COMPREHENSIVE BASIN REVIEW AND WATERCOURSE MONITORING

VOLUME I – MAIN REPORT

City of Mercer Island

in association with GeoEngineers, Inc.

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CERTIFICATE OF ENGINEER

CITY OF MERCER ISLAND

COMPREHENSIVE BASIN REVIEW AND WATERCOURSE MONITORING

The technical material and data contained in this report were prepared under the supervision and direction of the undersigned, whose seal as a registered professional engineer licensed to practice as such in the State of Washington is affixed below.



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COMPREHENSIVE BASIN REVIEW AND WATERCOURSE MONITORING

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Need for the Basin Review

This Comprehensive Basin Review (Basin Review) examines the City of Mercer Island's Storm and Surface Water Utility programs, focusing on capital needs, capital priorities, and utility policies. The need for this engineering and planning effort has increased in recent years for several reasons including:

- The need for a predictable long term Capital Improvement Program (CIP). The City has solved many of the more severe and well known watercourse/ravine problems since the creation of the Stormwater Utility in 1995. The City needs to identify where remaining problems are the worst, in particular the ravine erosion problems, and address these problems with future CIPs.
- The need for a standardized prioritization method so that when problems are identified, corrective actions can be ranked in a logical and consistent manner. This prioritization method should be simple, defensible, flexible, and easy to reproduce over time as new projects arise or additional information becomes available.
- The need for formalizing certain drainage policies that the City staff have historically used but have not been formally documented. Formalizing these policies will help define what is included in the CIP as well as manage day-to-day operation of the program.
- The need for a drainage system condition monitoring program to provide current information with which to reassess future CIP prioritization. For example, some erosion problems may worsen quickly while others are slowly worsening (e.g., those that have eroded down to hard pan and are less resistant to further erosion).

General System Description

Mercer Island is divided into four basins (north, south, east and west) and approximately 85 subbasins (shown on Figure E-1 below). Within each sub-basin, storm water runoff is collected in some combination of public and/or private lateral and trunk storm drains, streets, gutters, and ditches and then conveyed to the Island's watercourses. The watercourses flow downslope through occasional roadway culvert crossings to Lake Washington. Many of the watercourses are located in ravines. The storm and surface water systems also include underground detention systems and stormwater treatment systems (for large parking lots such as at the Community Center). In addition, the City has also constructed a few high-flow bypass pipelines that convey high storm runoff around a ravine erosion problem area while allowing base flows to remain in the watercourse.



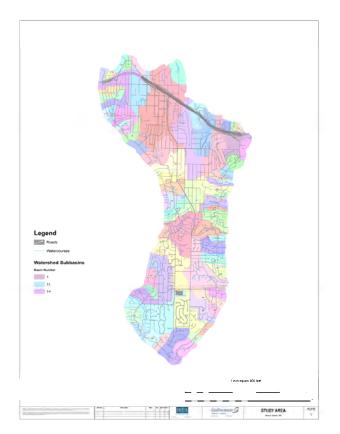


Figure E-1 Mercer Island Subbasins

There are many types of surface water problems that were generally found. While there do not appear to be any major recurrent flooding problems that result in significant property damage, there are pipe system problems that result in localized minor flooding during heavy rains. These involve both private and public substandard drainage systems that were installed long ago and which are either undersized, subject to root intrusion, inadequately maintained, or generally are in poor condition.

Several ravine watercourses are susceptible erosion and streambank channel to downcutting. Channel and streambank erosion occur where flow velocities are high and along sections in which the underlying geologic soils are more susceptible to erosion. Erosion in watercourses can result in environmental degradation, risks of damage to public and private property, and downstream sedimentation. The City has historically constructed capital improvements to address some of the worst ravine erosion problem areas.

Phased Basin Review Approach

Implementation of the Basin Review was conducted in a two-phased approach. Phase 1 included a high-level problem identification analysis and was based on a combination of interviews with City staff, review of previous documents, review and assessment of LiDAR-based topographic information, and very limited field reconnaissance. The problem identification was considered high level because it did not include detailed hydrologic or hydraulic modeling or extensive field investigations. The objective of the planning-level problem identification was to determine through a "desk top" exercise, the areas with high potential for drainage and erosion problems. Doing so allowed more efficient and cost effective direction of field work and investigation in Phase 2 to those areas as being the most severe. The Phase 1 work focused on ravine erosion problems along watercourses as well as drainage system (i.e., pipes and ditches) problems. Investigations to identify wetland, water quality, or fish habitat/passage problems were not included in this work.

The Phase 1 LiDAR analysis involved using good quality LiDAR (Light Detention and Ranging) topographic dataset obtained from Mercer Island's GIS. The objective of this analysis was to predict the susceptibility to erosion of any particular section of stream channel. Some of the factors that were considered in the analysis include stream gradient (slope), underlying geology,

historical areas of erosion and landslide. These and other factors were quantified to determine an overall susceptibility ranking, which was categorized as "high", "moderate", or "low".

Phase 1 also included an initial ravine erosion monitoring program. The City identified three specific erosion problem sites for periodic monitoring. The sites are located in sub-basins 26, 29, and 32b. The monitoring included taking measurements of the channel, and documenting how and where the measurements were taken. Future measurements can be taken in similar manner and the rate of erosion can be evaluated. Subsequently, as part of the Phase 2 effort, the Phase 1 sites were revisited in January 2006 and features were remeasured. During the course of the Phase 2 field investigations, several new locations were also identified that should be considered for future monitoring sites. Table 3-2 in the report (also presented below) lists these sites as well as the priority for implementation considering the observed severity of the problems.

| Table 3-2 Recommended New Monitoring Sites | | |
|---|---|--|
| Problem No. | Suggested Priority for Implementation of Monitoring based on Field Investigations | |
| 45b.3 | 1 | |
| 49b.4 | 2 | |
| 29.2 | 3 | |
| 52.1 | 4 | |
| 51a.1 | 5 | |
| 4.2 | 6 | |
| 46.3 | 7 | |
| 42.1 | 8 | |
| 42.1a | 9 | |
| 42.3 | 10 | |
| 42.2 | 11 | |
| 46a.4 | 12 | |
| 42.4 | 13 | |
| 27a.3 | 14 | |
| 46.2 | 15 | |
| 49b.2 | 16 | |
| 4.1 | 17 | |

One of the main objectives of the Phase 2 effort was to carry the Phase 1 problem identification work forward and develop improvement specific capital projects There was insufficient budget (CIPs). available to investigate all of the Phase 1 projects in more detail, therefore the scope of the effort needed to be limited. For erosion-type problems, field investigations and problem solutions were conducted on those erosion problems categorized in Phase 1 as "high". For drainage system problems, additional investigations (most often including TV'ing of pipe sections) were conducted on the systems of higher concern as determined by City staff. For these problems, solutions and conceptual cost estimates were developed.

In addition to this work, Phase 2 also included policy review and CIP prioritization. The policy review included working with the City's Utility Board to formalize five of the most important policy areas selected by the City.

Basin Review Results and Conclusions

The major results include development of Capital Improvement Projects (CIPs), development of a CIP prioritization method, ranking of proposed CIPs using the prioritization method, and formalization of certain storm water policies. These results are discussed below.

Capital Improvement Projects

For both erosion and drainage system problems, "Project Summaries" were developed (in Appendix G). The "Project Summary" includes the following information:

- Sub-basin number, project number and title
- Problem description and a representative photo
- CIP description
- Related projects, if any
- Planning-level cost estimate
- Simple plan view graphic showing location and extent of CIP

Twenty seven (27) erosion CIP Summaries and six drainage CIP Summaries were developed. The planning level cost estimates include 30 percent contingency and an allowance for indirect cost such as surveying, design and permitting. The total cost for completing all of the CIPs is estimated to be approximately \$6.3 million. The total cost for completing the erosion CIPs is \$5.1 million and the total cost for completing the drainage CIPs is \$1.2 million. Note that the cost for these watercourse erosion projects are only for solving problems identified in Phase 1 as "high". Additional future analysis of the problems identified in Phase 1 as "moderate" will result in additional projects. There were 40 locations where potential erosion problems in the "moderate" category were identified.

In general, these solutions should be considered preliminary for the purpose of estimating capital costs and defining priorities. As further investigations and design work proceeds on individual projects (such as field surveying and flow analysis), refinements to the projects and their estimated construction costs should be expected.

CIP Prioritization

The Basin Review team, City staff, and the City's Utility Board discussed criteria for prioritization of CIPs. With a documented process in place, it is possible to more clearly and objectively describe the merits of a particular project, and to explain and document to ratepayers and elected officials why one project gets built before another. Also, having this documented process will help to ensure that priorities are established in a consistent manner from year to year. The prioritization program includes a prioritization model in spreadsheet form. The model uses weighted evaluation criteria. The result is an effective model that scores how well the CIPs meet the criteria and gives an overall ranking or prioritization.

The criteria that were evaluated for each CIP project include the following:

- Magnitude of the problem (To help define the magnitude of problems, this criterion was further subdivided into separate criteria for risk to health and safety, risk to property, rate of degradation/project urgency, and the flows or size of the drainage area)
- Impact to water quality and stream habitat
- Cost effectiveness
- Special opportunity
- Reduction in maintenance and operation costs
- Neighborhood advocacy/complaints
- Permitting effort
- Overall project cost

The spreadsheet model is set up to automatically update the ranking when the scoring is modified. In this way, the City can update the prioritization as more information about problems becomes available or other problems arise. Using the prioritization method, a 6-year CIP implementation schedule was developed.

| | | Estima | ted Cos | st (in tho | ousands | s) |
|--|-------|--------|---------|------------|---------|-------|
| Description | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Medium/Large Basin Improvements | | | | | | |
| Parkwood WC Stabil., trail improvement, and sewer replacement (45b.3) | \$444 | | | | | |
| Lakeview Highlands (29.1) | \$95 | \$864 | | | | |
| Sub-Basin 26 Ph. 2 (26.1) | | \$50 | \$50 | \$961 | | |
| Basin Improvements/Conveyance System Replacement | | | | | | |
| 4905 EMW 18" culvert repl.(D47.1) | \$243 | | | | | |
| 24" pipe replacement SE 65th St. btwn. 8010 and 8020 (D29.2) | | | \$92 | | | |
| 7625 WMW culvert repl. (D32a.2) | | | \$25 | | | |
| EMW culvert replacements | | | \$15 | \$185 | | |
| WMW culvert replacements | | | | \$15 | \$185 | |
| Conveyance System Replacement 63rd Ave. SE from SE 24th St. to SE 27th St. (D15.4) | | | | | | \$585 |
| Sub-basin 46a Ph. 2 conveyance | | | | \$15 | \$185 | |
| Watercourse/Conveyance System Condition Assessments | \$30 | | \$30 | | \$30 | |
| 4700 91st Ave. SE (Sub-Basin 49b.4) | | | | | \$25 | \$175 |
| 4300 EMW WC Stabil. (Sub-Basin 52.1) | | | | | \$10 | \$95 |
| Neighborhood Drainage Improvements | | | | | | |
| Annual Improvements | \$50 | \$50 | \$60 | \$60 | \$70 | \$70 |
| Total Per Year | \$862 | \$964 | \$272 | \$1,236 | \$505 | \$925 |

Six-Year Stormwater CIP (2007-2012)

Program Policies

The Basin Review documented and formalized several longstanding informal policies through discussion, input and review by the City's Utility Board. These formalized policies help define what is included in the CIP as well as manage day-to-day operation of the City's stormwater program.

The key policy issues that were identified with City staff and evaluated include:

- CIP prioritization
- Erosion, easements, and regulatory compliance
- Fee-in-lieu of detention
- Maintenance easements for storm water facilities on private property
- Filling of roadside ditches

The specific recommendations are discussed in Section 6.

Additional Recommendations

In addition to the results described above, additional recommendations are included concerning future field evaluations and monitoring. The City should continue and expand erosion problem monitoring to provide additional data that can be input into the prioritization model and to make decisions on CIP implementation.

The City should continue to investigate drainage systems (summarized on Table 5-4) to identify and correct problems. Special emphasis should be placed on inspection and monitoring of the East Mercer Way and West Mercer Way culverts because these are critical structures.

Finally, the City should continue investigation of erosion problems categorized as "moderate" in Phase 1 (shown on Plate 3 and Table 4-1). Due to limited resources, only the "high" category problems were investigated as part of this project, but as additional resources become available, the City should continue investigations of other ravines noted as having susceptibility for erosion.

Section 1 INTRODUCTION



1.1 Purpose

This Comprehensive Basin Review (Basin Review) examines the City of Mercer Island's Storm and Surface Water Utility programs, focusing on capital needs, capital priorities, and utility policies. The need for this engineering and planning effort has increased in recent years for several reasons including:

- The need for a predictable long term Capital Improvement Program (CIP). The City has solved many of the more severe and well known watercourse/ravine problems since the creation of the Stormwater Utility in 1995. The City needs to identify where remaining problems are the worst, in particular the ravine erosion problems, and address these problems with future CIPs.
- The need for a standardized prioritization method so that when problems are identified, corrective actions can be ranked in a logical and consistent manner. This prioritization method should be simple, defensible, flexible, and easy to reproduce over time as new projects arise or additional information becomes available.
- The need for formalizing certain drainage policies that the City staff have historically used but have not been formally documented. Formalizing these policies will help define what is included in the CIP as well as manage day-to-day operation of the program.
- The need for a drainage system condition monitoring program to provide current information with which to reassess future CIP prioritization. For example, some erosion problems may worsen quickly while others are slowly worsening (e.g., those that have eroded down to hard pan and are less resistant to further erosion).

The Basin Review is intended to provide guidance for erosion and drainage system CIP planning over the next ten to twenty years, and to provide the City with the prioritization tools and methods for use when updating the prioritization of CIPs.

The Watercourse Monitoring elements of the project are intended to identify and implement approaches to physical monitoring of selected ravines suspected of ongoing erosion problems. In this way, data can be collected to assess the rate at which erosion problems are becoming worse. This can provide valuable information for determining CIP priorities.



1.2 Scope

Implementation of the Basin Review and Watercourse Monitoring was conducted in a two-phased approach. Phase 1 was completed in December 2004 ("Comprehensive Basin Review and Watercourse Monitoring – Phase 1", R.W. Beck, December 2004). Phase 1 is documented within this report in Sections 2, 3, and 4. Phase 1 included data review, conducting interviews with City staff and a LiDAR/GIS mapping assessment (described in detail in Section 3) with limited field work to identify and characterize drainage problems as well as provide initial investigations toward the watercourse monitoring. Phase 1 also included the development of planning level cost estimates to solve these problems. The focus of the Phase I work was on drainage system and watercourse (ravine) erosion problems for the development of CIP projects. Erosion problems identified in Phase 1 were classified into three categories: "high", "moderate", and "low". Investigations to identify wetland, water quality, or fish habitat/passage problems were not included in this work.

The Phase 2 effort is also summarized in this report in Sections 5, 6, and 7. Phase 2 included supplemental field and technical work to more specifically define the type and extent of the improvements and the costs for the erosion CIP projects in the "high" category in Phase 1. Phase 2 also included the identification of drainage system CIPs to the extent that information was available based on City-conducted conveyance system (pipe/culvert) inspections and "TV'ing" to assess the condition of the several systems identified as potential problems in Phase 1. The available data was used to recommend appropriate drainage system CIPs where possible. Investigations to identify wetland, water quality, or fish habitat/passage problems were not included in the Phase 2 work.

In addition to this work, Phase 2 also included policy review and CIP prioritization. The policy review included working with the City's Utility Board to formalize five of the most important policy areas selected by the City.

Section 2 STUDY AREA DESCRIPTION



2.1 Drainage System

Mercer Island is divided into four basins (north, south, east and west) and approximately 85 subbasins¹. Within each subbasin, storm water runoff is collected in some combination of public and/or private lateral and trunk storm drains, streets, gutters, and ditches and then conveyed to the Island's watercourses. The watercourses flow downslope through occasional roadway culvert crossings to Lake Washington. Many of the watercourses are located in ravines. The storm and surface water systems also include underground detention systems and stormwater treatment systems (for large parking lots such as at the Community Center). In addition, the City has also constructed a few high-flow bypass pipelines that convey high storm runoff around a ravine erosion problem area while allowing base flows to remain in the watercourse. The storm and surface systems also include detention basins and energy control structures.

Many areas of the island were developed before stormwater controls were implemented which has resulted in increases in the volume of stormwater runoff and peak flow rates to watercourses.

2.2 Geology

Geology is a major factor in determining the nature of the Mercer Island drainage basins. Like most of Puget Sound, the geology of Mercer Island is dominated by glacially-derived sediments. In the following paragraphs, the geology of the island will be described beginning from the oldest unit and going to the most recent unit.

Prior to the last phase of glaciation, fine grained silt was deposited, forming a dense, erosion-resistant, low permeability unit which probably underlies the island. This unit is called the Transitional beds (Qtb) because it was deposited in a transitional time between phases of glaciation. As an abbreviation Q is used to denote the Quaternary Period and tb is used to denote Transitional beds. This unit is present on the west and southeast shorelines of the island (Plate 2).

As the glaciers advanced from the north during the Vashon glaciation, sand and gravel were deposited over the Transitional beds. This unit is called advance outwash (Qva or Quaternary Vashon advance outwash). Although this unit was overridden by the glaciers and can stand vertically, it is susceptible to erosion and created many of the

¹ There are 54 numbered subbasins, some of which have multiple designations (i.e., 39a, 39b, etc.), for a total of 85.



erosion problems on the island. Furthermore, since it overlays the low permeability Transitional beds, advance outwash tends to collect groundwater and be subject to slope movement. Many of the slides on the island lie at the base of the advance outwash.

