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*Executive Summary*

# Kelly Creek Stormwater Master Plan

Prepared for  
**City of Gresham**

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Prepared by  
**HDR Engineering**

And in coordination with



**GEOENGINEERS** 



*SHAUN PIGOTT ASSOCIATES, LLC*

# Executive Summary

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The original 1988 Kelly Creek Basin Storm Drain Master Plan is being updated to reflect changes in land use, infrastructure and regulatory climate as well as anticipated growth within the basin. The revised Kelly Creek Stormwater Master Plan provides the City of Gresham with the necessary planning tools and capital improvement projects to address flood management, water quality, stream stability and natural resource enhancement within the basin. In addition, the plan also provides recommended improvements that support sustainable urban growth as the basin attains full development. Moreover, because this master plan represents the last in a series of plan updates for Gresham and the surrounding urban growth fringe, the accompanying city-wide stormwater utility financial analysis will provide a funding strategy that will support implementation of the recommended stormwater projects.

The goal of the Kelly Creek Stormwater Master Plan is to proactively manage stormwater runoff to protect water quality and aquatic habitat and to minimize impacts of localized and downstream flooding by identifying infrastructure and natural resource improvements for the collection, conveyance and treatment of stormwater runoff from the Kelly Creek basin. The plan prioritizes storm drain and natural resource improvements within the Urban Growth Boundary and provides a 5-year implementation schedule for the construction of the highest priority projects. Lesser priority projects are also identified in order of importance, and are to be implemented as opportunities arise.

Major tasks undertaken in the development of the plan include the following:

- Develop Planning and Analysis Criteria
- Water Quantity Modeling
- Water Quality Modeling
- Natural Resource Evaluation
- Geomorphic Evaluation
- Capital Improvement Program

## Study Area Characterization

Located on the eastern edge of the City of Gresham, Kelly Creek originates to the immediate southeast of the city limits and flows to the northwest for approximately 4 miles to its confluence with Beaver Creek. Kelly Creek, and its major tributary Burlingame Creek, drain a relatively narrow 2,853 acres basin that represents one of the four major drainage basins within Gresham. Burlingame Creek, which is situated west of Kelly Creek, runs for roughly 3 miles along the Highway 26/Burnside corridor in a combined open channels and piped system. Burlingame Creek drains approximately 1,266 acres or 44% of the entire basin.

Presently, the basin is nearly fully developed, with the exception of the Gresham golf course and the headwaters area outside of the city limits. Collectively, the current impervious percentage, assuming 2005 land use conditions, is 49% and is projected to be 51% under future conditions.

## Planning and Analysis Criteria

A master planning analysis was performed for the Kelly Creek watershed to identify potential stormwater and associated natural resource improvements in the basin. The evaluation was guided by a set of system analysis criteria used to identify conveyance, water quality and natural resource problem areas and to evaluate potential improvements. These criteria include quantitative assessments of storm drain surcharging, culvert overtopping, channel flooding, outfall erosion and pollutant loading as well as qualitative assessments of channel morphology and natural resource indicators.

## Water Quantity Modeling

A key element in the master planning process is the development of a hydrologic and hydraulic model of the watershed and its natural and man-made stormwater system. The model should be capable of analyzing control strategies for basin master planning; predicting flooding risk; evaluating existing facilities and infrastructure; supporting geomorphic and natural resource evaluations and designing proposed facilities. To these ends, the primary objectives of the water quantity modeling for the Kelly Creek basin were to:

- Construct a model that accurately represents the existing stormwater system within the Kelly Creek basin.
- Calibrate and verify the model to actual rainfall events based on available measured stream flow.
- Utilize a land use-based method to estimate runoff under current and future development plans.
- Evaluate the existing stormwater and natural resource (the stream channel) infrastructure.
- Locate, size and assess the performance of new stormwater management facilities and/or natural resource improvement projects.

Generally, the results from the hydraulic model indicate that the current stormwater infrastructure will provide adequate conveyance capacity to manage runoff from the planned levels of urbanization over then next decade. Several localized storm drain problems were identified along NE Division Street and SE Barnes Avenue and flooding was predicted within the Gresham Golf Course, but these types of problems areas do not appear to be widespread. Consequently, the recommended improvements to the conveyance system typically involve minor pipe upsizing or replacement.

