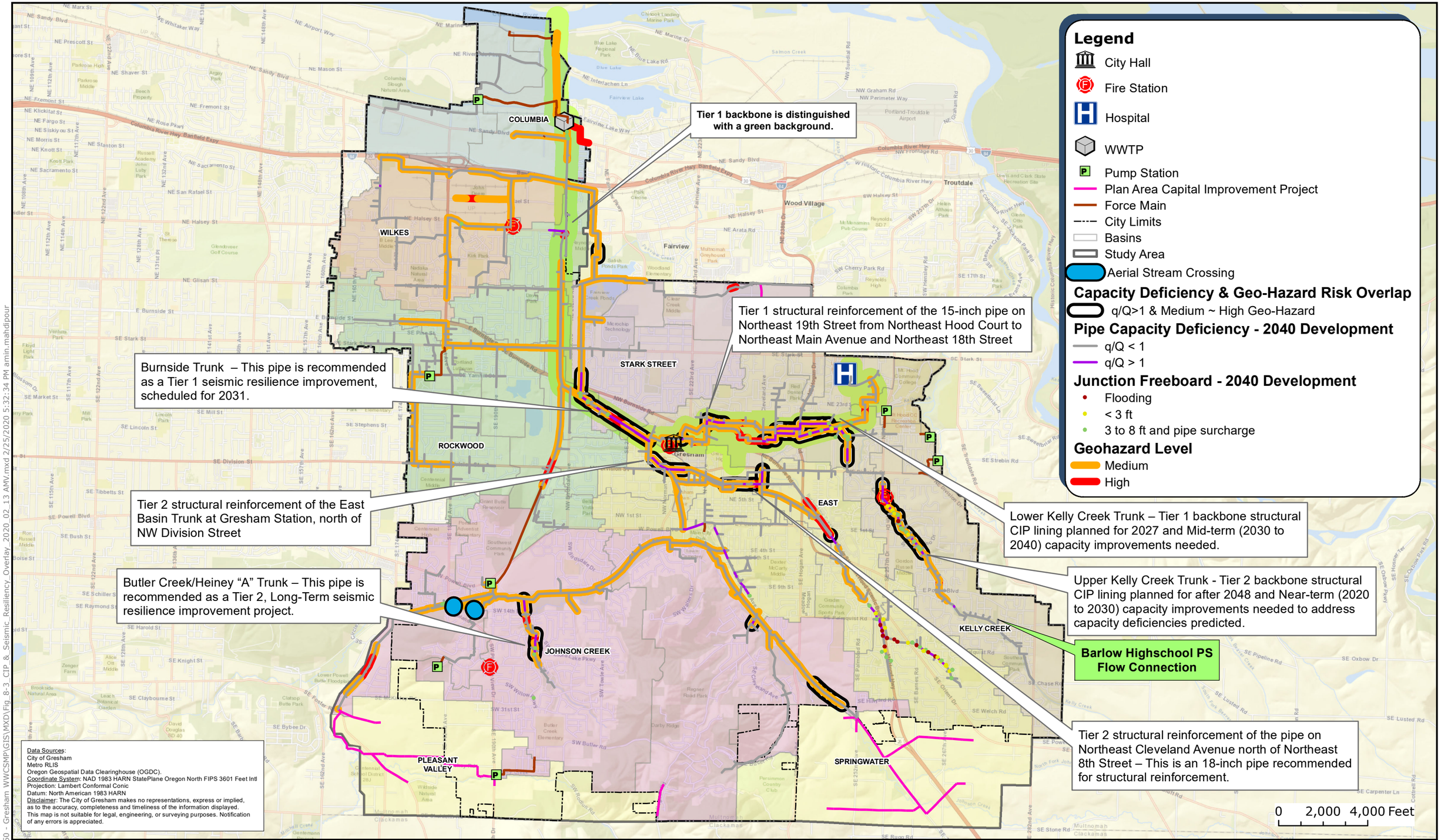
Figure 8-2 Barlow High School 2040 Flow Evaluation



Data Sources:
City of Gresham
Metro RLIS
Oregon Geospatial Data Clearinghouse (OGDC).
Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl
Projection: Lambert Conformal Conic
Datum: North American 1983 HARN
Disclaimer: The City of Gresham makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.

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City of Gresham, Oregon
Wastewater System Facility Plan

Figure 8-3
Project Integration

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