The material laid down directly under the glacier is till (Qvt). This unit forms a rolling cap which covers the top ³/₄ of the island and consists of a dense mixture of silt, sand and gravel. Because of its content and density is relatively resistant to erosion and sliding.

As the glaciers retreated, deposits of sand and gravel (Qvr) were laid down. This surface unit is present on the east shoreline and parts of the commercial district and is susceptible to erosion. Other mapped units include alluvium (Qyal) and modified soil/fill (m). These two units cover small areas.

Plate 2 shows the geology, landslide areas, watercourses, and major roads on Mercer Island.

Section 3 PHASE 1 PROBLEM IDENTIFICATION AND RESULTS



Section 3 PHASE 1 PROBLEM IDENTIFICATION AND RESULTS

This section contains a description of the methodologies used in the problem identification for Phase 1 as well as the approach to watercourse monitoring. This section also contains a summary of the problems identification results.

3.1 General Methodology

Drainage system and ravine erosion problem identification was conducted at a highlevel for the Phase 1 analysis and was based on a combination of interviewing City staff, review of previous documents, LiDAR review and assessment, and limited field reconnaissance. The problem identification was considered high level because it did not include detailed hydrologic or hydraulic modeling or extensive field investigations. The objective of the planning-level problem identification was to determine the areas with high potential for drainage and erosion problems. Doing so provided multiple benefits. First, this information was later used to focus a more detailed evaluation of problem areas in Phase 2 to those problems that are more severe. Second, the information was used to estimate order of magnitude costs for capital improvements. Third, the information was used to evaluate policy decisions on where to focus the funding of the City's stormwater program, such as whether the City should correct all know erosion problems or focus on the most severe.

This work focused on ravine erosion problems along watercourses as well as drainage system (i.e., system of pipes and ditches) problems. Investigations to identify wetland, water quality, or fish habitat/passage problems were not included in this work.

3.2 Interviews with City Staff

Interviews were conducted with current and former City maintenance staff (Jerry Judd and Jerry Meier) at two meetings. The interviews were conducted to collect unpublished information and to compile information regarding current and past erosion and drainage system problems. The following paragraph provides a general description of the information gathered. Specific information about individual problems is included in Table 3-3 for erosion problems and Table 3-4 for drainage system problems.

There are many types of surface water problems that were generally found within the City. While there do not appear to be any major recurrent flooding problems that result in significant property damage, there are pipe system problems that result in localized minor flooding problems. These include both private and public substandard



drainage systems that were installed long ago and which are either undersized, subject to root intrusion, may not be well maintained, or generally are in poor condition. In many cases private drainage systems are not well-maintained, and this can cause problems for the private systems as well as for the upstream public systems. In some cases, the private property owner may not be aware that problems exist within the private system. Some areas lack a formal drainage system, and in other areas, trashracks and culverts become clogged with debris, leaves and sediment. Furthermore, as a result of undersized drainage system components, the velocities in culverts or watercourses may be high and cause erosion. Steep channels throughout the City are susceptible to erosion and downcutting. Headcutting and sloughing also occur within the channels. Channel and streambank erosion occur where velocities are high. Bank failure and sediment deposition were also identified as problems throughout the City.

Following large storm events, City maintenance staff routinely discover new problems that need to be addressed.

3.3 Data Review

The City provided available drainage and utility documents for review. Several documents were provided that date back to the mid 1970s when comprehensive stormwater planning first began at the City. In more recent years, the City has conducted separate subbasin plans. These subbasin plans provided the most detailed account of drainage problems and were the focus of the data review. They included:

- Drainage Basin Evaluation Basin 21 (Channel Stabilization Downstream of West Mercer Way), Harding Lawson Associates for City of Mercer Island, July 1998, Technical Memorandum.
- Drainage Basin Evaluation Basin 26 (West Basin), CH2M Hill for City of Mercer Island, December 3, 2003, Technical Memorandum.
- Basin 29 Watercourse Stabilization and Rehabilitation Preliminary Engineering Report. City of Mercer Island. February 2000. CH2M Hill. Draft Report.
- Basin 29 High Flow Bypass Pipeline and Stream Restoration, Final Design Report. CH2M Hill for City of Mercer Island. June 2001.
- Basin #32B Drainage Basin Study, The McAndrews Group, Ltd., for the City of Mercer Island, November 2000.
- Basin #42 Drainage Basin Study, The McAndrews Group, Ltd., for the City of Mercer Island, December 2000.
- Drainage Basin Evaluation Basin 45b (East Basin), CH2M Hill for City of Mercer Island, December 9, 2003, Technical Memorandum.

3.4 LiDAR and GIS Ravine Analysis

3.4.1 Background and Data Sources

The City has benefited in this Ravine Analysis from the availability of a good quality LiDAR (Light Detection and Ranging) dataset obtained from King County and the Puget Sound Regional Council. The LiDAR was used to generate several derivative layers that support the analysis, including hydrographic flow direction, hill-shading, slope gradients and slope curvature. The analysis was also facilitated by several key GIS layers provided by the City's GIS coordinator which showed:

- 1. the City's stormwater conveyance system (originally an AutoCAD file);
- 2. impervious surfaces;
- 3. watercourses;
- 4. culverts and pipes;
- 5. historic landslides (where known); and
- 6. building footprints.

3.4.2 Analysis Objective

The objective of this analysis was to predict the susceptibility to erosion of any particular section of stream channel and to quantify that susceptibility as "high", "moderate", or "low". In order to do this, team geologists developed a predictive formula that considers a number of critical physical factors that contribute to the erosion process in the ravines. This was done by dividing each factor into categories and assigning a weight (or score) for each category. For example, the category of "Landslide in vicinity" was assigned a "yes" category with a weight of 5 and a "no" category with a weight of 0. The relative weights between categories were assigned by professional judgment of team geologists and from some sensitivity analysis. An additional factor was included that took into account known erosion problems area based on City staff input. These factors were then quantified to determine an overall susceptibility ranking.

3.4.3 Susceptibility Factors

The areas of potential erosion problems, as well as their severity, were identified using LiDAR and GIS information without performing significant field reconnaissance of the Island.

The key factors deemed to most influence the degree and susceptibility to erosion, and their relative importance (weighting) are tabulated below:

| Factor | Description | Categories | Weighting |
|------------------------|---|-------------------|-----------|
| Permeability | The City provided a layer | Yes | 1 |
| | showing areas of impermeability. No erosion takes place in these areas. | No | 0 |
| Known areas of erosion | Areas known by the City to suffer | Yes | 5 |
| | from erosion. | No | 0 |
| Geology | Main geological units from Dept. | Till | 2 |
| | of Natural Recourses. | Outwash | 10 |
| | | Transitional beds | 5 |
| Landslide in vicinity | Areas of landslide with a 50' | Yes | 5 |
| | zone. Contributes a weight of 5 if intersected by a stream. | No | 0 |
| Degree of slope | Gradient of the stream as | <15 | 0 |
| (stream gradient) | determined by calculation from | 15-30 | 2 |
| | LiDAR data. | 30-40 | 5 |
| | | >40 | 7 |
| Degree of curvature | Rate of change of the gradient | +1 | 2 |
| | (slope of the slope). | +2 | 5 |
| Outfalls | If onto outwash units, 5; | If yes Outwash | 5 |
| | transitional beds, 3. No consideration for condition of outfall. | Transitional Beds | 3 |
| Knickpoints | Identified as short, sharp | Yes | 35 |
| | gradients in the stream of greater than 100%. | No | 0 |

Table 3-1 Susceptibility Factor Weighting

3.4.4 Detailed Methodology

The methodology applied to derive the measure of a stream channel's susceptibility to erosion comprised a sequence of steps using multiple GIS data layers, some of which already existed, and some of which were derived through this analysis. Those sequential steps are summarized below:

1. The Puget Sound Regional Council's LiDAR raw elevation data set was interpolated to a 3-foot-square grid covering the entirety of Mercer Island to create a digital terrain model (DTM). According to the PSLC statement accompanying the data, the mapping has vertical accuracy on the order of one foot. Locally (i.e., within isolated areas within the data), the data may be of poorer quality. In areas of dense vegetation, LiDAR ground data points may be further apart than the 3-foot-square grid resolution used for this study, and consequently the surface interpolated between the points may be more uneven

than represented by the surface model. Despite these caveats, the data remains a very good source of elevation data for a study of this kind.

- 2. A combination of two data sets was required to create a master layer that showed the watercourses which are subject to erosion, and that was used to tabulate the various erosion factors. First, the island's hydrography was derived from the DTM derived in the step described above. This layer was then compared with a second layer, the City's stormwater conveyance system layer. The hydrography was modified appropriately where stormwater is piped or conveyed by other than watercourses. The resulting layer is the master layer used to evaluate erosion susceptibility factors.
- 3. Landslide data were compiled as a combination of documented historic landslide events provided by the City and areas of subject to landslides, as interpreted by a geologist from the DTM.
- 4. Slopes (channel and land gradients) were derived from the DTM.
- 5. Curvature was derived from the DTM.
- 6. The outfall layer was created to represent the downstream end of road culverts for the ravine watercourses. Only those culverts relevant to the ravine watercourses were represented.
- 7. By definition, a knickpoint is an interruption or break in slope; especially an abrupt change in the longitudinal profile of a watercourse. For the knickpoint layer in this study, a threshold of 200 percent over a minimum horizontal distance of about 12 feet was initially used to try to define those places along a creek bed where it is likely subject to more aggressive erosion. However, at this threshold, no areas were identified. As a second attempt, at a threshold of 100 percent over a minimum horizontal distance of about 12 feet was used. The resulting analysis showed numerous areas along a creek bed where it is likely subject to more aggressive erosion. These inflection points were derived from the slope layer. Visual observation of the DTM and review of the gradients suggests that additional knickpoints exist along some streams but, because they did not meet the 100 percent steepness threshold over this length, they were not identified in the analysis. This assertion is supported by observation of the slope model and the failure of the stream to reduce its gradient profile to the local norm. The explanations for this can be that: (a) the stream has encountered a particularly resistant layer and cannot easily cut back further, or; (b) it has encountered a unit tends to stand tall until undercut and then collapses (like the till). This latter type represents an active erosion point of potential concern. Knickpoints were given a stand-alone weighting of the maximum (35) to ensure they were included as "high" erosion areas, even if other factors did not put them in that category. Some refinement in the slope/distance threshold may improve the knickpoint identification.
- 8. The final analysis with these combined data sets involved superimposing each of the layers shown on Table 3-1 above and attributing creeks with their numerical values (weightings). This involved summing the weighted values

for each factor along the line of each watercourse to arrive at the numerical totals along the line of the watercourse (which are symbolized on Plate 3). The values are cumulative so that the higher the value, the more susceptible to erosion is that section of the watercourse. The impervious surface GIS layer was used to negate all values where erosion is deemed unlikely. The result is that the numerical classification applies only to drainages on pervious surfaces.

9. Results are classified into the categories "high", "moderate", and "low" based approximately on standard deviations from the mean:

| | <u>Category</u> | Score |
|-------------|-----------------|---------|
| >X+2s | High | > 30 |
| X+1s - X+2s | Moderate | 18 – 29 |
| >X+1s | Low | < 18 |

Those creek sections included in the "High" category are identified on the map as separate clusters which are grouped based on proximity. They are labeled on the map using a numbering convention that uses the basin number as a prefix, followed by a period separator, followed by sequentially numbered suffix to designate separate groupings. Numbering begins at the downstream end of the mainstem and progresses upstream, then following with any tributaries, again progressing sequentially from the downstream end. In some cases, the cluster may include some sections of "Moderate" susceptibility, for example, if a short section of "Moderate" susceptibility lies between two "High" susceptibility clusters.

It should be noted that geology has a large influence on the streambed susceptibility to erosion. The spatial resolution of the Department of Natural Resource's digital geology map is at a small, regional scale. Based on our field reconnaissance, the accuracy and resolution of the geology can be improved by re-interpreting the location of geological contacts relative to the topography. This refinement would likely result in additional watercourse sections being classified as "high".

3.5 Watercourse Condition Monitoring

3.5.1 Baseline Field Monitoring

During Phase 1, the City identified three specific erosion problem sites for periodic monitoring. The sites are located in subbasins 26, 29, and 32b. Two members of the project team, a geomorphologist from GeoEngineers and a hydraulic engineer from R. W. Beck, visited the three sites on November 16, 2004, to evaluate the erosion problems. A monitoring plan was then developed for each site. Each monitoring plan was developed to meet the following objectives:

- 1. Define the problem explicitly.
- 2. Recommend appropriate tasks and measurements to document the progress or change of the problem.

- 3. Choose a method that allows City staff to perform the future monitoring without additional training.
- 4. Comparison of baseline and future monitoring results is intended to provide evidence as to whether or not the problem is worsening.

The monitoring plans for each site are presented in separate memoranda in Appendix C-1. Each memorandum includes a discussion of the following information:

- 1. Description of the specific erosion problem being monitored.
- 2. Site location and access.
- 3. A description of the measurement locations and other specifics regarding the measurements.
- 4. The locations of fixed nails and pins.
- 5. Guidelines for interpreting future monitoring observations and measurements.
- 6. Photographs of each site including close-ups of important features.
- 7. Two sketch maps for the site: a plan view and an oblique view map showing locations of baseline measurements and photo reference numbers.

Subsequently, as part of the Phase 2 effort, the sites were revisited in January and October 2006 and features were remeasured. The monitoring measurements and results for each site are presented in Appendix C-2. The second and third sets of results are presented in tabular form that can be added to for future measurements.

During the course of the Phase 2 field investigations, several new locations were also identified that should be considered for future monitoring sites. These sites are listed on Table 3-2 and were generally selected because the erosion problems tended to be more severe and/or it appeared the area was more actively eroding. Table 3-2 also provides a recommended priority of these sites based on these same considerations.

| Problem No. | Suggested Priority for Implementation of Monitoring based on Field Investigations | |
|-------------|---|--|
| 45b.3 | 1 | |
| 49b.4 | 2 | |
| 29.2 | 3 | |
| 52.1 | 4 | |
| 51a.1 | 5 | |
| 4.2 | 6 | |
| 46.3 | 7 | |
| 42.1 | 8 | |
| 42.1a | 9 | |
| 42.3 | 10 | |
| 42.2 | 11 | |
| 46a.4 | 12 | |
| 42.4 | 13 | |
| 27a.3 | 14 | |
| 46.2 | 15 | |
| 49b.2 | 16 | |
| 4.1 | 17 | |
| | | |

| Table 3-2 |
|----------------------------------|
| Recommended New Monitoring Sites |

Sites Already Being Monitored

| Problem No. | |
|-------------|--|
| 26.1 | |
| 29.1 | |
| 32.5 | |

3.5.2 LiDAR Monitoring

The 2002 LiDAR Digital Elevation Model (DEM) provides good baseline topography over the whole of the island and, in particular the ravines. Future comparison of a LiDAR DEM map against the 2002 baseline DEM could provide an effective means for detecting changes in the ravine slopes, and watercourses. Using two separate LiDAR images, GIS routines can be developed that compare and identify locations where changes of a certain specified vertical distance (e.g., one foot) have occurred. This could provide helpful data in evaluation erosion activity.

While future LiDAR monitoring can be very efficient because it is an in-office digital exercise as opposed to field work, some caution should be exercised. While the field work performed in Phase 2 of this study found general concurrence with the Phase 1 LiDAR analysis, there were also deviations where field observations showed erosion either more or less severe and/or the extent of problem locations was varied. New geologic mapping will be available in 2006 that will increase the reliability of future LiDAR analysis. In summary, the City should weigh the cost of future LiDAR analysis with what could be accomplished in field observations.

3.6 Watercourse Erosion Problems

The LiDAR and GIS ravine analysis identified potential erosion problems within basins. As described earlier in this section, the problems are defined primarily by assigning various weighting values to features/characteristics in GIS data layers such as geology, slope gradient, topographic curvature (inclination), known landslides, culverts, and drainage outfalls.

The watercourse erosion problems identified in this analysis are shown on Plate 3 and listed on Table 3-3. Each problem is assigned a unique number which starts with the subbasin number and then is followed by a problem number. Problems are numbered sequentially within each subbasin. The table shows the tabulation of the susceptibility factors, as well as problem type and length. The erosion problems identified by the analysis are grouped into five categories which are listed on Table 3-3: 1) streambed knickpoints, 2) outfall erosion, 3) landsliding exacerbated by streambank erosion, 4) landsliding driven by external factors (unstable slopes, road cuts, ground water seeps in granular slope soils), and 5) streambed and bank erosion. Descriptions of these erosion categories are:

- A streambed knickpoint is a vertical step with a plunge pool scoured in the streambed. As water cascades over the lip of the knickpoint, the plunge pool, and the face of the step erode further, causing upstream retreat of the face. Knickpoints typically form in channels underlain by erosion-sensitive soils, such as advance outwash. However, they can form in virtually any soil type including those more resistant to erosion such as till and transitional beds. Unless mitigated, the upstream propagation of the knickpoint will result in systemic lowering of the channel floor.
- The **outfall erosion** category refers primarily to road culverts, although the category can also pertain to stormwater pipe outfalls. Erosion at outfalls typically occurs in two scenarios: 1) confined flows exiting the culvert at high velocities, and 2) improperly designed or constructed culverts and pipes. For both scenarios, outfall erosion typically includes formation of a plunge pool immediately downstream of the outlet, severe bank erosion and possibly channel widening. Where bank erosion is severe, destabilization of the ravine can occur, resulting in small to moderate landslides depending on the extent of the bank erosion. The outfall erosion category does not include non-culvert storm outfalls. Review of the available Mercer Island drainage system

mapping indicates that few stormwater pipe systems outfall onto ravine slope soils above the ravine watercourse. In actuality, there are likely several drainage systems, particularly smaller ones such as individual house roof leaders that discharge to the upper portion of a ravine that can be a source of erosion.

• Landslides identified on Mercer Island fall into two major types: 1) relatively small, shallow failures caused by localized stream bank erosion, and 2) large failures caused by regional conditions. Type 1 landslides are caused, and/or exacerbated by streambank erosion, which effectively removes toe support of lower ravine slope soils. These failures contribute sediment to the stream, which is typically deposited downstream of the landslide. Depending on downstream channel conditions, the deposited sediment may cause aggradation of the streambed. Aggradation typically results in decreased channel flow area, which in turn can cause increased frequency of flooding. In addition to flooding, channel floor aggradation can cause moderate to severe stream bank erosion and channel widening. Type 1 landslides are included as candidates for CIP projects (see Section 4).

Type 2 landslides are driven by regional scale conditions such as unstable soils, ground water seepage, and mechanical disturbances that destabilize ravine slopes (e.g., road cuts and improper discharge of stormwater runoff). These features are typically large, and can involve entire sections of a ravine. The movement of Type 2 landslides into a stream channel typically results in the diversion of the channel around the slide and severe erosion along the opposite bank. Similar to the Type 1 slides, eroded sediment is subject to downstream transport and deposition. Type 2 landslides are not included in the CIP project development at this time.

• Streambed and bank erosion within most streams on the island is caused by a combination of factors including geology and soil type, channel gradient, and increased peak flows resulting from urbanization and previous stormwater control practices. The erosion is most notable in drainages dominated by glacial outwash soils. However, erosion-resistant transitional beds are also subject to erosion, particularly in densely developed basins. Streambed erosion identified in the analysis typically reflects potential channel downcutting.

High and moderate erosion potential problems are shown on Plates 3 and 4. High erosion potential areas include several types of erosion problems: channel headcutting, outfall erosion, landsliding exacerbated by streambank erosion, and landslides. A representative example of a high erosion potential problem area is that provided at the monitoring site in subbasin 26, where an approximately 6-foot-high knickpoint is migrating upstream. As the knickpoint moves upstream, it leaves behind a wider, deeply incised channel. Moderate erosion potential areas typically consist of streambank and channel incision erosion. Moderate erosion potential areas include stream sections with outwash soils and channel gradients from 1 to 3 percent.

3.7 Drainage System Problems

Table 3-4 lists the drainage system problems (or drainage systems of concern/substandard) identified by current and former City staff. These problems are also shown on Plate 4. Drainage problems are numbered sequentially within each basin. Each problem is assigned a unique number which is preceded by a "D", followed by the subbasin number, and then a problem number. The "D" is used to distinguish drainage problems from erosion problems. This plate also includes the watercourse erosion problems as described in Section 3.6.

Some of the problems listed on this table and shown on the figure are twenty-five (25) "hot spots" which were identified by City staff as areas that require attention during storm events in order to prevent flooding. These are listed as a general problem on Table 3-4. An example, of a "hot spot" would be a drainage system inlet where the inlet (or inlet grates) has been more historically susceptible to becoming clogged with leaves and/or other debris if left unattended during a major storm.

Table 3-3Phase 1 - High Erosion Potential Areas

| Basin # | Problem No. | Total Value ¹ | Susceptivity Value ² | Geology ³ | Nickpoint | Convexity | Stream Gradient | Known Slide ⁴ | Outfall | Known Problem⁵ | Problem Classification Type | Supplemental Information, if available (City input/prior documents) | Approximate Length (ft) ⁶ |
|------------|--------------------|-----------------------------|------------------------------------|----------------------|-----------|-------------|--------------------|-----------------------------|---------|---------------------|---|--|---|
| 4 | 4.1 | 30 | 30 | Qva | | | > 40% | yes | | Erosion Downcutting | streambed and back erosion/channel confined by large | Upstream of erosion problem, there is hardpan. A small sediment pond exists at the downstream end of this water course, before it crosses under I-90. | 12 |
| 4 | 4.2 | 49 | 14 | Qvt | yes | | 30 - 40% | yes | | | streambed and back erosion/channel confined by large landslide | | 42 |
| 6 | 6.1 | 52 | 17 | Qvt | yes | | > 40% | no | | Erosion Downcutting | knick point and incision | Follows is a general discussion of Basin #6. Two branches join prior to crossing under I-90. Around 1996-1997 City installed instream channel armoring/sandbags/check dams in the longer easterly branch. The shorter western branch where problem 6.1 is located was piped. Construction involved highline type operations. The watercourses join at a sediment pond. WSDOT had previously maintained the sed pond excavating out 1-2 truck loads/yr. City now does it and took out 60 yrds in 2003. The system has been improved but the improvements needs to be inspected. | |
| 6 | 6.2 | 39 | 4 | Qvt | yes | | 0 - 15% | no | | | knick point | | 47 |
| 10 | 10.1 | 39 | 4 | Qvt | yes | | 0 - 15% | no | | | knick point | | 65 |
| 10 | 10.2 | 47 | 12 | Qvt | yes | 21.1 - 37.5 | 15 - 30% | no | | | knick point and incision | | 27 |
| 10 | 10.3 | 39 | 4 | Qvt | yes | | 0 - 15% | no | | | knick point | | 85 |
| 23 | 23.1 | 53 | 20 | Qtb | yes | | > 40% | no | yes | | knick point at outfall | Problem previously solved by armoring in 2004 | 14 |
| 26 | 26.1 | 52 | 17 | Qvt | yes | | > 40% | no | | Erosion Downcutting | knick point | | 11 |
| 27a | 27a.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | streambed and back erosion | City staff reported erosion along water course. Main problem appears to be downcutting. | |
| 27a | 27a.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | streambed and back erosion | City staff reported erosion along water course. Main problem appears to be downcutting. | 12 |
| 27a | 27a.3 | 50 | 15 | Qtb | yes | | > 40% | no | | | knick point | City staff reported erosion along water course. Main problem appears to be downcutting. This is the main problem reach in this basin. A general comment about basin 27 is that there has been exposed sewer along certain reaches. Historically, City has had to repair some damaged sewers along watercourse. | 13 |
| 27a | 27a.4 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | yes | | Outfall Erosion | Although identified by LiDAR/GIS analysis, this is not considered a problem because system is piped to the pond in this area. | 2 |
| 27a | 27a.5 | 47 | 12 | Qvt | yes | | > 40% | no | | | knick point | Although identified by LiDAR/GIS analysis, this is not considered a problem because system is piped with a low flow creek. | 32 |
| 29 | 29.1 ⁷ | 30 | 30 | Qva | | | > 40% | no | yes | Erosion Downcutting | | The stream channel in Basin 29 watercourse has been downcut, causing bank failures in several locations. This has contributed to increasing sediment deposition within the stream and at the outlet to Lake Washington. The ravine slopes have undergone slides and active slope movement causing problems to the homeowners at the top of the ravine. CH2M has done a preliminary design report for a high flow bypass. City wants to construct in 2007. The distance measured by the LiDAR/GIS analysis for this basin for severe erosion is likely under estimated. | 40 |
| 29 | 29.2 ⁷ | 57 | 22 | Qva | yes | 4.7-21 | > 40% | no | | | knickpoint/streambed and back erosion | See note above. | 50 |
| 38 | 38.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | Substandard System | streambed and back erosion | Although identified by LiDAR/GIS analysis, this is not considered a problem because system has been piped. | 11 |
| 38 | 38.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | | streambed and back erosion | Although identified by LiDAR/GIS analysis, this is not considered a problem because system has been piped. | 5 |
| 38 | 38.3 ⁷ | 47-60 | 25 | Qva | yes | | > 40% | yes | | | knick point and incision | Although identified by LiDAR/GIS analysis, this is not considered a problem because system has been piped. | 67 |
| 39a | 39a.1 ⁷ | 30-35 | 30 | Qva | | | > 40% | yes | yes | | Outfall erosion and streambed and back erosion | | 7 |

Table 3-3Phase 1 - High Erosion Potential Areas

| Basin # | Problem No. | Total Value ¹ | Susceptivity Value ² | Geology ³ | Nickpoint | Convexity | Stream Gradient | Known Slide⁴ | Outfall | Known Problem ⁵ | Problem Classification Type | Supplemental Information, if available (City input/prior documents) | Approximate Length (ft) ⁶ |
|------------|--------------------|-----------------------------|------------------------------------|----------------------|-----------|-------------|--------------------|-----------------|---------|----------------------------|--|--|---|
| 42 | 42.1 | 30 | 25 | Qvr | | 21.1 - 37.5 | 15 - 30% | yes | | Erosion Downcutting | Toe erosion, landsliding and streambed and back erosion | Erosion of ravines. City performed instream bank stabilization, check dams, and gabions on different sections, as well as planting on banks. and constructed sediment vault. Improvements have helped but monitoring recommended. | 5 |
| 42 | 42.2 ⁷ | 30-65 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | Hot | Spots/Erosion Downcu | It streambed and back erosion/channel confined by large landslide | same as above | 110 |
| 42 | 42.3 ⁷ | 30-35 | 30 | Qva | | | > 40% | yes | | Erosion Downcutting | streambed and back erosion | same as above | 67 |
| 42 | 42.4 | 57 | 22 | Qvt | yes | | > 40% | yes | | Erosion Downcutting | knick point | same as above | 12 |
| 42 | 42.5 ⁷ | 55 | 20 | Qvr | yes | | > 40% | no | | | knick point | same as above | 46 |
| 42 | 42.6 | 60 | 25 | Qva | yes | | > 40% | yes | | | knick point | same as above | 33 |
| 42 | 42.7 ⁷ | 30 | 30 | Qva | - | 21.1 - 37.5 | > 40% | yes | | | streambed and back erosion | same as above | 16 |
| 42 | 42.8 ⁷ | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | | streambed and back erosion | same as above | 19 |
| 42 | 42.9 ⁷ | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | streambed and back erosion | same as above | 16 |
| 42 | 42.10 | 47 | 12 | Qvt | yes | | > 40% | no | | | knick point | same as above | 17 |
| 44b | 44b.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | yes | | Outfall Erosion | | 1 |
| 44b | 44b.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | yes | | Outfall Erosion | City staff considered this problem to be solved | 0 |
| 45b | 45b.1 ⁷ | 30-60 | 25 | Qva | yes | | > 40% | no | | Erosion Downcutting | knick point/streambed and back erosion | Considered minor erosion by City staff. Near East Mercer Way and Private Road, Minor channel downcutting was observed and a slow slide was observed on the southern embankment. During discussions with City staff, this section of channel was considered ok. | 17 |
| 45b | 45b.2 | 47 | 12 | Qvt | yes | | > 40% | no | | | knick point | | 41 |
| 46a | 46a.1 | 39 | 4 | Qvt | yes | | 0 to 40% | no | | | knick point/streambed and back erosion | | 87 |
| 46b | 46b.1 | 52 | 17 | Qvt | yes | 21.1 - 37.5 | > 40% | no | | | knick point and incision | | 61 |
| 47 | 47.1 | 47 | 12 | Qvt | yes | | > 40% | no | | | knick point | | 21 |
| 48 | 48.1 ⁷ | 47 | 12 | Qvt | yes | | > 40% | no | | Problem Solved | knick point and incision | | 25 |
| 49b | 49b.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | streambed and back erosion | | 12 |
| 49b | 49b.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | streambed and back erosion | | 3 |
| 50b | 50b.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | yes | | Outfall Erosion | | 4 |
| 50b | 50b.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | streambed and back erosion | The LiDAR GIS analysis identified a less than 1 ft section of severe erosion. This location is in a long reach of moderate erosion (i.e, very dominated by moderate erosion) and therefore not considered a severe problem. | . 1 |
| 50b | 50b.3 ⁷ | 55-67 | 20 | Qva | yes | | > 40% | no | | | knick point | | 83 |
| 50c | 50c.1 ⁷ | 30 | 30 | Qva | - | | > 40% | no | yes | Erosion Downcutting | Outfall Erosion/streambed and back erosion | Some erosion problems below East Mercer Way in this watercourse | 5 |

Table 3-3Phase 1 - High Erosion Potential Areas

| Basin # | Problem No. | Total Value ¹ | Susceptivity Value ² | Geology ³ | Nickpoint | Convexity | Stream Gradient | Known Slide ⁴ | Outfall | Known Problem⁵ | Problem Classification Type | Supplemental Information, if available (City input/prior documents) | Approximate Length (ft) ⁶ |
|------------|--------------------|-----------------------------|------------------------------------|----------------------|-----------|-------------|--------------------|-----------------------------|---------|---------------------|--|--|---|
| 50c | 50c.2 | 30 | 30 | Qva | | | > 40% | yes | | Erosion Downcutting | streambed and back erosion | Some erosion problems below East Mercer Way in this watercourse | 6 |
| 50c | 50c.3 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | | streambed and back erosion | Some erosion problems below East Mercer Way in this watercourse | 1 |
| 51a | 51a.1 ⁷ | 30-35 | 30 | Qva | | | > 40% | no | yes | Erosion Downcutting | Outfall erosion and streambed and back erosion | Some erosion problems below East Mercer Way in this watercourse | 36 |

Explanation:

²Suscept val: Susceptibility value that represents the modeled value for erosion potential susceptibility that includes factors of geology, erodibility, convexity, slope %, and presence of landslides.

¹Total Value: Total value that equals the Susceptibility value plus a knick point factor (35 points).

³Geology:

Qva: Quaternary age Vashon Advance Outwash Qvt : Quaternary age Vashon Till Qvr: Quaternary age Vashon Recessional Outwash Qtb: Quaternary age Transitional Beds

⁴Known Slide: Within 50 feet of known slide area.

⁵Known Problem: Known problem areas identified by the City of Mercer Island staff.

⁶Length: The linear channel distance (feet) subject to high erosion potential. Note this is the length calculated in the GIS model and should be considered very approximate.

⁷Problem reflects a summary or accumulation of multiple problems in close proximity. See Appendix B for complete data for each problem reach.

Table 3-4Phase 1 - Drainage System Problem Areas

| Basin | Problem No. | Subbasin No./ Problem No. | Problem Type/Description | Approximate Length (ft) | Private Public |
|-------|-------------|------------------------------|---|----------------------------|-------------------|
| 6 | D6.1 | 6-2 | Pipe system is surcharged. City previously installed locking Lid on system to contain flows. Further investigations would be necessary to determine if this is a problem. | 400 | |
| 6 | D6.90 | 6-3 | Several blocks west of 84th Avenue SE that include private informal systems that are flate and likely | 600 | |
| | | | substandard. Some ponding in road occurs. | | |
| 6 | D6.91 | 7 | Several blocks west of 84th Avenue SE that include private informal systems that are flate and likely substandard. Some ponding in road occurs. | 600 | |
| 9 | D9.1 | 9-1 | Pipe system flows full causing periodic ponding in flat intersection. This hasn't been considered a | 400 | |
| | | 0.0 | significant flooding problem because ponding quickly recedes. | 050 | |
| 9 | D9.2(2.54) | 9-2 | Private system suspected as being substandard and in poor condition. | 250 | privat |
| 12 | D12b.1 | 12-1 | Substandard system. This block along Roanoke Way needs new drainage system. | 500 | |
| 13 | D13c.1 | 13-1 | Private system suspected as being substandard and in poor condition. | 400 | privat |
| 15 | D15.1 | 15-1 | Private system suspected as being substandard and in poor condition. Has been subject to some | 350 | privat |
| 15 | D15.2 | 15-4 | Private system suspected as being substandard and in poor condition. | 250 | privat |
| 15 | D15.3 | 15-2 | Private system suspected as being substandard and in poor condition. | 250 | privat |
| 16 | D16.1 | 15-3 | Private system suspected as being substandard and in poor condition. Recommend replacement. Have not been able to TV system due to bad system. | 350 | priva |
| 16 | D16.2 | 16-1 | Private system suspected as being substandard and in poor condition. | 250 | priva |
| 18 | D18c.1 | 18 | First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General | 950 | |
| 10 | D 100.1 | 10 | area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding. | 000 | |
| 18 | D18c.2 | 18 | First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General | 1,900 | |
| 10 | D100.2 | 10 | area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major | 1,300 | |
| | . | | flooding. | | |
| 19 | D19a.1 | 19-1 | Culvert crossing W Mercer Way is suspected of poor condition and should be inspected. | 70 | |
| 20 | D20.1 | 20-1 | Private system suspected as being substandard and in poor condition. Also noted as very steep. | 400 | privat |
| 20 | D20.2 | 20-1 | Private system suspected as being substandard and in poor condition. Also noted as very steep. | 300 | priva |
| 21 | D21.1 | 21-1 | Private system suspected as being substandard and in poor condition. | 250 | priva |
| 21 | D21.2 | 21-2 | Private system suspected as being substandard and in poor condition. Recommend inspection. | 150 | |
| 22 | D22.1 | 23-2 | Flat informal system subject to nuisance ponding. Currently planned overaly project will solve this problem | 1,300 | |
| 23 | D23.1 | 24-2 | deep 18-inch crossing of Forest Ave SE (80th Ave SE near Merrimount Dr SE) is in bad condition and in need of inspection and possible replacement. Have not been able to TV system. | 50 | |
| 25 | D25b.1 | 25-1 | Some sloughing alongside Forest Avenue SE (between SE 48th Street and SE 49th Street) fills ditch. | 500 | |
| 25 | D250.1 | 20-1 | Also debris plugging of nearby cross culvert has been a problem. Recommend inspection of cross culvert | 500 | |
| ~- | | | and downstream system to lake. | | |
| 25 | D25b.2 | 25-2 | Some debris plugging of West Mercer Way cross culvert. Also condition of cross culvert is old and deep. Inspection is recommended. | 150 | |
| 28 | D28b.1 | 27-2 | 1960 system installed in slide area. Any failure would have high risk of damage and inspection is | 1,200 | |
| | | | recommended. Some root problems have occurred. There is also some concern that if bypass | | |
| | | | malfunctions all flows would return to channel and cause flooding. Inspection is recommended. | | |
| 29 | D29.1 | 29-2 | Older concrete system between 80th and 81st is suspect of poor conditions with root intrusion due to a lot of planting. | 1,800 | |
| 31 | D31c.1 | 31-1 | Private system suspected as being substandard and in poor condition. | 450 | priva |
| 31 | | | Private system suspected as being substandard and in poor condition. | 800 | |
| 31 | D31c.2 | 31-2 | | | priva |
| 32 | D32a.1 | 32-1 | Private system suspected as being substandard and in poor condition. System was TV'd and lower portion was found in bad condition. | 1,000 | priva |
| 32 | D32b.1 | 32-2 | Private system suspected as being substandard and in poor condition with root problems. | 400 | priva |

Table 3-4Phase 1 - Drainage System Problem Areas

| Basin | Problem No. | Subbasin No./ Problem No. | Problem Type/Description | Approximate Length (ft) | Private/ Public |
|-------|-------------|------------------------------|--|----------------------------|--------------------|
| 33 | D33a.1 | 33-1 | Several West Mercer Way culvert crossings are old and in poor condition and need replacement. One option being considered is to route flow to south in new system in West Mercer Way to Lakeview Ln and then to lake. Several slide in area have occurred and repaired by the City. The pipe systems | 2,000 | |
| 35 | D35.1 | 35-1 | downstream from these culvert crossings were also noted as poor condition. Old system constructed along steep bank. A past blowout occurred due to root intrusion resulting in flooding of home. System investigation is recommended. If failure occurs, damage risk is high. | 1,000 | |
| 36 | D36.1 | 36-1 | Culvert/driveway crossing not functioning properly. Some settlement has occurred. May be private drainage problem. | 40 | |
| 37 | D37.1 | 37-1 | Drainage system suspected of poor condition (not constant slope). Recommend inspection. | 200 | |
| 37 | D37.2 | 37-2 | Drainage system suspected of poor condition (not constant slope). Recommend inspection. | 350 | |
| 37 | D37.3 | 37-3 | Drainage system suspected of poor condition. Recommend inspection. | 300 | |
| 38 | D38.1 | 38-1 | System near Terrywood Ln is constructed in steep sandy bank. Pipe is partially buried. City TV'd part of system and it was considered marginal. This system is a concern because if failure occurs there is high potential for damages. Downstream portion in park is considered ok. | 700 | |
| 40 | D40.a1 | 40-2 | Informal drainage system in poor condition. A roadway/drainage improvement CIP planned for 2005 will solve this problem | 300 | |
| 40 | D40b.1 | 40-1 | Culvert crossing suspected of poor condition. Recommend inspection. | 50 | |
| 46 | D46a.1 | 46-3 | Culverts under East Mercer Way are suspected of poor condition and should be investigated. This site is also designated as a "Hot Spot". | 60 | |
| 46 | D46a.2 | 46-3 | Culverts under East Mercer Way are suspected of poor condition and should be investigated. | 150 | |
| 47 | D47.1 | 47-1 | Culvert under East Mercer Way are suspected of poor condition and should be investigated. | 200 | |
| 49 | D49b.1 | 49-2 | Existing pipe system is suspected of being undersized and should be investigated. | 150 | |
| 49 | D49b.2 | 49-1 | East Mercer Way culvert crossing is in substandard condition (old clay and cracked, imploding) and needs replacement | 60 | |
| 50 | D50c.1 | 50-4 | 18" cross culvert (at 4449 East Mercer Way) is failing and needs to be replaced. | 60 | |
| 51 | D51a.1 | 51-1 | Private conveyance system at downstream end of watercourse is suspected of being undersized. | 250 | |
| 53 | D53.1 | 53-1 | 4" stormdrain is undersized. This may be a private system. | 250 | |
| | | General | many systems installed a long time ago and are private are subject to root intrusion. These locations are often unknown until a problem occurs. Many of these system are also private. Private systems often lack maintenance and in some cases, even the system owners don't know the location of the system. | | |
| | | General | many public system are routed to private system which are not maintained. This can lead to problems both with private systems an the upstream public system. | | |
| | | General | City has identified approximately 25 "hot spots" that crews are sent to during significant storms. These are often associated with frequent plugging from leaves/debris/sediment and the crews work to keep the system functioning. | | |

Section 4 PHASE 1 PRELIMINARY CAPITAL PROJECTS IDENTIFICATION



4.1 General Approach

This section describes the identification of preliminary Capital Improvements Projects based on the identified problems in Section 3. As a part of the Phase 1 work, the CIPs are organized by groups represented by broad categories of improvements. As only a few of the problem areas were visited in the field as part of this phase, the type, extent, and cost of solutions are considered order-of-magnitude level. Planning level cost estimates were developed for each of the categories. As previously discussed, this information was later useful during Phase 2 to evaluate policy decisions on where to focus funding of the City's stormwater program and to provide a starting point from which problems should be investigated in more detail. In Section 5, Phase 2 builds on Phase 1 work and provides individual CIP descriptions and project costs for selected projects.

4.2 CIP Project Categories

The solution categories developed generally take into account the type of problem, potential severity, and appropriate groupings of problems. Groupings of problems to be addressed by a CIP were chosen to reflect the proximity of the problems as well as how the City could implement a project with consideration of severity. For example, if a severe erosion problem area is located immediately upstream or downstream of a short, moderate erosion problem area, it was assumed that the moderate problem area would be included in the solution. In these situations, the problem area is dominated by the severe erosion problem area. One reason to consider it this way is that once access to the site is obtained, it makes sense to solve both problem areas. However, if there was a small section of severe erosion adjacent to a lengthy section of moderate erosion (i.e., the watercourse system was dominated by moderate versus severe problems), solving these problems was defined as two separate CIPs (one project for the severe erosion area and the other project for the moderate erosion area). This is due in part to the possibility that the City may only be able afford to correct severe problems and it is desirable to keep track of the dominant conditions separately.

Four broad CIP Project categories include:

1. Drainage system investigations (e.g., TV). City staff reported many systems as systems of concern and/or substandard. More specific information about each system is necessary to determine the action necessary to ensure proper system performance. For example, some pipe systems may simply require



maintenance, some may require repair or replacement in the near term (e.g. 6-years), and some may be in better condition and not need replacement or need replacement in a longer term (6-years to 20-years). It is assumed that all pipe systems that were identified as a system of concern by the City will require some level of investigation to evaluate pipe conditions and therefore, will be TV'd and investigated. The data collected can be used to prioritize the drainage system replacements in the future.

- 2. Drainage system replacement. Drainage system replacement includes complete replacement of a drainage conveyance system identified by City staff as a system of concern. It is assumed that all systems identified by the City as problems or systems of concern will likely need to be replaced within the next 20 years even though it is likely many of these will not need replacement within the next 6 years.
- 3. High potential erosion. This includes correcting erosion problems that were dominated by areas with high erosion potential. The type of solution to correct the different types of erosion problems is discussed below.
- 4. Moderate potential erosion. This includes correcting erosion problems that were dominated by areas with moderate erosion potential. The type of solution to correct the different types of erosion problems is discussed below.

4.3 Phase 1 Cost Estimates

Generalized cost estimates were developed for the above categories during the Phase 1 effort. Phase 1 cost estimates are considered planning level and are not site-specific. Cost estimates were based on the Consultant's experiences with similar type projects and include a 40 percent construction contingency and 45 percent for planning, permitting, design, administration, and construction administration. For some CIP categories, different cost estimates were developed to more closely represent costs that would be commensurate with the type of solution. The breakdown is as follows:

- 1. Drainage system investigations. A cost of \$4 per lineal foot (LF) of system was used. Cost includes pipe TV'ing and field investigations. A minimum cost of \$800 was used for very short systems.
- 2. Drainage system replacement. Costs were based on LF of system. Cost estimates were developed for three categories. Simple, Complex and/or Larger Diameter systems, and ravine culvert replacement. Costs for simple systems (\$400/LF) were based on pipe replacement of up to 18-inch-diameter pipes. Cost for complex systems was based on a ratio of 1.5 to the simple systems and \$600/LF was used. This latter category would be used for systems known to be complex, deep, or larger in diameter. The ravine culvert category would be typically for culvert replacements for crossings of East or West Mercer Road. These are deep, large, may require headwalls, may be required to provide fish passage, and possibly other additional features than a pipe system replacement. A cost of \$1800/LF was used.

- 3. Erosion. Several categories were used as follows:
 - a) Correcting a Knickpoint with Difficult Access. A cost of \$80,000 per each was used. Difficult access means that construction would be done by highline, large mobile crane, or hard labor (for small projects). Helicopter work would probably not be feasible in most areas.
 - b) Correcting a Knickpoint with Vehicle Access. A cost of \$30,000 per each was used. Vehicle access would allow normal construction equipment to be used with minimal road building.
 - c) Instream Stabilization with Difficult Access. Construction methods include those described under Knickpoints. Most erosion restoration work on Mercer Island falls within this category. The cost per LF was estimated to be \$1,800.
 - d) Instream Stabilization with Vehicle Access. This occurs where vehicular access is likely to be feasible based on the slope and proximity to a street or driveway. The cost per LF was estimated to be \$1400.
 - e) High Flow Bypass. This option would be used very selectively for the most severe erosion problems that are difficult to access, construction feasibility problems, or where instream solutions would not work (like general landslide hazard area). The cost per LF was estimated to be \$800.

The Washington State Habitat Manager at the Washington Department of Fish and Wildlife (WDFW) was contacted to discuss acceptable solutions for erosion problems. The Habitat Manager indicated a preference that watercourse erosion problems be addressed by instream stabilization measures including such features as rock check dams, log check dams, boulders, rootwads, banks stabilization with plantings and bioengineering techniques. When asked about the use of high flow bypasses as an alternatives to instream stabilization, particularly in areas of severely restricted access, the habitat manager said that while they can be considered, there is some concern over the long-term sustainability with this approach, citing problems that other jurisdictions have encountered (e.g., City of Bellevue). Two situations where high flow bypasses would be considered more favorably were:

- Where upstream urban storm runoff can be diverted at its sources (e.g., at the end of a piped drainage system outfall prior to entering a natural watercourse) and can be routed to Lake Washington without returning high flows to the watercourse.
- For bypasses that involve diversion away from a natural watercourse or back into a watercourse, it is preferable to include stream enhancement of the affected watercourse along with any high flow bypass solutions in order to ensure that the channel

capacity is maintained and to protect the stream in the event that the bypass fails.

f) Pipe Outfall Erosion. This was estimated to be \$16,000 per site. The cost was based on providing fish passage although it is recognized that few fish reside in the watercourses.

4.4 Phase 1 CIP Project Summary

Tables 4-1 and 4-2 summarize the CIP projects identified in the Phase 1 analysis for erosion problems and drainage system (piped) problems respectively. Again, the methodology used for the identification of erosion problems is approximate so this list of CIP erosion projects represents a list of "potential" erosion projects. In fact, during Phase 2, some of the identified problems were visited in the field and determined not to be a problem. Similarly, the drainage system problems identified by City staff are a good indication that the identified drainage system problems should be investigated. However, it is not certain that each system will need to be replaced. Therefore these drainage system CIPs should also be considered "potential" projects. Individual projects for both erosion and drainage system problems were later refined during Phase 2.

The total cost for completing all of the potential CIPs identified in Phase 1 is estimated to be approximately \$42 million of which approximately 60 percent is for CIPs to solve moderate erosion problems. The total cost for completing all of the "High" category erosion problems is \$4.6 million. The total cost for completing all of the "Moderate" erosion category problems is \$24.4 million. The total cost for the drainage system CIPs is \$12.6 million.

Table 4-1 includes some information on the proximity of house structures to erosion problems. This can be one factor in considering the risk of property damage due to continued erosion.

Table 4-2 also distinguishes which CIP solutions solve private drainage system problems. The indication of which systems are "private" is preliminary and should be reviewed by City staff. As previously noted, City staff report that new problems are often identified following a major storm event. Therefore, it is likely that within a 20-year planning horizon, additional problems and projects will be identified.

In general these planning level cost estimates reflect the projected cost to correct all "potential" drainage system and ravine erosion problems. As noted above, some of the projects evaluated further in Phase 2 were determined to be small enough as to not warrant a solution.

| Basin # | Project ID | Problem Type | Problems Solved | Dominate Severity Classification ¹ | Solution Type | Construction Access (if applicable) ² | Unit | Unit Cost | Quantity Severe | Quantity Moderate | Total Quantity | Cost ³ | Number of Houses In Area ⁴ | Comment |
|----------|----------------|---|---------------------|--|--|---|----------|---------------------|-----------------|-------------------|----------------|-----------------------|---|--|
| 3 | P3.1 | Streambed and Bank | 3M | Moderate | Instream Stabilization | (ii applicable) | LF | \$1,400 | Quantity ocvere | 100 | 100 | \$140,000 | NA | Comment |
| 4 | P4.1 | erosion streambed and back erosion/channel confined by large landslide | 4.1 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 12 | 0 | 12 | \$21,600 | 0 | |
| 4 | P4.2 | streambed and back erosion/channel confined by large landslide | 4.2 | Severe | Instream Stabilization | | LF | \$1,400 | 42 | 0 | 42 | \$58,800 | 2 | |
| 4 | P4.3 | Streambed and Bank erosion | 4M | Moderate | Instream Stabilization | | LF | \$1,400 | | 690 | 690 | \$966,000 | NA | |
| 5 | P5.1 | Streambed and Bank erosion | 5M | Moderate | Instream Stabilization | | LF | \$1,400 | | 0 | 0 | \$0 | NA | Drainage Section maps show as piped and therefore this is likely not a problem so no cost is included. |
| 6 | P6.1 | Knickpoint and Streambed and bank erosion | 6.1, 6.2 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 100 | 0 | 100 | \$180,000 | 0 | |
| 6 | P6.2 | Streambed and Bank erosion | 6M | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 360 | 360 | \$648,000 | NA | As previously noted, two branches join prior to crossing under I-90 Around 1996-1997 City installed instream channel armoring/sandbags /check dams in the longer easterly branch. Th shorter western branch was piped. The system has been improve but the improvements needs to be inspected. |
| 7 | P7.1 | Streambed and Bank erosion | 7M | Moderate | Instream Stabilization | | LF | \$1,400 | | 40 | 40 | \$56,000 | NA | City staff reported these channels as okay. |
| 10 | P10.1 | Knickpoint and Streambed and bank erosion | 10.1, 10.2, 10.3 | Severe | Stabilize Knickpoint | difficult | EA | \$80,000 | | | 1 | \$80,000 | 3 | |
| 10 | P10.2 | Stream and Bank Erosion | 10M | Moderate | Instream Stabilization | | LF | \$1,400 | | 30 | 30 | \$42,000 | NA | Isolated headwater channels |
| 11 | P11.1 | Stream and Bank Erosion | 11M | Moderate | Instream Stabilization | | LF | \$1,400 | | 100 | 100 | \$140,000 | NA | The lowest reach of this basin was not identified a problem in the LiDAR/GIS analysis, but City staff indicated some erosion of banks north of SE 22nd St. |
| 19a | P19a.1 | Stream and Bank Erosion | 19aM | Moderate | Instream Stabilization | | LF | \$1,400 | | 50 | 50 | \$70,000 | NA | City staff reported this watercourse as okay. |
| 19b | P19b.1 | Stream and Bank Erosion | 19bM | Moderate | Instream Stabilization | | LF | \$1,400 | | 50 | 50 | \$70,000 | NA | City drainage system maps show areas as piped so may not be a problem. |
| 21 | P21.1 | Stream and Bank | 21M | Moderate | Instream Stabilization | | LF | \$1,400 | | 260 | 260 | \$364,000 | NA | City Staff reports some erosion. |
| 22 | P22.1 | Stream and Bank Erosion | 22M | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 450 | 450 | \$810,000 | NA | City staff reported isolated erosion problems on the main tributary and downcutting on north branch. Possible culvert outfall erosion at Island Crest Way and SE 43rd Street |
| 23 | P23.1 | Stream and Bank Erosion | 23M | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 210 | 210 | \$378,000 | NA | City staff reported this as steep with erosion problems and downcutting. Some check dams are already in place. |
| 24 | P24.1 | Stream and Bank Erosion | 24M | Moderate | Instream Stabilization | | LF | \$1,400 | | 60 | 60 | \$84,000 | NA | |
| 25 | P25.1 | Stream and Bank Erosion | 25M | Moderate | Instream Stabilization | | LF | \$1,400 | | 120 | 120 | \$168,000 | NA | |
| 26 26 | P26.1 P26.2 | Knickpoint Stream and Bank Erosion | 26.1 26M | Severe Moderate | Stabilize Knickpoint Instream Stabilization | difficult | EA LF | \$80,000 \$1,400 | | 500 | 1 500 | \$80,000 \$700,000 | 0 NA | Downcutting and bank erosion between Island Crest Way and S 84th Street and downstream of SE 84th Street in slide area. Also outfall erosion is possible at Island Crest Way. |
| 27a | P27a.1 | streambed and back erosion | 27a.1 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 5 | 0 | 5 | \$15,000 | 6 | Assume \$15,000 minimum cost. |
| 27a | P27a.2 | | 27a.2, 27a.3 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 25 | 40 | 65 | \$117,000 | 1 | |
| 27 | P27.3 | Stream and Bank Erosion | 27M | Moderate | Instream Stabilization | | LF | \$1,400 | | 1635 | 1635 | \$2,289,000 | NA | City staff reported some additional reaches may be subject to erosion |
| 29 | P29.1 | Outfall Erosion/streambed and back erosion | 29.1 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 1000 | 0 | 1000 | \$1,800,000 | 1 | The LiDAR/GIS scoring system identified this reach as mostly moderate with some severe, based on site observations more of the reach appeared severe and the entire reach was reclassified a severe for the purpose of the CIP development. |
| 29 | P29.2 | knickpoint/streambed and back erosion | 29.2 | Severe | HDPE Pipeline into Ravine | | LF | \$800 | 50 | 90 | 140 | \$112,000 | 0 | Although more of the reach is classified as moderate, this entire reach was included in the severe category because the solution is relatively simple. |
| 29 | P29.3 | Stream and Bank Erosion | 29M | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 270 | 270 | \$486,000 | NA | The moderate erosion is considered that portion upstream of West Mercer Way. |
| 32 | P321 | Outfall Erosion | 32M | Moderate | Instream Stabilization | | LF | \$1,400 | | 0 | 0 | \$0 | NA | All significant drainage at identified site is piped and this is not considered a problem and no cost are identified. |

 Table 4-1

 Phase 1 - Watercourse Erosion Capital Projects Summary Table

| Deein # | Due is at ID | Decklere Truce | Problems | Dominate Severity | Colution Turne | Construction Access | 11 | Unit Coot | Our antitue Courses | Oursetitu Madamata | Total Quantity | C ast ³ | Number of Houses In | Comment |
|----------------|----------------------|--|-----------------|---------------------------------------|---|------------------------------|------------|-----------------------|---------------------|--------------------|----------------|-------------------------------------|------------------------|--|
| Basin # 39a | Project ID P39a.1 | Problem Type Stream and Bank | Solved 39a.1 | Classification ¹ Severe | Solution Type Outfall Restoration | (if applicable) ² | Unit EA | Unit Cost \$16,000 | Quantity Severe | Quantity Moderate | Total Quantity | Cost³ \$16,000 | Area ⁴ | Comment |
| 3 9a | F 33a. I | Erosion | 55a. I | Severe | Outian Restoration | | LA | \$10,000 | | | Ι | \$10,000 | I | |
| 39a | P39a.2 | Stream and Bank Erosion | 39aM | Moderate | Instream Stabilization | | LF | \$1,400 | | 750 | 750 | \$1,050,000 | NA | |
| 39b | P39b.1 | Stream and Bank Erosion | 39bM | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 30 | 30 | \$54,000 | NA | Watercourse fed by groundwater. Slide area to south. |
| 40b | P40b.2 | Stream and Bank Erosion | 40bM | Moderate | Instream Stabilization | | LF | \$1,400 | | 80 | 80 | \$112,000 | NA | City did not report any problem in these reaches |
| 40a | P40a.1 | Stream and Bank Erosion | 40aM | Moderate | Instream Stabilization | | LF | \$1,400 | | 40 | 40 | \$56,000 | NA | Very minor watercourse so may not be a problem |
| 41 | P41.1 | Stream and Bank Erosion | 41M | Moderate | Instream Stabilization | | LF | \$1,400 | | 130 | 130 | \$182,000 | NA | Problem located within 250 feet downstream of East Mercer Way. Other drainages are piped so adjustment in length was made. |
| 42 | P42.1 | Toe erosion, landsliding and streambed and back erosion | 42.1 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 5 | 15 | 20 | \$36,000 | 0 | |
| 42 | P42.2 | streambed and back erosion/channel confined by large landslide | 42.2 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 110 | 190 | 300 | \$540,000 | 1 | There are several severe locations interspersed with moderate erosion and it is suggested to include the moderate length and assume this CIP addresses a severe problem |
| 42 | P42.3 | streambed and back erosion | 42.3 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 67 | 110 | 177 | \$318,600 | 0 | There are several severe locations interspersed with moderate erosion and it is suggested to include the moderate length and assume this CIP addresses a severe problem |
| 42 | P42.4 | knick point | 42.4 | Severe | Stabilize Knickpoint | difficult | EA | \$80,000 | | | 1 | \$80,000 | 0 | · · · · · · · · · · · · · · · · · · · |
| 42 | P42.5 | knick point, outfall erosion, and streambed and bank erosion | 42.5 | Severe | HDPE Pipeline Surface Pipeline into Ravine | 1 | LF | \$800 | 46 | 114 | 160 | \$128,000 | 0 | Although more of the reach is classified as moderate, this entire reach was included in the severe category because the solution is relatively simple. |
| 42 | P42.6 | knick point | 42.6 | Severe | Stabilize Knickpoint/Instream Stabilization | | EA | \$1,400 | 35 | 0 | 35 | \$49,000 | 0 | |
| 42 | P42.7 | streambed and back erosion | 42.7 | Severe | Instream Stabilization | | LF | \$1,400 | 15 | 105 | 120 | \$168,000 | 1 | Although more of the reach is classified as moderate, this entire reach was included in the severe category because the solution is relatively simple. |
| 42 | P42.8 | streambed and back erosion | 42.8 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 19 | 0 | 19 | \$34,200 | 0 | |
| 42 | P42.9 | streambed and back erosion | 42.9 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 17 | 20 | 37 | \$66,600 | 0 | |
| 42 | P42.10 | knick point | 42.10 | Severe | HDPE Pipeline Surface Pipeline into Ravine | e difficult | LF | \$800 | 250 | 0 | 250 | \$200,000 | 1 | Drainage System consists of half-round pipe and quarry spalls. C is assumed but it may not be needed. |
| 42 | P42.11 | Stream and Bank Erosion | 42M | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 2525 | 2525 | \$4,545,000 | NA | Significant erosion in ravine subject to landslides. |
| 43b | P43.1 | Stream and Bank Erosion | 43bM | Moderate | Instream Stabilization | | LF | \$1,400 | | 110 | 110 | \$154,000 | NA | Staff reported no problems but that stream corridor always wet. |
| 44b | P44b.1 | Outfall Erosion | 44b.1 | Severe | Outfall Restoration | | EA | \$16,000 | | | 1 | \$16,000 | 3 | |
| 44b | P44b.2 | Stream and Bank Erosion Stream and Bank Erosion | 44bM | Moderate | Instream Stabilization | -1:22: 14 | LF LF | \$1,400 | | 390 | 390 | \$546,000 | NA | City staff reported no deposition problems downstream on south watercourse. flow in upper 2/3 of basin intercepted by East Mercer Way Pipe |
| 44a 45b | P44a.3 | knick point/streambed and | | Moderate Severe | Instream Stabilization | difficult | | \$1,800 | 17 | 0 | 120 | \$30,600 | 0 NA | System, caring flow to basin filtercepted by East Mercer way Pipe System, caring flow to basin 44b. Small length of erosion reach. City staff reported no problems in |
| | | back erosion | | | | | | | | 0 | | | | this reach. |
| 45b 45b | P45b.2 P45b.3 | knick point Stream and Bank Erosion | 45b.2 45bM | Severe Moderate | Stabilize Knickpoint Instream Stabilization | difficult difficult | LF | \$80,000 \$1,800 | | 730 | 1 730 | \$80,000 \$1,314,000 | NA | Street drainage probably flows into ravine Southern watercourse was considered minor erosion by City staff Near East Mercer Way and Private Road, Minor channel downcutting was observed and a slow slide was observed on the southern embankment. During discussions with City staff, this section of channel was considered ok. For, northern watercourse downcutting is occurring for 450 feet upstream of East Mercer Wa exposing a sanitary sewer. Hillslopes show instability. Downstream of East Mercer Way, channel downcutting occurring and slow slide observed on south embankment. City staff reporte that there were no problems. Pond at mouth requires approximately 8 cy of material to be removed each year. |
| | | | 45aM | | Instream Stabilization | difficult | LF | \$1,800 | | 50 | 50 | \$90,000 | NA | |

Table 4-1 Phase 1 - Watercourse Erosion Capital Projects Summary Table

|--|

| | | | Problems | Dominate Severity | | Construction Access | | | | | | | Number of Houses In | |
|---------|------------|--|----------|-----------------------------|---|------------------------------|------|-----------|-----------------|--------------------------------------|----------------|-----------------------------|------------------------|---|
| Basin # | Project ID | Problem Type | Solved | Classification ¹ | Solution Type | (if applicable) ² | Unit | Unit Cost | Quantity Severe | Quantity Moderate | Total Quantity | Cost ³ | Area ⁴ | Comment |
| 46a | P46a.1 | knick point/streambed and back erosion | 46a.1 | Severe | Stabilize Knickpoint | difficult | EA | \$80,000 | | | 1 | \$80,000 | 0 | |
| 46a | P46a.2 | streambed and back erosion | 46aM | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 1260 | 1260 | \$2,268,000 | NA | large unstable slope is feeding large quantities of sediment to creek. Downcuttng in tributaries also a source. Check dams in middle of basin trap sediment but they may be nearly full. Deposition at mouth is a problem. |
| 46b | P46b.1 | knick point/streambed and back erosion | 46b.1 | Severe | Stabilize Knickpoint | difficult | EA | \$80,000 | | | 1 | \$80,000 | 3 | |
| 46b | P46b.2 | streambed and back erosion | 46bM | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 100 | 100 | \$180,000 | NA | City staff did not report problems |
| 47 | P47.1 | streambed and back erosion | 47M | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 550 | 550 | \$990,000 | NA | City staff did not report problems |
| 48 | P48.1 | streambed and back erosion | 48M | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 130 | 130 | \$234,000 | NA | City staff reported most problems fixed with culvert replacement and installation of check dams. |
| 49b | P49b.1 | streambed and back erosion | 49b.1 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 12 | 0 | 12 | \$21,600 | 12 | |
| 49b | P49b.2 | streambed and back erosion | 49b.2 | Severe | Instream Stabilization | difficult | LF | \$1,800 | 3 | 0 | 3 | \$15,000 | 4 | Assume \$15,000 minimum cost. |
| 49b | P49b.3 | streambed and back erosion | 49bM | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 830 | 830 | \$1,494,000 | NA | City staff reported erosion problems in upper basin particularly pipe outfall from 91st Ave SE |
| 49c | P49c.1 | Streambed and Bank erosion | 49cM | Moderate | Instream Stabilization | | | \$1,400 | | 100 | 100 | \$140,000 | NA | probably small watercourse |
| 50a | P50a.1 | Streambed and Bank erosion | 50aM | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 10 | 10 | \$18,000 | NA | probably small watercourse |
| 50b | P50b.1 | Outfall Erosion | 50b.1 | Severe | Outfall Restoration | | EA | \$16,000 | | | 1 | \$16,000 | 0 | |
| 50b | P50b.3 | knickpoint/streambed and back erosion | 50b3 | Severe | Stabilize Knickpoint & Outfall Restoration | | EA | \$30,000 | | | 1 | \$30,000 | 2 | May be a result of Pipe outfall. An optional solution is 100 LF of HDPE surface Pipeline |
| 50b | P50b.4 | Streambed and Bank erosion | 50bM | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 440 | 440 | \$792,000 | NA | City staff reported some erosion problems upstream of East Mercer Way |
| 50c | P50c.1 | Outfall Erosion/streambed and back erosion | 50c.1 | Severe | Outfall Restoration | | EA | \$16,000 | | | 3 | \$48,000 | 1 | |
| 50c | P50c.2 | streambed and back erosion | 50c.2 | Severe | Instream Stabilization | | LF | \$1,400 | 6 | 10 | 16 | \$22,400 | 5 | |
| 50c | P50c.3 | streambed and back erosion | 50c.3 | Severe | Instream Stabilization | | LF | \$1,400 | 1 | 10 | 11 | \$15,400 | 5 | |
| 50c | P50c.4 | Streambed and Bank erosion | 50cM | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 800 | 800 | \$1,440,000 | NA | City staff reported some erosion problems downstream of East Mercer Way |
| 51a | P51.1 | Outfall erosion and streambed and back erosion | 51a.1 | Severe | Outfall Restoration | | EA | \$16,000 | | | 1 | \$16,000 | 0 | |
| 51a | P51a.1 | Streambed and Bank erosion | 51aM | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 400 | 400 | \$720,000 | NA | City staff reported some erosion problems downstream of East Mercer Way |
| 52 | P52.2 | Streambed and Bank erosion | 52M | Moderate | Instream Stabilization | difficult | LF | \$1,800 | | 210 | 210 | \$378,000 | NA | Small watercourse |
| Totals | | | | | | | | | | Totals (Severe) Totals (Moderate) | | \$4,571,800 \$24,384,000 | | |
| | | | | | | | | | | Totals | | \$28,955,800 | | |

Table 4-1 Phase 1 - Watercourse Erosion Capital Projects Summary Table

¹his severity class, although can include multiple classes

² Difficulty of access identified based on review of mapping only. If not designated as difficult, assumes access does not present major challenges

³ Cost includes 40% construction contingency and 45% for administration, engineering, and permitting
 ⁴ Indicates number of houses within 100 feet of problem grouping. Not estimated for moderate problems.

| Table 4-2 |
|--|
| Phase 1 - Drainage System Capital Projects Summary Table |

| Basin # | Project ID (same as Problem ID) | Problem Type/Description | Approximate Length (ft) | Assumed Solution Type | Unit | Unit Cost | CIP Cost | Unit Cost for Field Inspection | Cost For Field Inspection | Private |
|---------|---------------------------------------|---|----------------------------|-----------------------------|------|-----------|-----------|--------------------------------------|---------------------------------|---------|
| 6 | D6.1 | Pipe system is surcharged. City previously installed locking Lid on system to contain flows. Further investigations would be necessary to determine if this is a problem. Cost only included for field investigation | 400 | NA | LF | | NA | \$4 | \$1,600 | |
| 6 | D6.90 | Several blocks west of 84th Avenue SE that include private informal systems that are flate and likely substandard. Some ponding in road occurs. | 600 | Simple | LF | \$400 | \$240,000 | \$4 | \$2,400 | |
| 6 | D6.91 | Several blocks west of 84th Avenue SE that include private informal systems that are flate and likely substandard. Some ponding in road occurs. | 600 | Simple | LF | \$400 | \$240,000 | \$4 | \$2,400 | |
| 9 | D9.1 | Pipe system flows full causing periodic ponding in flat intersection. This hasn't been considered a significant flooding problem because ponding quickly recedes. | 400 | Simple | LF | \$400 | \$160,000 | \$4 | \$1,600 | |
| 9 | D9.2(2.54) | Private system suspected as being substandard and in poor condition. | 250 | Simple | LF | \$400 | \$100,000 | \$4 | \$1,000 | private |
| 12b | D12b.1 | Substandard system. This block along Roanoke Way needs new drainage system. | 500 | Simple | LF | \$400 | \$200,000 | | . , | |
| 13c | D13c.1 | Private system suspected as being substandard and in poor condition. | 400 | Complex | LF | \$600 | \$240,000 | · · · | | private |
| 15 | D15.1 | Private system suspected as being substandard and in poor condition. Has been subject to some flooding. | 350 | Complex | LF | \$600 | \$210,000 | \$4 | \$1,400 | private |
| 15 | D15.2 | Private system suspected as being substandard and in poor condition. | 250 | Simple | LF | \$400 | \$100,000 | | | private |
| 15 | D15.3 | Private system suspected as being substandard and in poor condition. | 250 | Simple | LF | \$400 | \$100,000 | | | private |
| 16 | D16.1 | Private system suspected as being substandard and in poor condition. Recommend replacement. Have not been able to TV system due to bad system. | 350 | Complex | LF | \$600 | \$210,000 | \$4 | \$1,400 | private |
| 16 | D16.2 | Private system suspected as being substandard and in poor condition. | 250 | Simple | LF | \$400 | \$100,000 | \$4 | \$1,000 | private |
| 18c | D18c.1 | First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding. | 950 | Simple | LF | \$400 | \$380,000 | \$4 | \$3,800 | |
| 18c | D18c.2 | First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding. | 1900 | Simple | LF | \$400 | \$760,000 | \$4 | \$7,600 | |
| 19a | D19a.1 | Culvert crossing W Mercer Way is suspected of poor condition and should be inspected. | 70 | Culvert | LF | \$1,800 | \$126,000 | \$4 | \$800 | |
| 20 | D20.1 | Private system suspected as being substandard and in poor condition. Also noted as very steep. | 400 | Complex | LF | \$600 | \$240,000 | | | private |
| 20 | D20.2 | Private system suspected as being substandard and in poor condition. Also noted as very steep. | 300 | Complex | LF | \$600 | \$180,000 | | | private |
| 21 | D21.1 | Private system suspected as being substandard and in poor condition. | 250 | Complex | LF | \$600 | \$150,000 | | | private |
| 21 | D21.2 | Private system suspected as being substandard and in poor condition. Recommend inspection. | 150 | Simple | LF | \$400 | \$60,000 | | | |
| 22 | D22.1 | Flat informal system subject to nuisance ponding. Currently planned overaly project will solve this problem | 1300 | Simple | LF | \$400 | \$520,000 | | | |
| 23 | D23.1 | deep 18-inch crossing of Forest Ave SE (80th Ave SE near Merrimount Dr SE) is in bad condition and in need of inspection and possible replacement. Have not been able to TV system. | 50 | Culvert | LF | \$1,800 | \$90,000 | \$4 | \$800 | |

Table 4-2Phase 1 - Drainage System Capital Projects Summary Table

| Basin # | Project ID (same as Problem ID) | Problem Type/Description | Approximate Length (ft) | Assumed Solution Type | Unit | Unit Cost | CIP Cost | Unit Cost for Field Inspection | Cost For Field Inspection | Private |
|---------|---------------------------------------|---|----------------------------|-----------------------------|------|-----------|-------------|--------------------------------------|---------------------------------|---------|
| 25b | D25b.1 | Some sloughing alongside Forest Avenue SE (between SE 48th Street and SE 49th Street) fills ditch. Also debris plugging of nearby cross culvert has been a problem. Recommend inspection of cross culvert and downstream system to lake. | 500 | Complex | LF | \$600 | \$300,000 | \$4 | \$2,000 | |
| 25b | D25b.2 | Some debris plugging of West Mercer Way cross culvert. Also condition of cross culvert is old and deep. Inspection is recommended. | 150 | Culvert | LF | \$1,800 | \$270,000 | \$4 | \$800 | |
| 28b | D28b.1 | 1960 system installed in slide area. Any failure would have high risk of damage and inspection is recommended. Some root problems have occurred. There is also some concern that if bypass malfunctions all flows would return to channel and cause flooding. Inspection is recommended. | 1200 | Complex | LF | \$600 | \$720,000 | \$4 | \$4,800 | |
| 29 | D29.1 | Older concrete system between 80th and 81st is suspect of poor conditions with root intrusion due to a lot of planting. | 180 | 0 Simple | LF | \$400 | \$720,000 | \$4 | \$7,200 | |
| 31c | D31c.1 | Private system suspected as being substandard and in poor condition. | 450 | Complex | LF | \$600 | \$270,000 | \$4 | \$1,800 | private |
| 31c | D31c.2 | Private system suspected as being substandard and in poor condition. | 800 | Simple | LF | \$400 | \$320,000 | | | private |
| 32a | D32a.1 | Private system suspected as being substandard and in poor condition. System was TV'd and lower portion was found in bad condition. | 1000 | Simple | LF | \$400 | \$400,000 | | | private |
| 32b | D32b.1 | Private system suspected as being substandard and in poor condition with root problems. | 400 | Simple | LF | \$400 | \$160,000 | \$4 | \$1,600 | private |
| 33a | D33a.1 | Several West Mercer Way culvert crossings are old and in poor condition and need replacement. One option being considered is to route flow to south in new system in West Mercer Way to Lakeview Ln and then to lake. Several slide in area have occurred and repaired by the City. The pipe systems downstream from these culvert crossings were also noted as poor condition. | 2000 | Complex | LF | \$600 | \$1,200,000 | \$4 | \$8,000 | |
| 35 | D35.1 | Old system constructed along steep bank. A past blowout occurred due to root intrusion resulting in flooding of home. System investigation is recommended. If failure occurs, damage risk is high. | 1000 | Complex | LF | \$600 | \$600,000 | \$4 | \$4,000 | |
| 36 | D36.1 | Culvert/driveway crossing not functioning properly. Some settlement has occurred. May be private drainage problem. | 40 | Simple | LF | \$400 | \$16,000 | \$4 | \$800 | |
| 37 | D37.1 | Drainage system suspected of poor condition (not constant slope). Recommend inspection. | 200 | Simple | LF | \$400 | \$80,000 | | | |
| 37 | D37.2 | Drainage system suspected of poor condition (not constant slope). Recommend inspection. | 350 | Complex | LF | \$600 | \$210,000 | | | |
| 37 | D37.3 | Drainage system suspected of poor condition. Recommend inspection. | 300 | Complex | LF | \$600 | \$180,000 | | | |
| 38 | D38.1 | System near Terrywood Ln is constructed in steep sandy bank. Pipe is partially buried. City TV'd part of system and it was considered marginal. This system is a concern because if failure occurs there is high potential for damages. Downsteam portion in park is considered ok. | 700 | Complex | LF | \$600 | \$420,000 | | | |
| 40a | D40.a1 | Informal drainage system in poor condition. A roadway/drainage improvement CIP planned for 2005 will solve this problem | 300 | Culvert | LF | \$1,800 | \$540,000 | \$4 | \$1,200 | |
| 40b | D40b.1 | Culvert crossing suspected of poor condition. Recommend inspection. | 50 | Simple | LF | \$400 | \$20,000 | \$4 | \$800 | |
| 46a | D46a.1 | Culverts under East Mercer Way are suspected of poor condition and should be investigated. This site is also designated as a "Hot Spot". | 60 | Culvert | LF | \$1,800 | \$108,000 | \$4 | \$800 | |
| 46a | D46a.2 | Culverts under East Mercer Way are suspected of poor condition and should be investigated. | 150 | Culvert | LF | \$1,800 | \$270,000 | \$4 | \$800 | |

Table 4-2Phase 1 - Drainage System Capital Projects Summary Table

| Basin # | Project ID (same as Problem ID) | Problem Type/Description | Approximate Length (ft) | Assumed Solution Type | Unit | Unit Cost | CIP Cost | Unit Cost for Field Inspection | Cost For Field Inspection | Private |
|---------|---------------------------------------|--|----------------------------|-----------------------------|------|-----------|----------------------------|--------------------------------------|---------------------------------|---------|
| 47 | D47.1 | Culvert under East Mercer Way are suspected of poor condition and should be investigated. | 200 | Culvert | LF | \$1,800 | \$360,000 | \$4 | \$800 | |
| 49b | D49b.1 | Existing pipe system is suspected of being undersized and should be investigated. | 150 | Culvert | LF | \$1,800 | \$270,000 | \$4 | \$800 | |
| 49b | D49b.2 | East Mercer Way culvert crossing is in substandard condition (old clay and cracked, imploding) and needs replacement | 60 | Culvert | LF | \$1,800 | \$108,000 | \$4 | \$800 | |
| 50c | D50c.1 | 18" cross culvert (at 4449 East Mercer Way) is failing and needs to be replaced. | 60 | Culvert | LF | \$1,800 | \$108,000 | \$4 | \$800 | |
| 51a | D51a.1 | Private conveyance system at downstream end of watercourse is suspected of being undersized. | 250 | Culvert | LF | \$1,800 | \$450,000 | \$4 | \$1,000 | Private |
| 53 | D53.1 | 4" stormdrain is undersized. This may be a private system. | 250 | Complex | LF | \$600 | \$150,000 | \$4 | \$1,000 | |
| | Totals | | | | | | \$12,656,000 | | \$94,400 | |
| | | Totals (Private Only) Totals (Public) | | | | | \$3,230,000 \$9,426,000 | | \$23,800 \$70,600 | |

Notes: Use \$800 minimum for TV/field inspection

Section 5 PHASE 2 CAPITAL PROJECTS IDENTIFICATION



5.1 General Approach

One of the main objectives of the Phase 2 effort was to carry the Phase 1 problem identification work forward and develop specific capital improvement projects (CIPs). There was insufficient budget available to investigate all of the Phase 1 projects in more detail, therefore the scope of the effort needed to be limited. For erosion-type problems, field investigations and problem solutions were conducted on those erosion problems categorized in Phase 1 as "high". For drainage system problems, additional investigations (most often including TV'ing of pipe sections) were conducted on the systems of higher concern as determined by City staff. For these problems, solutions and conceptual cost estimates were developed.

5.2 Field Investigations for Erosion Problems

Field reviews were performed for the problems identified as "high" erosion potential areas during the Phase 1 effort shown on Table 3-3. City staff also identified a few additional erosion problems along other watercourses which were also investigated in Phase 2. These watercourses generally included Phase 1 erosion problems that were identified as "moderate" problems. However, the City staff had concerns about these systems because of either prior observations or prior citizen complaints. In general, the field reconnaissance included:

- Observing the nature, extent (problem limits) and severity of the problem.
- Observing site constraints, and other issues to identify the type of solution that will be appropriate for the problem area.
- Collecting other data about the problems areas considering information that is also used for prioritizing problems.

The site visits were conducted by a senior engineer with over 20 years of experience solving erosion problems. Site visits were made to approximately 17 ravines and about 50 problems were evaluated. Through the field reconnaissance, some new problems within these ravines were identified and considered severe enough to warrant a CIP. At the same time, some of the Phase 1 erosion problems were found to be small enough as to not warrant a solution. Eighteen of the 50 Phase 1 "high" erosion problems were eliminated.

The field investigations for erosion problems are summarized on Table 5-1 based on the detailed field investigation forms which are included in Appendix E. At each site,



several parameters were evaluated, as shown on the table and field forms. These parameters include:

- Site Conditions
 - 1. Geology
 - 2. Approximate flow on the day of the investigation (estimated by "eye")
 - 3. Approximate channel gradient
 - 4. Approximate tributary area
 - 5. Bank vegetation type and quality
 - 6. Condition of aquatic habitat
 - 7. Proximity to drainage outfalls
 - 8. Location and apparent rate of erosion (i.e., bed, left or right bank, headcut)
- Risks
 - 1. Public versus private
 - 2. Whether unsafe conditions exist
 - 3. Bank and upper slope stability
 - 4. Landslide potential
 - 5. Sediment source
 - 6. Risk to habitat
 - 7. Risk to health and safety, property, home, other structures, private road or driveway, infrastructure, public road
 - 8. Proximity to homes at risk
- Solutions
 - 1. Construction access difficulties
 - 2. Potential reduction in O&M costs
 - 3. Restoration of construction access
 - 4. Conceptual solution
 - 5. Whether or not the site is a potential monitoring location

5.3 General Description of Solutions for Erosion Problems

Based on the field observations about the nature of erosion problems, there were eight general types of solutions that were identified as needed to solve erosion problems. These types of general solutions are briefly discussed below. In addition, the cost estimates (described later in this section and included in Appendix G) were developed

for each CIP project. These detailed cost estimates provide additional detail about needed features for each project. Table 5-5 summarizes all of the proposed CIP projects and their respective costs.

In general these solutions should be considered preliminary for the purpose of estimating capital costs and defining priorities. As further investigations and design work proceeds on individual projects, refinements to the projects should be expected.

5.3.1 Outfall Protection

The outfall protection solution consists of a riprap pad and was considered when erosion occurs at a culvert or pipe outfall or other discharge point. Although angular quarry rock is normally used, rounded river rock could be used to create a more natural appearance. Rock pads do not provide fish passage.

5.3.2 Storm Drain Extension

This solution was proposed where it was practical and necessary to extend a pipeline but where the aquatic habitat was poor or non-existent. An example is where a storm drain discharges halfway down a steep slope toward a ravine.

5.3.3 Bypass Pipe

A bypass pipe solution would typically consist of a butt-fused HDPE pipeline (forming a single continuous length) with a manhole and buried concrete anchor block at the upstream end. These were proposed in reaches with severe erosion where pipes outlet onto steep channels having no fish habitat. An example of this is a pipe outlet at the top of a steep bank that slopes to a ravine watercourse.

5.3.4 Check Dams

Check dams were considered as a solution to channel erosion problems where the aquatic habitat is poor or fair, where the channel has a maximum gradient of about 10 percent, and where the banks are relatively stable. Rock check dams were assumed for cost estimating although log check dams could also be installed. In many cases, check dams were proposed to replace existing sand bag and geotextile dams that had been previously installed as a temporary solution.

5.3.5 Boulder Cascades

Boulder cascades were considered as a solution to channel erosion problems where the aquatic habitat is poor or fair, and the channel gradient is greater than 10 percent. These reaches are too steep to effectively use check dams. The intent of boulder cascades is to use large rounded rock to simulate a steep headwater stream.

5.3.6 Channel Stabilization

Channel stabilization was considered as a solution to channel erosion problems where check dams alone could not solve the problems, and where habitat potential was limited. Most often channel stabilization is selected over check dams in areas having bank instability. For the purpose of this study, channel stabilization was assumed to include less habitat improvement work and would be appropriate where potential aquatic habitat is limited. It would be less costly per linear foot than stream restoration.

5.3.7 Stream Restoration

As stated above, the stream restoration solution is similar to the channel stabilization solution. Stream restoration was assumed to require more habitat work and would have dual goals of reducing erosion and improving habitat. Stream restoration would be slightly more costly per linear foot than channel stabilization due to more planting and stream structures.

5.3.8 Hand-Constructed Stream Restoration

Hand-constructed stream restoration is similar to the stream restoration solution and was only considered in reaches where access with conventional and compact equipment is not practical, would cause excessive damage, or where the work was limited in magnitude. The work is limited to materials that can be carried manually or with very small machines. The cost of this solution is relatively high.

5.4 Permitting for Erosion Problems

Table 5-2 summarizes the permits that may be required for each of the erosion CIP solutions. The table also identifies special studies that could be necessary, and notes permits that require long lead times. Depending on the amount of work to be done inside of a wetland boundary, or below the ordinary high water mark, a Corps of Engineers (COE) nationwide permit may be required. This permit requirement would trigger the need for an Endangered Species Act (ESA) review, which requires the preparation of a Biological Assessment (BA). The COE permit could also trigger a Department of Ecology 401 Water Quality Certification review.

An ESA review and the requirement of a BA may also be triggered if the project is constructed using federal funding. A Hydraulic Permit Approval (HPA) from the Washington State Department of Fish and Wildlife will be required for projects that disturb any stream (defined as waters of the state) within its ordinary high water line. A SEPA checklist will be required for all projects. Additionally, local permits, such as a clearing/grading or right of way (ROW) use permits, may be required for projects.

5.5 Drainage Problems and CIP Projects

City maintenance crews conducted conveyance system inspections and "TV" investigations to assess the condition of selected segments of the City's drainage system. The investigated systems were selected by City staff and include many of the systems identified as problem areas during Phase 1, as well as a few additional systems not identified during Phase 1, but considered as systems of concern. Because of budget/resource limitations, not all of the systems identified in Phase 1 could be investigated. A summary of the areas that were investigated/TV'd is included in Table 5-3. The summary table was assembled following a meeting between R.W. Beck and City staff to review the information collected during the TV'ing. This table is also included in Appendix F, along with the summary forms that were filled out during the work. The table includes a summary of the observations by the TV consultant and City staff, and then one of three conclusions for each system. The three possible conclusions for each system investigated are:

- Not a problem The system appears to be fully functioning with no or minimal maintenance needs.
- Not a major problem, but additional investigation and/or maintenance are required - For these systems, maintenance is needed (for example, if significant root intrusion is interfering with the flow area) and/or additional investigation is required to determine if the system is functioning. Additional investigations area often required for systems needing maintenance because the TV camera could not completely evaluate the pipe segment because it could not get past some obstacle, such as a root.
- Problem and CIP identified These included systems problems that went beyond routine maintenance needs and required a capital improvement. Examples are severely damaged pipe, or where pipe joints have become severely separated.

There are many areas within the City where additional investigation and/or maintenance is required and these areas are listed on Table 5-4. The list was compiled from the TV inspections identified in Table 5-3 and from those systems identified in Phase 1 as systems of concern that were not investigated as part of Phase 2 because of limited resources. One of the most important recommendations for future studies is to investigate the condition of all culvert crossings of East and West Mercer Way not investigated as part of this study. These culverts represent critical components of the drainage system because failure of these culverts can affect the City's main arterials.

Through this process, six CIPs were identified to address drainage system problems. These six problems, their proposed solutions, and their estimated costs are summarized on Table 5-5.

The CIP solutions for the drainage system problems primarily include culvert or pipe replacement. Most of the pipe/culvert replacements can be done using traditional open cut/shoring techniques. In one case, pipe bursting methods are recommended for a pipe replacement across East Mercer Way due to high traffic volumes and depths of embankment.

5.6 Capital Improvement Projects for Erosion and Drainage Problems

Preliminary CIP projects were developed for the erosion problems visited as described in this section, and for the drainage problems identified with input from City staff. In addition to the data collected in the field, prior basin plan information was incorporated as appropriate for the erosion problems. A "Project Summary" was developed for each CIP and these are included in Appendix G. The "Project Summary" includes the following information:

- Basin number, project number and title
- Problem description and a representative photo (if available)
- CIP project description
- Related projects, if any
- Planning level cost estimate
- Simple plan view graphic showing location and extent of CIP

There are 25 erosion CIP Project Summaries and six drainage CIP Project Summaries. Some erosion CIPs address more than one problem identified in the Phase 1 analysis (for example, where there are two or more problems located close together along the same watercourse and one proposed project can fix both problems). In some cases, it is noted on the Project Summary if another CIP project should be completed prior to another.

The planning level cost estimates are for the total cost of the project. The estimates include consideration for special access requirements, erosion and sediment control, traffic control, mobilization, 30 percent contingency, and state sales tax. The cost estimates also include the following indirect costs: surveying and design, permitting, construction engineering and administration, and easement/land acquisition administration. For all easement acquisition, it is assumed that the only cost is administrative and that there is no cost to acquire the easement. Table 5-5 summarizes all of the proposed CIP projects and their respective costs.

The total cost for completing all of the CIPs is estimated to be approximately \$6.4 million. The total cost for completing all of the erosion CIPs is \$5.2 million and the total cost for completing all of the drainage CIPs is \$1.2 million.

Note that the cost for these watercourse erosion projects are only for solving problems identified in Phase 1 as "high". Additional future analysis of the problems identified in Phase 1 as "moderate" will result in additional projects. There were 40 locations where potential erosion problems in the "moderate" category were identified.

Table 5-1 Summary of Phase 2 Field Investigations for Erosion Problems

| Basin No. | Problem No. | Date of site visit | Description of Problem ⁽¹⁾ | Estimated Stream Gradient ⁽²⁾ | Approximate Size of Tributary Area ⁽³⁾ | Aquatic Habitat | Rate of Erosion | Located on Public or Private Property? | Landslide | Risk to Health and Safety | Risk to Residence | Risk of Property Damage ⁽⁴⁾ | |
|------------------|----------------|-----------------------|---|--|---|--------------------|--------------------|---|--|--|-----------------------------|--|---|
| 4 | 4.1 | 9/24/05 | Head cut is moving upstream creating a 30-foot long incised channel into till that is up to 7 feet deep | >10% | < 30 acres | Fair | Moderate | Private | None mapped or observed. | None | None | Bed erosion | A small sediment por course, before it cros |
| 4 | 4.2 | 9/24/05 | Downstream of storm drain outlet, flow is scouring and undercutting toe of large slide. Two other storm drain outlets contribute flow. | 5-10% | < 30 acres | Good | Rapid | Private | Mapped and observed | None | None | Erosion and slide trigger. Long term risk to Gallager Hill Road. | ζ. |
| 6 | 6.1 | 9/24/05 | Downstream of surface storm drain outlet, flow is scouring and undercutting toe of small slide within an undeveloped ravine. | 5-10% | 30 to 80 acres | Fair | Moderate | Public | Observed | None | None | Deposition downstream and in lake. | n Two branches join pr installed instream cha easterly branch. Mos is located was piped. WSDOT had previou 20 cy/yr. City now do |
| 6 10 | 6.2 10.1 | 9/24/05 9/28/06 | No significant erosion problem No significant erosion problem. Headwater area | | | | | | | | | | |
| 10 | 10.2 | 9/28/25 | No significant erosion problem. Headwater area | | | | | | | | | | |
| 10 | 10.3 | 9/28/05 | No significant erosion problem. Headwater area | | | | | | | | | | |
| 10 | 10.4 | 9/24/05 | Large subbasin from business district outlets in open channel lined with riprap. Rock may be undersized | >10% | >80 acres | Poor | Stable | Private | None mapped or observed. | None | Low | Bank erosion | Reported to City staff |
| 26 | 26.1 | 1/5/06 | Nine-foot high head cut in glacial till in undeveloped ravine | >10% | >80 acres | Good | Moderate | Private | None mapped or observed. | Minor falling hazard | None | Bed and bank erosion | Design is already bei Subbasin plan was d |
| 27a | 27a.1 | 9/28/05 | 30 LF of streambed and bank erosion with head cut | >10% | 30 to 80 acres | Poor | High | Private | Observed | None | None | Bank erosion | |
| 27 | 27a.2 | 9/28/05 | No significant erosion problem | | | | | | | | | | |
| 27a | 27a.3 | 9/28/05 | 110 LF of deeply incised channel in glacial till with three head cuts in undeveloped ravine | 2 to 5% | < 30 acres | Good | Moderate | Private | None mapped or observed. | Minor falling hazard | None | Bank erosion | |
| 27 | 27a.4 | 9/28/05 | No significant erosion problem | | | | | | | | | | |
| <u>27</u> 27a | 27a.5 27a.6 | 9/28/05 9/28/05 | No significant erosion problem. System piped 4-foot high timber dam is failing | 2 to 5% | 30 to 80 acres | Good | Rapid | Private | None mapped or observed. | None. Sanitary sewer main downstream not exposed. | None | Rapid incision and sediment pulse following dam failure | Has been observed in |
| 29 | 29.1 | 1/5/06 | Drop at culvert outlet at West Mercer Way and severe bank erosion along 600 feet of stream. Slope instability being created. | 5-10% | >80 acres | Good | Rapid | Private | Mapped and observed | • | Low risk to 2 residences | Bank erosion and slope failure | The stream channel i locations. This has of the stream and at the slopes have undergo problems to the homo- restoration design is 2007. This is a curre |
| 29 | 29.2 | 12/14/05 | Very steep channel has created a head cut and incised into the east bank of the main stem of the creek. The small, narrow channel is up to 12 feet deep. | >10% | < 30 acres | Poor | Rapid | Private and public | None mapped or observed. | None | None | Bank erosion and slope failure | |
| 32b | 32b.1 | 10/20/06 | Below the outlet of a 48 inch diameter, half round CMP conveyance pipe, the channel is scoured and drops 3 to 5 vertical feet over 15 to 20 linear feet. Water is also flowing along the underside of the half round pipe. Banks are steep, unvegetated, composed of very dense silt and retreating. Channel bottom lacks any substrate and consists of smooth, very dense silt. | >10% | >80 acres | Poor | Moderate | Private | None mapped or observed. | None | None | Bed and Bank Erosion. | |
| 32b | 32b.2 | 10/20/06 | Approximate 5 to 7 foot deep headcut through very dense silt. Below headcut channel is deeply incised with vertical, unvegetated banks. Channel bottom has little loose substrate and consists of very dense silt. | >10% | >80 acres | Poor | Moderate | Private | None mapped or observed. | None | None | Bed and Bank Erosion. Headcut retreat | |
| 37b | 37b.1 | 3/3/06 | Outfall erosion and erosion from street runoff is threatening driveway | >10% | < 30 acres | Poor | Moderate | Private and public | Mapped | Low | Low. Home is pile supported | Bank erosion and slope failure | e Design underway by |
| 39a | 39a.1 | 9/28/05 | 40 LF of minor streambed erosion | >10% | < 30 | Fair | Moderate | Private | Mapped | None | None | Bank erosion | |
| 42 | 42.1 | 3/3/06 | Bank protection and check dams of sandbag and geotextile were installed for temporary protection of this reach. The dams are up to 4 feet high and are beginning to fail. Some bank erosion is also occurring. There is a large amount of fine grained sand behind the dams and in the channel. South bank appears to be slide material. | 2 to 5% | >80 acres | Fair | Moderate | Private | Observed or south bank but not mapped | | None | Bank erosion and sandbag dam failure causing deposition downstream. | Much of the riparian a |

Comments/City Input

pond exists at the downstream end of this water rosses under I-90.

n prior to crossing under I-90. Around 1996-1997 City channel armoring/sandbags/check dams in the longer Most of the shorter western branch where problem 6.1 ed. The watercourses join at a sediment pond. iously maintained the sediment pond excavating 10v does it and removed 60 yds in 2003.

taff by property owner

being developed as part of separate project. s developed in 2003. This is a current monitoring site.

ed in 2006 by city engineer and maintenance staff

nel is down cutting, causing bank failures in several as contributed to increasing sediment deposition within t the outlet to Lake Washington. The ravine side ergone slides and active slope movement causing nomeowners at the top of the ravine. A stream n is being developed and construction is planned for turrent monitoring site.

by property owner's engineer.

an area would be considered wetlands.

Table 5-1 Summary of Phase 2 Field Investigations for Erosion Problems

| Basin No. | Problem No. | Date of site visit | e Description of Problem ⁽¹⁾ | Estimated Stream Gradient ⁽²⁾ | Approximate Size of Tributary Area ⁽³⁾ | Aquatic Habitat | Rate of Erosion | Located on Public or Private Property? | Landslide | Risk to Health and Safety | Risk to Residence | Risk of Property Damage ⁽⁴⁾ |
|--------------|----------------|-----------------------|--|--|---|--------------------|--------------------|---|---|--|----------------------|--|
| 42 | 42.1A | 3/3/06 | Two sandbag and geotextile check dams and sandbag and geotextile bank protection were temporarily installed for protection of this reach. These are beginning to fail. Some bank erosion is also occurring on the south bank. | 5-10% | >80 acres | Good | Moderate | Private | Observed on downstream end of south bank but not mapped | None | None | Bank erosion and sandbag dam failure causing significant deposition downstream. |
| 42 | 42.2 | 3/3/06 | About 100 feet of the south bank of this 300-foot reach s experiencing erosion and needs bank protection and restoration. Two large rock check dams need repairs. | 5-10% | >80 acres | Fair | Moderate | Public | South bank mapped and observed as a landslide | None | None | Bank erosion and slope destabilization |
| 42 | 42.3 | 3/3/06 | South bank is a landslide area and consists of soft, wet material that is subject to loss by flowing water and by spring sapping. About 90 feet of this 270-foot reach has problematic erosion. | 5-10% | 30-80 acres | Fair | Moderate | Public | South bank mapped and observed as a landslide | None | None | Bank erosion and slope destabilization |
| 42 | 42.4 | 3/3/06 | Bank sloughing and spring sapping exists along about one-third of the south bank of this 400-foot reach. Previous restoration work done but additional work is needed. On the north bank the creek runs adjacent to sanitary sewer manhole and is armored with quarry spalls which may be too small in size for adequate protection. | 5-10% | 30-80 acres | Good | Moderate | Public | South bank mapped and observed as a landslide | Sanitary sewer manhole adjacent to creek | None | Bank erosion and slope destabilization |
| 42 42 | 42.5 42.6 | 3/3/06 3/3/06 | No significant erosion or collection area. Erosion and head cutting of soft bed and banks in small steep water course with undeveloped drainage area. | >10% | < 30 acres | None | Moderate | Public open space | Mapped | None | None | Bed and bank erosion |
| 42 42 | 42.7 42.8 | 3/3/06 3/3/06 | No significant erosion problem Erosion or soil movement in very small channel with limited drainage area, 40 percent gradient and erodible soil which is mapped as slide material. Soil loss is caused by spring sapping and flowing water. | >10% | < 30 acres | None | Rapid | Public open space | Mapped and observed | None | None | Bed and bank erosion |
| 42 | 42.8A | 3/3/06 | About 30 feet of the south bank is experiencing erosion and spring sapping. North bank composed of large rock to protect sanitary sewer main and no erosion is evident. Total reach length is about 140 feet. Large rock check dams are also okay. | 2 to 5% | >80 acres | Fair | Slow | Public open space | Mapped | None | None | Bank erosion and slope destabilization |
| 42 | 42.9 | 3/3/06 | There are two erosion problems at this site;1) a 5- foot drop from the 18-inch CMP culvert under a private driveway which is undergoing moderate erosion and 2) 30 feet of channel down cutting located 100 feet downstream of the culvert. The soft, wet east bank has wetland characteristics. Site is located in undeveloped ravine. Work may need to be done primarily by hand due to site conditions. | 5-10% | < 30 acres | Fair | Slow | Private and public | Not Mapped or observed | None | None | Bed and bank erosion |
| 42 | 42.10 | 3/3/06 | Existing public drainage system consists of a manhole with a sound CMP outlet pipe on top of the ravine about 50 feet long, about 30 feet of half round CMP, an above ground transition from the half-round pipe to a 24-inch corrugated polyethylene pipe and 80 feet of corrugated polyethylene pipe which lies on the ground in the bottom of the small ravine. Only one of the corrugated polyethylene pipe joints is capable of handling thrust. There is leakage from the pipe and seepage from the hill slope. The seepage has contributed to slope instability particularly on the south bank. | | < 30 acres | None | Moderate | Private | Observed | None | None | Unraveling slope |
| 44b | 44b.1 | 12/14/05 | No erosion. Lined channel built by property | | | | | | | | | |
| 44b | 44b.2 | 12/14/05 | owner No significant erosion problem. Quarry spalls in | | | | | | | | | |
| 45b | 45b.1 | 12/8/05 | place Existing quarry spall check dams effective but need some bank protection | 2 to 5% | 30 to 80 acres | Fair | Slow | Private | Mapped on south bank | Bank Erosion potentially affecting East Mercer Way | None | Bank Erosion City crews knew of potentially affecting annually. East Mercer Way |
| 45b 45b | 45b.2 45b.3 | 12/8/05 9/12/05 | No significant erosion problem Stream down cutting has exposed 120 feet of sewer and generated considerable sediment, which is a maintenance problem downstream. South bank subject to sliding. | >10% | < 30 acres | Fair | Rapid | Private and public | Observed on right bank | Exposed sewer is leaking into creek | None | Bank erosion and slope Predesign investiga failure |

| Comments/City Input | |
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| of no problems, but 8 cy of sediment is removed | |
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tigation underway as part of the Parkwood Project.

Table 5-1 Summary of Phase 2 Field Investigations for Erosion Problems

| Basin No. | Problem No. | Date of site visit | Description of Problem ⁽¹⁾ | Estimated Stream Gradient ⁽²⁾ | Approximate Size of Tributary Area ⁽³⁾ | Aquatic Habitat | Rate of Erosion | Located on Public or Private Property? | Landslide | Risk to Health and Safety | Risk to Residence | Risk of Property Damage ⁽⁴⁾ | |
|--------------|----------------|-----------------------|---|--|---|--------------------|--------------------|---|--|---|---|--|---------------------------------|
| 45b | 45b.4 | 9/12/05 12/8/05 | Drop at culvert outlet of 12-inch CMP culvert under private drive is eroding partially protected steep slope. Erosion also occurring downstream of the outlet. | >10% | < 30 acres | None | Moderate | Private | None mapped or observed. | None | None | Bank Erosion | |
| 46a | 46a.1 | 12/8/05 | No significant erosion or collection area | | | | | | | | | | |
| 46a | 46a.3 | 11/8/04 3/3/06 | Large scale slope movement into creek is pinching channel along 250-foot reach. Creek erosion of toe and fill south of street may be contributing to slope movement. This is a large source of sediment. The slope and much of the contributing area is mapped as a slide. | 2 to 5% | < 30 acres | Fair | Rapid | Public open space | Large scale slide mapped and observed | None | None | Bank erosion, deposition downstream and slope movement which may ultimately affect 53rd Palace | City crews report depo |
| 46a | 46a.4 | 3/3/06 | Downstream of pipe outlet, channel is down cutting along 100 feet of soft fill and slide material. This tributary stream is located south of 53 rd Place on city open space. | 3 to 5% | < 30 acres | Good | Moderate | Public open space | Large scale slide mapped and observed | None | None | Bank erosion and deposition downstream | City crews report dep |
| 46b 49b | 46b.1 49b.1 | 12/8/05 12/8/05 | No significant erosion or collection area. Slide Pipe system outlet from East Mercer Way and SE 47 th Street discharges onto East Mercer Way embankment eroding a deep channel and 2 foot drop at outlet. Pipe outlet is also partially crushed. | >10% | < 30 acres | None | Rapid | Public | Mapped | Bank Erosion potentially affecting East Mercer Way | None | Bank Erosion potential affecting East Mercer Way | |
| 49b | 49b.2 | 12/8/05 | Moderate bank erosion and head cutting along portions of 250 feet of channel. | >10% | < 30 acres | Poor | Slow | Private | None mapped at site but observed upstream. | None | None. Nearby house on pin piles | Bank Erosion | |
| 49b | 49b.4 | 12/14/05 | Large scale, severe erosion at an existing 12-inch storm drainage outlet which drops six feet into a steep channel in sandy soil. Channel incision is about 100 feet long and the depth varies from 5 to 20 feet. | >10% | < 30 acres | Poor | Rapid | Unopened street right of way | Mapped | None | long term risk to one residence | Bank erosion | City staff reported ero |
| 50b | 50b.1 | 12/8/05 | No significant erosion problem. Quarry spalls in place | | | | | | | | | | |
| 50b 50c | 50b.3 50c.1 | 12/8/05 12/14/05 | No significant erosion or collection area No significant erosion problem. Quarry spalls in | | | | | | | | | | |
| 500 | 500.1 | 12/14/03 | place but suggest adding 2 additional CY | | | | | | | | | | |
| 50c | 50c.2 | 12/18/05 | Problem eliminated by installation of pipe system for home | | | | | | | | | | |
| 50c | 50c.3 | 12/18/05 | Problem eliminated by installation of pipe system along private drive | | | | | | | | | | |
| 51a | 51a.1 | 12/14/05 | 50 feet of south bank erosion and outlet erosion at 18-inch culvert may threaten embankment of East Mercer Way. Considerable sand in channel from upstream | >10% | < 30 acres | Fair | Slow | Private | None mapped but south slopes are steep | Bank Erosion and upper slope failure potentially affecting East Mercer Way | None | Bank Erosion and upper slope failure potentially affecting East Mercer Way | City staff reported sor Way. |
| 52 | 52.1 | 12/14/05 | Rapid bed erosion, bank erosion and head cuts in a small channel with a bottom width of 2 feet and a depth of 3 to 7 feet on downstream side of East Mercer Way. Bed and banks consist of erodible sandy material and fill. May have been accelerated by addition of collection area to the 18-inch pipe under East Mercer Way. | 5-10% | < 30 acres | Poor | Rapid | Private | None mapped or observed. | None | Clogged system can cause flooding around residence | Bank erosion and deposition downstream. Deposition downstream causes flooding. | |

Notes:

1. Refer to Appendix E for detailed field observations.

Stream gradient categories (field estimated): 0-1% 2-5% 5-10% >10%
 Tributary area categories are estimated:

<30 acres = average flow of <0.1 cfs (no significant habitat value) and small peak flows 30-80 acres = average flow of 0.1 to 0.3 (some habitat) and moderate peak flows >80 acres = average flow of > 0.3 cfs (has significant habitat) and high peak flows

4. Risk of property damage describes what is being eroded and if erosion could affect any roads/structures.

| Comments/City Input | |
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deposition at mouth is a problem.

deposition at mouth is a problem.

d erosion at outlet.

ed some erosion problems downstream of East Mercer

ed problem to City.

Table 5-2Summary of Potential Permits

| Permit / Approval | LEAD Agency | TRIGGER | DESIGN DETAIL REQUIRED | PROCESSING TIME | APPEAL | COMMENTS |
|---|-------------------------|--|---|---|--|---|
| FEDERAL - CORP | S OF ENGINEE | RS (COE) | | | | |
| Nationwide Permit under the Clean Water Act Section 404 | COE – local district | Discharge of dredged or fill material into waters of the United States. Currently, there are 42 nationwide permits that may be used in Washington State for various types of activities. The specific NWP will be determined after an alternative is chosen. | As contained w/in JARPA application. | ± 60 days | No internal appeal process. | Requires CZM (explained below), 401 WQ Certification (explained below), and 30 day public notice. |
| FEDERAL – U.S. FI | SH & WILDLIF | E SERVICE (USFWS) & NATIONAL MARINE | FISHERIES SERVICE (NM | (FS) | | |
| Endangered Species Act Review | USFWS & NMFS | Federal Nexus** and listed species. Application for a federal permit when a plant or animal species may be affected that is suspected to be, or actually is of threatened or endangered status. | Requires specific construction detail for Biological Assessment. | Varies | Court | ** A Federal nexus exists where projects require work in federally controlled properties, work requiring federally issued permits (i.e. COE Section 10 and 404), and/or projects that will use federal funding. |
| STATE – WASHING | GTON STATE D | EPT. OF FISH & WILDLIFE (WDFW) | | | | |
| Hydraulic Project Approval (HPA) | WDFW | Work that uses, diverts, obstructs, or changes the natural flow or bed of state waters. Activities include: bridges, piers, & docks; pile driving; channel change/realignment; pipeline crossing; culvert installation; dredging; gravel removal; pond construction; placement of outfall structures; log, log jam, or debris removal; installation/maintenance of (w/equipment) water diversions. | General Project Plans 100% plans for work within the OHWM 100% plans for the proper protection of fish 3 copies of completed JARPA | Max. 45 days after application and State Environmental Policy Act (SEPA) compliance are complete Max. 15 days for expedited HPA Immediately for emergency HPA | Informal and formal appeal processes avail. – must be filed w/in 30 days of HPA issuance / denial | |
| Priority Habitats and Species (PHS) Consideration | WDFW | A search of the WDFW PHS database is required to determine the presence of state and federally listed species including those that are designated as endangered, threatened, sensitive, candidate, and monitor. | Project description Vicinity map | Data is usually sent within 30 days and is accurate up to 6 months. | N/A | A search of the database has been completed for the project vicinity. |
| STATE - WASHING | GTON STATE D | EPT. OF ECOLOGY (ECOLOGY) | | | | |
| Water Quality Certification Section 401 of the Clean Water Act | Ecology | Applying for a federal permit or license to conduct any activity that might result in a discharge of dredge or fill material into water or non-isolated wetlands or excavation in water or non-isolated wetlands. | As contained in JARPA application. | Concurrent with Section 404. Usually takes 30 days but can take up to 180 days. | Appealable to Pollution Control Hearings Board w/in 30 days of Ecology decision. | Issued after Section 404 permit. |

Table 5-2Summary of Potential Permits

| Permit / Approval | LEAD AGENCY | TRIGGER | DESIGN DETAIL REQUIRED | PROCESSING TIME | APPEAL | COMMENTS |
|--|--|---|---|--|--|--|
| LOCAL | | • | | | • | • |
| Land Use Approval – Shoreline Master Program | Local government | Development w/in 200 ft. of water body covered by the SMP and associated wetlands. | Varies by jurisdiction. | Varies by jurisdiction. | Lengthy appeal to State Shoreline Hearings Board | Currently no projects are proposed within 200 feet of the shoreline. |
| Construction Permits • Grading/ Clearing • Right of Way (ROW) Use | Local government | Construction activities. | Varies by jurisdiction. | Varies by jurisdiction. | No. | Permits can be sequenced. |
| MISC. PERMITS | | | | | | |
| SEPA Checklist | SEPA lead agency | Any proposal that requires a state or local agency decision to license, fund, or undertake a project, or the proposed adoption of a policy, plan, or program can trigger environmental review under SEPA. (See WAC 197-11-704 for a complete definition of agency action.) SEPA requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. The checklist provides information to help the agency identify impacts and decide whether an EIS is required. | Typically at least 30% design. Depends on SEPA lead agency. SEPA environmental review usually starts with the applicant completing an environmental checklist that is submitted to the SEPA lead agency. The standard checklist form is in WAC 197-11-960. | Depends on the lead agency. Environmental Checklist – 3 to 6 months EIS – 9 to 18 months | Depends on the lead agency. | |
| SPECIAL STUDES | | | | | | |
| Wetland Determination Report | COE – local district, Ecology, local government | Work in proximity to wetlands. | N/A | N/A | N/A | |
| Biological Assessment | COE – local district, USFWS, NMFS Ecology, local government | Federal nexus. | 60% design | 180 days | N/A | |
| Conceptual Mitigation Plan | COE – local district, Ecology, local government | Unavoidable impacts to critical areas | 30% design | 60 days | N/A | |

Table 5-2Summary of Potential Permits

| Permit / Approval | LEAD Agency | TRIGGER | DESIGN DETAIL REQUIRED | PROCESSING TIME | Appeal | COMMENTS |
|--------------------------|--|---------------------------------------|---------------------------|-----------------|--------|----------|
| Final Mitigation Plan | COE – local district, Ecology, local government | Unavoidable impacts to critical areas | 60% design | 30 days | N/A | |

Table 5-3 Summary Results of Phase 2 Drainage System Investigations ⁽¹⁾

| Location | Phase 1 Problem No. (If Applicable) ⁽²⁾ | TV Site ID | City Map Section | Summary of Observation ⁽³⁾ | Conclusion Based on City Observations |
|------------------------------|--|--------------------------|---------------------|--|---|
| 60th Ave SE & SE 20th St | D13c.1 | 1 thru 4 | A1 | Part of pipe is oval-shaped from squashing; heavy debris at downstream end of pipe system. | Not a problem. |
| 2227 80th Ave SE | D9.3 (new) | 2 thru 4 | A3 | Upstream pipe is partially collapsed and needs replacement (site #2) at the crossing of 80th Ave SE near house #2227; some parts of the system could not be accessed; several joint offsets of 3 to 6 inches or more were identified; root intrusion and debris (rocks) present. | Problem - CIP Identified, more investigation required. |
| 7638 SE 22nd St | none | 5 | A3 | Light offsets. | Not a problem. |
| 78th Ave SE and SE 22nd St | D9.1 (#10) | 6 thru 10; 12 thru 14 | A3 | Light to medium joint offsets; could not access all of the system. | Not a major problem, but additional investigation may be required. |
| 80th Ave SE and SE 22nd St | D9.1 | 11 | A3 | Medium offset at one joint. | Not a problem. |
| 2218 80th Ave SE | D9.2 | 15 | A3 | Medium debris and offsets; light longitudinal cracking; light root intrusion and debris; break in one connection. | Not a problem. |
| 80th Ave SE and SE 20th St | none | 16 and 17 | A3 | Section of pipe is broken and sagging and needs to be replaced (site #17); medium offsets and separation observed. | Not a problem. ⁽⁴⁾ |
| 2000 82nd Ave SE | none | 18 and 19 | A3 | Some light to medium cracking and broken joints. | Not a problem. |
| 63rd Ave SE and SE 27th St | D15.4 (new) | 1 and 2 | B1 | Medium to heavy offsets; could not access all of the system. | Not a major problem, but additional investigation may be required. Possible CIP. ⁽⁵⁾ |
| 2432 63rd Ave SE | D15.4 (new) | 3 | B1 | Heavy offset; could not complete run. | Not a major problem, but additional investigation may be required. Possible CIP. ⁽⁵⁾ |
| 2440 63rd Ave SE | D15.4 (new) | 4 | B1 | Medium to heavy joint offsets and separation; this area needs a spot repair, especially the first 12 feet of pipe; could not access all of the system - may want to use the push camera. CB 28B is not on the storm drainage map but is downstream of CB 29. | Problem - CIP Identified, more investigation required. ⁽⁵⁾ |
| 2420 63rd Ave SE | D15.4 (new) | 5 | B1 | Heavy offset and separations; light to heavy root intrusion; could not complete run; needs replacement. | Problem - CIP Identified, more investigation required. ⁽⁵⁾ |
| 61st Ave SE and SE 28th St | none | 6 and 7 | B1 | Medium offsets and root intrusions; dissimilar pipe connections; broken pipe sections; some cracking. | Not a problem. |
| 3049 71st Ave SE | D18c.2 | 1 and 2 | B2 | No problems observed. | Not a problem in the 500 feet TV'd. |
| 70th Ave SE and SE 29th St | D18c.1 | 3 thru 13 | B2 | System along 70th Ave SE from SE 29th St to SE 32nd St; light to heavy offsets; not all of reach could be completed; medium cracking, medium to heavy separation; recommend monitoring areas of heavy offset (site #9); much of the reach was observed to have no problems; some broken sections that should be replaced also observed - within a 700 foot section there are two substandard sections, one is 125 feet long and one is 50 feet long; site #5 needs grouting at a heavily offset joint; this is a 12-inch shallow system. | Problem - CIP Identified, more investigation and maintenance is required. |
| 8452 N Mercer Way | D6.1 | 1 and 2 | B4 | Shovel stuck within pipe at site #2; light root problem and slight oval-shape due to squashing also observed. It is also noted that a locking lid was installed recently to prevent flooding, and so far no flooding has been observed. | Not a major problem, but maintenance is required, and continued monitoring of the area where the locking lid was installed. |
| 77th Ave SE and SE 37th St | none | 1 thru 3 | C3 | No problems observed. | Not a problem. |
| 76th Ave SE and SE 37th St | D10.1 (site 5) (new) | 4 and 5 | C3 | 76th Ave SE north of SE 37th St and near house #7602. Medium to heavy offset and separation; pipe is sagging in sections; pipe joint separation with void space in the bottom; need to apply grout in one void at invert of separated joint (site #5). This is a 12-inch pipe system. | Not a major problem, but maintenance and additional investigation is required. |
| 76th Place SE and SE 36th St | none | 6 and 7 | C3 | Light root intrusion and medium joint offset. | Not a problem. |
| 76th Place SE and SE 34th St | D10.2 (site 8) (new) | 8 and 9 | C3 | Medium to heavy offset and medium cracking; requires spot repair at site #8 where part of the pipe is broken and offset by 1 inch. | Not a major problem, but maintenance is required. |
| 77th St SE and SE 37th St/Pl | none | 10 through 12 | C3 | Medium to heavy offset, some pipe sagging; the observed heavy offset may actually be due to the pipe dropping over a bank - the top of the pipe looks well-grouted. | Not a problem. |
| 3835 83rd Ave SE | D21.3 (sites 13, 14, 15) (new) | 13 and 14 | C3 | Heavy offset (over 4"), this pipe needs replacement at site #13; the pipe is broken in one section and plugged with debris at site #14; could not complete the investigation to the end of the run. | Not a major problem, but maintenance is required and additional investigation may be required. ⁽⁶⁾ |

Table 5-3Summary Results of Phase 2 Drainage System Investigations ⁽¹⁾

| Location | Phase 1 Problem No. (If Applicable) ⁽²⁾ | TV Site ID | City Map Section | Summary of Observation ⁽³⁾ | Con |
|--|--|------------|---------------------|---|-----------------------|
| 3843 83rd Ave SE | D21.3 (sites 13, 14, 15) (new) | 15 and 16 | C3 | Light offset; section of pipe is broken and full of dirt at site #16; could not complete investigation. | Not a inve |
| 4845 Forest Ave SE | D25b.1 | 1 thru 5 | F3 | Could not complete entire investigation of this run; light to heavy root intrusion; medium offset observed; light to heavy offset and separation. | Not a requ |
| 5225 E Mercer Way | D46a.2 | 1 | F5 | Light root intrusion. | Not |
| E Mercer Highlands and E Mercer Way (North of 4905) | D47.1 | 2 | F5 | Culverts under East Mercer Way are suspected of poor condition; investigation revealed cracked 18-inch clay pipe, longitudinal cracks, oblong pipe has started to flatten out; cross culvert under major arterial; the pipe is collapsed at the end; embankment is shallow on west side but there are two large trees at the inlet end of the culvert; the culvert is much deeper on the east side; could not complete investigation. High priority to replace. | Prob |
| 6160 94th Ave SE | none | 1 | G5 | Heavy separated joint. | Not a |
| 7515 SE 71st St | D31c.2 | 1 | H2 | Light root intrusion; could not complete investigation; medium separation at a couple of joints. | Not a invest |
| 80th Ave SE and SE 70th St | D29.1 | 1 | H3 | Heavy root intrusion blocking camera access to complete investigation; light debris accumulation; roots should be removed. | Not a main |
| 80th Ave SE and SE 67th St | D29.1 | 2 and 3 | H3 | Light to heavy root intrusion; could not complete investigation; one large root at site #2 needs to be removed; roots at site #3 near backyard of 6537 81St Ave SE need to be removed. | Not mair |
| 80th Ave SE and SE 65th St | D29.1 | 4 | H3 | Heavy root intrusion blocking camera access to complete investigation at site #4, roots should be removed; investigation could not be completed. | Not mair |
| 80th Ave SE and SE 65th St | D29.2 | 5 | H3 | Medium to heavy cracking along the 24-inch pipe at site #5 which runs between two houses (on private property); the outlet section of the pipe at the watercourse is collapsed; this pipe needs replacement; the joints look okay. | Prob |
| 7623 W Mercer Way | D32a.2 | 1 | 12 | Flow restriction due to pipe downsizing limited camera access; also pipe material changes from CMP to concrete with bad connection; monitor in the future; may want to try the push camera. | Not a |
| 7800 W Mercer Way | D33a.1 | 2 | 12 | Pipe replaced in Feb 2006 due to heavy offsets and broken/collapsed sections. | No p culve prob |
| 7405 78th Ave SE | none | 1 | 13 | Light cracking and some debris. | Not a |
| 7408 Mercer Terrace Dr | none | 2 | 13 | Light cracking, heavy root intrusion, heavy offsets, broken pipe section, could not complete investigation. | Not a requ |
| 8410 W Mercer Way | none | 1 and 2 | J3 | Medium root intrusion; could not complete investigation because end of pipe was submerged; one section of pipe was broken. | Not a requ |
| 84th Ave SE and SE 83rd St | D35.1 | 3 | J3 | Medium to heavy root intrusion should be removed this summer; could not complete investigation. | Not mair |
| 8259 W Mercer Way | D35.1 | 4 thru 11 | J3 | No problems observed in most of the reach; one section could not be completely investigated because of steep slope; medium root intrusion at one end. | Not requ |

Notes:

(1) The results are presented in the order of the City storm drainage system "City Map Section" beginning with Section A1.

(2) If identified as (new), this system was not identified in the Phase 1 effort.

(3) See detailed Site ID results in Appendix F.

(4) Based on City input.

(5) The problems in this reach are combined into one CIP project where it will be necessary to evaluate the whole reach to determine the extent of the replacement required.

(6) Adjacent problem areas in these locations are combined into one problem.

onclusion Based on City Observations

ot a major problem, but maintenance is required and additional vestigation may be required. ⁽⁶⁾

ot a major problem, but additional investigation may be quired.

ot a problem.

oblem - CIP Identified, more investigation required.

ot a problem.

ot a major problem in the north branch TV'd, but additional vestigation may be required.

ot a major problem, but additional investigation and aintenance is required. ⁽⁶⁾

ot a major problem, but additional investigation and aintenance is required. ⁽⁶⁾

ot a major problem, but additional investigation and aintenance is required. ⁽⁶⁾

oblem - CIP identified, but additional investigation is required.

ot a major problem, but more investigation required.

o problems observed now on the other East Mercer Way Ilverts, but additional investigation is required to make sure any oblems that arise are addressed readily.

ot a problem.

ot a major problem, but additional investigation may be quired.

ot a major problem, but additional investigation may be guired.

ot a major problem, but additional investigation and aintenance is required.

ot a major problem, but additional investigation may be quired.

 Table 5-4

 Summary of Areas Requiring Additional Investigation and/or Maintenance

| No. | Basin | Problem No. | TV Site Designation (if applicable) | Problem Type/Description ⁽¹⁾ | Approximate Length (ft) | |
|-----|-------|----------------|---|--|----------------------------|--|
| 1 | 6 | D6.1 | B4, site 2 | This pipe system experienced surcharging in the past, but the City previously installed a locking lid on system to contain flows and subsequently, no flooding has been observed. This is a 30-inch system. Shovel stuck within pipe at site #2; light root problem and slight oval-shape due to squashing also observed. | 400 | Maintenance monitor for su routine TV'ing |
| 2 | 6 | D6.90 | | Several blocks west of 84th Avenue SE that include private informal systems that are flat and likely substandard. Some ponding in road occurs. | 600 | |
| 3 | 6 | D6.91 | | Several blocks west of 84th Avenue SE that include private informal systems that are flat and likely substandard. Some ponding in road occurs. | 600 | |
| 4 | 9 | D9.1 | A3, sites 10 and 11 | Pipe system flows full causing periodic ponding in flat intersection. This hasn't been considered a significant flooding problem because ponding quickly recedes. | 400 | Not a major p investigation problem by T |
| 5 | 9 | D9.3 (new) | A3, site 2 | Upstream pipe is partially collapsed and needs replacement (site #2) at the crossing of 80th Ave SE near house #2227; some parts of the system could not be accessed; several joint offsets of 3 to 6 inches or more were identified; root intrusion and debris (rocks) present. | 40 | A CIP is iden pipe), but add system. |
| 6 | 10 | D10.1 (new) | C3, site 5 | Crossing of SE 37th Place and near house #7602. Medium to heavy offset and separation; pipe is sagging in sections; pipe joint separation with void space in the bottom; need to apply grout in one void at invert of separated joint (site #5). This is a 12-inch pipe system. | 85 | Not a major p required, in a offset at site a |
| 7 | 12 | D12b.1 | | Substandard system. This block along Roanoke Way may need new drainage system. | 500 | |
| 8 | 15 | D15.1 | | Private system suspected as being substandard and in poor condition. Has been subject to some flooding. | 350 | |
| 9 | 15 | D15.2 | | