Snohomish County

Marshland Tributaries and Sunnyside Creek Drainage Needs Report

Executive Summary

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The Marshland Tributaries and Sunnyside Creek Drainage Needs Report (DNR) is one of a series of 11 drainage plans completed for most of Snohomish County's Urban Growth Areas (UGAs). The purpose of these plans is to identify flooding and surface water problems and to recommend solutions.

In order to gain a better understanding of the drainage systems, streams, and wetlands within the unincorporated UGAs of Snohomish County, the Snohomish County Council authorized, in 2001, the accelerated development of drainage plans for these areas. The purpose of the DNR project is to plan for existing and future drainage infrastructure needs in a way that identifies how to reduce road and property flooding, protect and enhance aquatic habitat, and reduce stormwater pollution. This Marshland Tributaries and Sunnyside Creek (Marshland/Sunnyside) DNR is one of a series of 11 individual reports that were prepared, in addition to a summary report for the entire DNR project.

Overview

Scope of Analyses: For the Marshland/Sunnyside DNR study area, detailed hydrologic and hydraulic models were created to analyze flooding problems along many of the major tributaries and some of the larger local drainage systems that have experienced historical problems. Due to budget constraints, many of the smaller, local drainage systems in the study area were not analyzed. In addition, less detailed analyses were conducted to assess habitat, water quality, and erosion problems in the study area.

The Marshland/Sunnyside DNR study area comprises two geographically distinct areas, both of which are located in the Snohomish River basin. The Marshland portion of the study area covers approximately 7,000 acres within the unincorporated UGA southeast of the City of Everett. This area includes several separate streams that originate in a gentle sloping plateau above Lowell-Larimer Road and descend through steep ravines to the Snohomish Valley floor. These ravines are subject to natural erosion processes that may have been accelerated by development in the plateau. The upper reaches of the Marshland study area are dominated by medium- and high-density single-family residential with some more intense commercial uses and major roadway corridors, including Interstate 5, located in the northern portion of the study area. Forest cover primarily exists within the steep ravines along the eastern side of the study area.

The other portion of the overall study area is the Sunnyside Creek study area, which covers approximately 950 acres and consists of the Sunnyside Creek drainage basin. Sunnyside Creek originates in a gentle sloping plateau above Sunnyside Boulevard and descends south and west to the Snohomish Valley floor. Much of this basin is located within the unincorporated Marysville UGA and is made up rural and low-density suburban residential neighborhoods and large wooded tracts.

This DNR study identified a total of 133 surface water problems in the Marshland/ Sunnyside study area. Of these, 37 are flooding problems, all of which are located within the Marshland study area. Many of the drainage systems within the developed plateau of this area consist of piped systems that are older and lack sufficient conveyance capacity. Though only some of these systems were analyzed, numerous flooding problems were

identified for those systems. Additional problems would likely be identified once more of these systems were analyzed. Since the installation of larger pipes to solve the identified flooding problems could accelerate downstream erosion in the ravine channels, additional improvements such as detention ponds and bypass pipelines are recommended. Because much of this area is developed, it was difficult to find locations to install new detention ponds. As a result, the expansion of several existing detention ponds is recommended. The bypass pipelines are recommended to divert higher flows around the reaches of the steep ravines that experience the most significant erosion problems. For the Sunnyside Creek study area, only a handful of culverts along the main stem of the creek were analyzed, which resulted in no identified flooding problems.

In addition, the study identified 37 habitat problems, such as fish barrier culverts, inadequate vegetation, and lack of large woody debris to provide good habitat. The majority of these problems are located in the Marshland Tributaries study area. To address the higher priority problems, typical habitat projects consist of culvert upgrades to remove fish passage barriers as well as revegetation improvements and large woody debris placement along some stream channels and/or adjacent riparian corridors. In addition, one large wetland acquisition for preservation is recommended in the Sunnyside Creek basin. Existing conditions downstream of the Marshland Tributaries study area (such as a pump station that acts as a barrier to fish passage and generally poor habitat quality) would limit the benefit of the proposed habitat improvements within the Marshland study area. Until these downstream conditions are addressed, habitat improvements in the Marshland study area would generally have a lower priority than habitat improvements proposed in other study areas for the DNR project.

Water quality in the Marshland study area is generally poor and is typical of urbanized areas. Water quality in the Sunnyside Creek basin is likely better than in the Marshland study area because it is less urbanized; however, there is very limited data to assess the water quality of this basin. Several projects are proposed to improve water quality, such as retrofitting existing detention ponds to improve water quality treatment.

Twenty-one erosion problems were identified in the Marshland study area, which has historically been one of the worst areas prone to erosion problems in the County. Erosion within the steep ravines and deposition as the streams enter the valley floor has historically caused plugging of culverts, flooding, and sediment deposition in downstream channels. In addition to several bypass pipelines, additional recommended improvements include bank stabilization and tightlines (that would convey runoff down steep slopes in pipes to avoid erosion).

Table ES-1

Recommended CIP Projects for Marshland/Sunnyside DNR

12	Flooding Projects	$2,893,000
10	Habitat Projects	$1,211,000
3	Water Quality Projects	$884,000
11	Erosion Project	$5,430,000
4	Flooding/Habitat Projects	$1,439,000
3	Flooding/Water Quality Projects	$1,787,000
43	**Total Recommended Projects**	**$13,644,000**

The recommended plan for this DNR addresses the highest priority flooding problems and some of the more significant habitat, water quality, and erosion problems. Table ES-1 shows that 43 projects totaling $13.6 million are recommended, some of which address more than one type of problem. To implement these projects, a number of issues will need to be resolved, such as available funding, project responsibility, project priorities, construction sequence, and permitting. The recommended plan includes several non-project actions, such as additional maintenance and additional studies.

Study Area

The Marshland/Sunnyside DNR study area comprises two geographically distinct areas, both of which are located in the Snohomish River basin. This includes the unincorporated UGA within the Marshland study area and within the Sunnyside Creek basin (see Figure 1-1). Although the focus of the DNR project is on the unincorporated UGAs, analysis of areas outside of the unincorporated UGA area were included if they affected or were affected by conditions within the unincorporated UGA area.

Marshland

The Marshland study area (Figure 1-2) includes 13 separate streams and ravines of varying sizes that originate in a gentle sloping plateau and descend through steep ravines above Lowell-Larimer Road to the Snohomish Valley floor. The lower boundary of the study area is Lowell-Larimer Road, which runs along the west side of the valley floor at the base of the ravines. The streams generally cross Lowell-Larimer Road through independent culverts and then exit the study area into the Marshland Drainage District, where most of the streams have been channelized and are routed north and east to a pump station where water is pumped into the Snohomish River.

Sunnyside Creek

Sunnyside Creek (Figure 1-3) originates in a gentle sloping plateau above Sunnyside Boulevard and descends south and west to the Snohomish Valley floor. Much of this basin is located within the unincorporated Marysville UGA southeast of the City of Marysville, though the City of Marysville makes up a very small portion of the basin. While the focus of this study is on the unincorporated UGA within Sunnyside Creek, some habitat and wetland analyses were conducted outside of the Sunnyside Creek basin since access to perform field investigations was not granted by many property owners in the Sunnyside Creek basin. It was therefore decided to include Hulbert and Weiser Creeks in the analysis of habitat conditions since they are located directly south of Sunnyside Creek and have many similar characteristics.

Flooding

Detailed hydrologic and hydraulic models were developed for many of the conveyance systems to help quantify existing and future surface water conditions within or related to the Marshland/Sunnyside study area and to evaluate potential solutions to identified problems. In general, hydrologic models were used to estimate the amount of stormwater runoff that would be generated during a storm or series of storms. The hydraulic models were then used to simulate the routing of these flows through the stormwater conveyance system (including stream channels, ditches, culverts, and enclosed storm drain systems).

Marshland

Hydraulic models were developed for several of the drainage systems within the Marshland study area that were known to experience more frequent historical flooding problems. Of those systems that were analyzed, 37 flooding problems were identified. As more of the drainage systems in the study area are evaluated in the future, more flooding problems will likely be identified.

Of the 37 identified flooding problems, eight were the result of inadequate conveyance capacity at the culvert crossings where ravine streams cross through Lowell-Larimer Road. Of the remaining flooding problems, 28 were associated with the inadequate

capacity of pipe and ditch systems in the upland developed area and one was associated with high lake levels around Hilton Lakes where a home was flooded. Many of these identified problems correspond with historical problems that have been observed by or reported to the County.

Complete descriptions of flooding problem areas and the estimated flooding frequency are provided in Section 8.0. Since the number of identified flooding problems exceeded the number of problems in which solutions could be analyzed within the scope of this DNR project, solutions were only developed for the highest priority problems in the study area. The selected problems included the culverts along Lowell-Larimer Road (Modeling Area 1) that experience flooding and/or fish passage problems and two of the largest neighborhood drainage systems (Modeling Areas 3 and 18) that discharge to ravine streams with severe erosion problems. The analysis of solutions for those problems that were not selected would likely result in additional flooding projects to add to the recommended project lists.

For the multiple culverts that cross Lowell-Larimer Road (Modeling Area 1), only one alternative solution was typically evaluated. This generally consisted of replacing the existing culvert with a larger culvert to improve conveyance and/or fish passage conditions. A total of eight separate CIP projects were developed to replace eight existing culverts identified as having flooding problems. At two of these locations, the existing culverts are also proposed to be shortened so that a portion of the existing pipe can be reverted back to a natural stream channel.

For the main drainage system in the headwaters of Larimer Creek (Modeling Area 3), two alternative solutions were evaluated. The first alternative addressed flooding problems primarily by increasing the capacity of the conveyance system while adding detention storage where feasible sites exist. Since this area is developed and suitable sites for new detention ponds were difficult to locate, detention opportunities were primarily limited to expanding existing detention ponds. As a result, a key project for Alternative 1 is the expansion of the existing residential subdivision pond at Silver Firs Division 2, which would roughly double its detention storage volume to 8 acre-feet and provide better water quality treatment. Other projects in this alternative include two small pipe system improvements. The second alternative for Modeling Area 3 includes all of the improvements of the first alternative as well as a 1,940-foot long high-flow bypass pipeline that would convey high flows around one of the worst sections of existing ravine erosion areas in the Marshland study area. While the second alternative, with the high-flow bypass, would cost approximately $1 million more than the first alternative, the second alternative was recommended since it would help solve one of the most severe erosion problems in the study area. Added benefits of solving these erosion problems include improvement to downstream water quality by reducing the sediment load.

For the main drainage system that outfalls to an unnamed stream above Craven Dairy (Modeling Area 18), two alternatives were similarly evaluated. The first alternative addresses flooding problems through a combination of conveyance improvements and detention. As with the previous drainage system, detention opportunities were primarily limited to expanding existing detention ponds since this area is already developed. Therefore, a key project for Alternative 1 is the expansion of the existing residential subdivision pond at Shadowood subdivision to increase its detention storage from 1 acre-foot to approximately 6 acre-feet and to improve water quality treatment. Several of the other projects in Alternative 1 include simple pipe replacements with larger diameter pipe to increase conveyance capacity and reduce flooding. Combined, these projects include replacement of approximately 2,930 feet of undersized pipe. The second alternative is similar to the first, except that it includes a high-flow bypass pipeline near the downstream end of this system to route high flows around the downstream ravine erosion problem areas. The high-flow bypass would extend approximately 6,190 feet,

from the intersection of 122nd Street SE and 49th Avenue SE to Lowell-Larimer Road. While the second alternative, with the high-flow bypass, would cost approximately $1.6 million more than the first alternative, it was recommended since it would help solve one of the most severe erosion problems in the study area.

A total of 19 CIP projects were selected for inclusion in the recommended plan to address flooding problems, some of which also provided multiple benefits such as improving fish passage, improving water quality, and improving fish habitat.

Sunnyside Creek

For the Sunnyside Creek basin, only those culverts along the main stem of the creek were analyzed to identify flooding problems. Of those culverts that were analyzed, only one flooding problem was identified and this problem would only occur under future land use conditions for the 100-year flood event. However, using the design criteria employed for the overall DNR study, capital projects were only developed for problems if they were to occur for flood frequencies of 25 years or less. As a result, no alternatives solutions to flooding problems were evaluated for the Sunnyside Creek basin.

Habitat

Aquatic habitat assessments were performed in many drainage basins within the County, including the Marshland/Sunnyside DNR study area. Data from these assessments were combined into a regional analysis to make it possible to explore relationships among physical and habitat/biological variables over a broader range of conditions than would be found in any one drainage area. The results of the regional analysis conducted for the DNR project are provided in a separate document, *Aquatic Habitat Summary: Current and Future Conditions of Urban and Urbanizing Streams of Snohomish County* (Snohomish County, 2002).

For the habitat assessment, sites were selected for examination and data collection that were considered to be representative of the variety of habitat conditions found within the Marshland tributaries and Sunnyside Creek basin. Access to much of the private property along Sunnyside Creek was denied by property owners, so habitat investigations were conducted on an adjacent stream, Hulbert Creek, which has similar characteristics to Sunnyside Creek. A total of 15 miles of fish-bearing streams were surveyed for this project, of which 13.3 miles consisted of the streams in the Marshland study area. The habitat assessment at these sites primarily focused on instream habitat, biotic condition, and fish passage issues. In addition, riparian areas along fish-bearing streams and wetlands within the unincorporated areas and downstream Snohomish River floodplain were evaluated using recent aerial photos. Analysis was then performed to examine interrelations between habitat components and factors that could affect habitat quality.

Marshland

Based on the habitat assessment, a total of 30 habitat problems were identified within and downstream of the Marshland study area. Most were identified within the study area, though some outside of the study area were identified because they affect habitat within the study area. One of the major problems is fish passage barriers. The downstream Marshland pumphouse severely restricts fish passage into the stream systems in the Snohomish River floodplain and upstream Marshland tributaries. Although resident salmonids currently exist in many of the streams in the study area, the pumphouse acts as a passage barrier to anadromous fish. Another likely barrier to fish passage on the Marshland floodplain is the poor water quality of water in the drainage

ditches and canals, including high water temperature, low dissolved oxygen levels, and other pollutants. In addition, several of the culvert crossings of Lowell-Larimer Road were also identified as fish passage barriers due to high velocities or perched outlets.

There is also a lack of micro-habitat complexity within the Marshland study area due to excessive bedload movement and sedimentation. The number and size of pools is extremely low along most of the surveyed tributaries and some tributaries were found to possess low large woody debris (LWD) recruitment potential and high shade risk.

Potential CIP projects were developed to address the higher priority habitat problems within the Marshland study area. Recommended habitat CIP projects include replacements or retrofits for several culvert fish passage barriers, installing large woody debris along stream corridors, removing invasive vegetation, and planting various types of native riparian vegetation. However, until downstream problems are addressed (such as the pump station that acts as a fish passage barrier and poor downstream habitat quality), habitat improvements in the Marshland study area would generally have a lower priority than habitat improvements proposed in other study areas for the DNR project.

Sunnyside Creek

Seven habitat problems were identified in the Sunnyside Creek habitat study area. The identified habitat problems included three fish passage barriers, two of which were associated with culverts and one associated with an existing fish ladder on Hulbert Creek that is not functioning adequately. Other identified problems included low LWD recruitment potential, high shade risk, and lack of micro-habitat complexity and pools, particularly in Hulbert Creek.

Potential habitat projects were developed to address the higher priority problems within the UGA portions of the study area, with one exception of improving the fish ladder on Hulbert Creek which is outside of the UGA. Three recommended habitat projects were identified and include the replacement of a culvert along Sunnyside Creek, the Hulbert Creek fish ladder improvement, and a 15-acre wetland acquisition in the headwaters of Sunnyside Creek.

Water Quality

The assessment of existing water quality conditions and associated problems within the Marshland/Sunnyside study areas was also performed and was based on a review of available data and reports, with limited field observation.

Marshland

Urban development in upland areas of the Marshland study area is impacting the water quality of downstream receiving waters. The water quality problems associated with urban development include elevated concentrations of fecal coliform bacteria, nutrients, toxic metals, and suspended sediments. The source of the suspended sediment appears to be erosion in the steep ravines that convey water from upland regions of the basin to lowland areas. Urbanization and the associated impervious surfaces are likely exacerbating erosion problems by increasing peak flow rates and flow volumes in the ravines. The elevated fecal coliform bacteria and nutrient concentrations likely stem from fertilizer applications, pet wastes, and failing septic systems in residential developments. Runoff from commercial areas and roadways is the likely source of toxic metals.

Although the lowland areas of the Marshland basin are located outside the study area, poor water quality in this area can present a fish barrier and limit fish use in the

upstream Marshland tributaries as previously discussed. In general, water quality in the lowlands downstream of the Marshland study area is being significantly impacted by agricultural land use as evidenced by low measured dissolved oxygen levels, elevated concentrations of fecal coliform bacteria and nutrients, and high water temperatures.

A combination of specific CIP projects and programmatic actions by the County were developed to improve water quality in the Marshland study area. Five CIP projects are included in the recommended plan with the primary objective of improving water quality. Four of the projects would retrofit existing stormwater ponds in residential developments to improve their water quality treatment performance and the fifth would involve the construction of a new wetpond.

Sunnyside Creek

Water quality conditions in the Sunnyside Creek study area are difficult to determine due to the limited amount of monitoring data available for this basin. Water quality problems associated with the current mixture of rural to low-density residential land use likely include elevated concentrations of nutrients, fecal coliform bacteria, metals, and suspended sediments. Programmatic recommendations to improve water quality were developed to address water quality problems in the Sunnyside Creek study area, but no specific water quality projects were identified.

Erosion and Sedimentation

Since no historical erosion problems are known in the Sunnyside Creek basin, the detailed investigation of erosion issues was limited to the Marshland study area. Erosion within the steep ravines and deposition as the streams enter the valley floor have historically caused plugging of culverts and corresponding flooding. High sediment loads are also a concern to the property owners along Lowell-Larimer Road due to sediment filling in drainage channels. Of the areas that were investigated, a total of 21 erosion problems were identified. The number of erosion problems identified exceeded the number of problems that could be analyzed within the scope of this DNR project, so 13 potential CIP projects were identified to address the most significant of the 21 identified problems. The types of potential erosion CIP projects included high-flow bypasses, “tightlines,” bank stabilization projects, and a sediment pond along Lowell-Larimer Road. Two of the larger erosion projects, the high-flow bypasses for the west fork of Larimer Creek and the unnamed creek above Craven Dairy, were evaluated with hydrologic and hydraulic models and described above under the Flooding section. Additional recommended improvements include bank stabilization projects and “tightlines.”

While the erosion CIP projects are included as part of the recommended plan, it was recognized during the planning process that a more clear County policy is necessary to decide when to implement erosion projects. Some of the considerations include whether the project reduces private and/or public flooding, the extent that habitat could be improved, the quality of the existing habitat (which is often not optimal in ravine erosion areas), protecting property that is at risk of damage, cost/benefit, downstream water quality and control of sediment.

Recommended Plan

As indicated in Table ES-1, the recommended projects were grouped into six different categories, based on the types of problems that were addressed by each project. The lists of recommended projects for each of these categories are included in Tables 10-2 through 10-7 in Section 10.0 of this report. Appendix F contains additional details for

each project in project summary sheets, which include a summary, a cost estimate, and a sketch of the proposed improvements. Table ES-1 provides a summary of the recommended projects for the Marshland/Sunnyside DNR.

The recommended list of CIP projects would be needed to solve most of the identified problems in the areas of the basin that were analyzed. None of these projects are actually required to be implemented by current County code. This list also includes projects that would primarily benefit private property owners, which the County would not be responsible to implement.

Another important consideration is that the construction of CIP projects that the County would implement is dependent on the availability of public funds. Based on the current allocation of County revenues for surface water purposes, the County does not have sufficient funds allocated to implement all of the recommended County-funded CIP projects. The County will need to consider the relative importance of the recommended projects in the Marshland/Sunnyside Creek DNR with those in the rest of DNR study areas, in order to use the limited funds most effectively. Since a funding analysis was beyond the scope of the DNR project, the County will need to perform a separate evaluation to determine how much funding would be available to construct the recommended County CIP projects.

Successful implementation of all 43 CIP projects within the Marshland/Sunnyside DNR area will result in a reduction of flooding at 26 identified problem sites, enhancement of existing habitat conditions, modest improvements to water quality, and correction of 11 of the worst erosion problems.

It is further recommended that the following actions be implemented:

- Continued programmatic maintenance of the drainage infrastructure.
- Additional investigations at three potential flooding sites: 44th Drive SE and 117th Street SE, 108th Street SE and 44th Avenue SE, and 91st Street between 27th Avenue SE and 31st Avenue SE. Additional investigation at these sites is necessary to evaluate the problems and the need for corrective actions.
- Development of County policy to define when and to what extent County funds should be used for erosion projects.
- Addition habitat investigations for fish passage analysis at the east fork of Larimer Creek crossing of 134th Place SE and the Thomas Creek crossing at Lowell-Larimer Road.
- Additional habitat investigations including B-IBI sampling to confirm some of the data found during this study.
- Continuation of a detention pond retrofit program, which will provide additional water quantity and quality control. Three pond retrofit projects within the study area are already designed and permit applications are being reviewed.
- Additional analysis to evaluate the need to retrofit existing ditches to improve water quality.
- Coordination with the City of Everett to implement water quality improvements.
- Coordination with the Marshland Drainage District to implement water quality improvements.