## Water Quality Modeling

A second key element in the master planning process is the development of a representative water quality model for the piped storm drain system as well as Kelly Creek and Burlingame Creek, that is capable of analyzing a variety of different water quality constituents, stormwater facilities, and best management practices. For these purposes, a water quality model was built to predict pollutant concentrations and the loads for primary conveyance system in the Kelly Creek basin using a 6-month (approximately 1/3 of the 2-year event) return period “water quality” design storm. The model simulation provides approximate concentrations throughout the system to identify potential pollutant “hot spots” within the basin where regional water quality improvements would be most beneficial.

The primary objectives of the water quality modeling were as follows:

- Construct a model that approximately represents the water quality within the existing stormwater system for the Kelly Creek basin.
- Evaluate an appropriate set of water quality constituents (total suspended solids (TSS), phosphorus (P), and three metals - lead (Pb), copper (Cu) and zinc (Zn)).
- Locate, size and assess the performance of new water quality facility based on areas identified in the model that exhibit elevated pollutant concentrations and/or loads.

Results from the water quality analysis indicate that pollutant concentrations and loads are highest in the Burlingame Creek Basin. This is primarily a result of the dense industrial and commercial developments along the Highway 26/Burnside corridor. Given the density of development in this area and the overall lack of open space, recommended water quality improvements tend to be more structural in nature, such as proprietary pollution reduction manholes.

## Geomorphology

Another element in the master planning process is the identification of important geomorphic characteristics influencing the current condition of Kelly Creek. Stream reconnaissance revealed that the Kelly Creek drainage is severely degraded, entrenched, and functioning primarily as a transport system, through which water and sediment are rapidly conveyed downstream (except for the detention ponds). The existing condition appears to be driven by several basin- and reach-scale cause / effect relationships;

- Increased discharge derived from storm water runoff, resulting in a general increase in channel depth (entrenchment) over time.
- Basin-wide exposure of Swift Water Formation (SWF) silt, which limits sediment supply to the channel and decreases the channel roughness, both of which have resulted in accelerated flow velocities and loss of channel complexity.
- Capture of available bedload sediment in detention ponds, causing sediment starvation downstream of the detention sites.

- Utilization of bank hardening measures (such as riprap and cement flume structures), which accelerate flow velocities and promote streambed erosion and channel entrenchment.

These basin- and reach-scale geomorphic trends have been integrated into the recommended system improvements to better ensure the long-term performance of enhancement projects and stability of the stream channel. Recommendations include roughening up the channel to reduce flow velocities and erosion. This can be accomplished by adding engineered in-channel woody-debris structures and boulders designed to both increase friction on the streambed and banks, and improve geomorphic complexity. Restoration projects recommended by the project team are also linked together wherever practicable in a programmatic approach. Similarly, it is recommended that projects be completed from downstream to upstream, beginning with the removal of the existing cement flume and ripraped bank structures. This approach offers a much longer life expectancy for the restoration measures, and greater channel complexity/stability than could be expected under a plan of sporadic project locations.

## Natural Resource Enhancement

Another element in the master planning process is the identification of areas along the stream corridor that are degraded from natural resource and riparian perspective. Stream reconnaissance identified a number of severely degraded locations along Kelly Creek exhibiting:

- Invasive species (non-native woody vine) dominance.
- Stream bank failures and poor channel integrity.
- Limited vegetation overstory.
- Reduced riparian corridor width.

Recommendations were developed to address each of the problem areas through both structural and non-structural means. Structural improvements include channel reconfiguration and bank stabilization and are most common in the lower portion of Kelly Creek. For example, a concrete-lined flume and a sharp channel kink are recommended for removal. This location also has areas of bank instability which will also be addressed using engineered bank stabilization methods. Non-structural improvements to the riparian corridor include large woody debris, shading, invasive species removal and native planting. These projects will have a beneficial effect on resident fish that are presently isolated from lower Beaver Creek by the pond at Mount Hood Community College. Increased shade and ultimately the contribution of large woody material will also moderate water temperatures, add habitat complexity within the channel and improve water quality treatment within the riparian corridor.

## Stormwater Infrastructure Improvements

A number of different stormwater system infrastructure improvements were developed for the Kelly Creek Basin. Although the system analysis identified numerous deficiencies,

recommended improvements were developed for only the most critical hydraulic/water quality and natural resource problem areas, as determined by the project team. As a result, a total of nine (9) storm drain/water quality improvements and twelve (12) natural resource enhancement projects were developed. The CIP projects are divided into the following general improvement categories:

- Storm drain improvements including pipe replacement/up-sizing and hydraulically parallel pipes for increased conveyance.
- Open channel and culvert improvements including culvert replacements and channel conveyance improvements to reduce flooding risk to buildings and homes.
- Water quality improvements including swales, stream corridor enhancement and structural pollution reduction facilities (PRF). It is important to note that although the two pollutants listed by the Clean Water Act for Kelly Creek, bacteria and temperature, were not explicitly modeled, a number of the recommended improvements developed for the basins targeted, either directly or indirectly, a wide variety of pollutants, including both temperature and bacteria.
- Natural resource improvements for enhancing the riparian stream corridor, creating a more geomorphically stable system and improving aquatic habitat.

Proper maintenance of the storm drainage system is as essential as an adequately sized system, if storm flows are to be properly conveyed and treated prior to discharge to Kelly Creek. This master plan presents recommendations for both the cities existing storm drain maintenance program and maintenance of the stream corridor, proposed water quality facilities and existing detention facilities.

## Capital Improvement Plan

The goal for this master plan is to manage stormwater, by minimizing impacts on localized and downstream flooding and protecting water quality and aquatic habitat. To these ends, a set of twenty-one (21) capital improvement projects, including nine (9) storm drain and water quality projects and twelve (12) natural resource projects were identified and recommendations were developed to provide the stormwater management required to meet the previously stated goals as for Kelly Creek (Figures ES-1 and ES-2).

Preliminary cost estimates were developed for the individual CIP projects. Cost estimates included in this master plan are considered planning level and are subject to change as individual projects are further refined during detailed design. Tables ES-1 and ES-2 summarize the total cost for each recommended project.

The recommended stormwater improvements for the Kelly Creek basin were prioritized according to a point-based implementation matrix. This matrix, which was completed by the project team and City staff, includes a weighting for cost, available funding, regulatory mandate, safety/liability, complexity, impact, environmental benefit, permitting and concurrence with outer city improvements. Tables ES-1 and ES-2 present the rating results of the storm drain/water quality and natural resource projects, respectively.

**TABLE ES-1**  
Rating Matrix - Storm Drain and Water Quality Projects  
*Kelly Creek*

<b>ID</b>	<b>Project Name</b>	<b>Capital Cost</b>	<b>Rating</b>	<b>0-5 Year CIP</b>	<b>Long-Term CIP</b>
KC1	Highway 26 Ecology Embankment	\$ 643,471	29	✓	
KC2	Hogan Place Regional PRF	\$ 752,238	26	✓	
KC9	Major Outfall Rehabilitation (NE Scott, SW Condor, SE Laura)	\$ 104,459	22.6	✓	
KC6	Barnes Ave Pipe Improvements (N. of 5th Street)	\$ 68,981	21	✓	
KC3	Vista Way PRF	\$ 121,154	18.4		✓
KC4	23rd Ave and Hale Street PRF	\$ 146,771	18.4		✓
KC7	Ironwood Culvert Removal	\$ 40,396	16.4		✓
KC5	Division Road Pipe Upsize	\$ 726,496	16		✓
KC8	Burlingame Piping	\$ 307,511	13.2		✓
<b>Total</b>				\$ 1,569,149	\$ 1,342,328

**TABLE ES-2**  
Rating Matrix - Natural Resources Projects  
*Kelly Creek*

<b>ID</b>	<b>Project Name</b>	<b>Capital Cost</b>	<b>Rating</b>	<b>0-5 Year CIP</b>	<b>Long-Term CIP</b>
KCN-7	Gresham Golf Course Riparian Enhancement	\$ 128,536	42.4	✓	
KCN-6	Powell Valley Pools	\$ 142,022	36.2	✓	
KCN-1	NE Hale Place	\$ 142,909	36.2	✓	
KCN-3A	NE Division Street	\$ 22,733	34.2		✓
KCN-3B	Bell Acres to SE Kane	\$ 24,991	34.2		✓
KCN-3C	Dogwood Lane (SE Acacia Pl.)	\$ 42,869	34.2		✓
KCN-3D	SE Powell Valley Road	\$ 44,647	34.2		✓
KCN-2	NE 17th Street	\$ 286,490	33.8		✓
KCN-4	Bell Acres Trailer Park	\$ 465,972	33.8		✓
KCN-5	NE 7th Court	\$ 130,330	32.2		✓
KCN-9	SE 24th Street to SE Salquist Road	\$ 267,737	23.6		✓
KCN-8	Gresham Golf Course Creek Meandering	\$ 507,817	16.4		✓
<b>Total</b>				\$ 413,467	\$ 1,793,586

For a full copy of this Master Plan please contact the Department of Environmental Services, 503-618-2525.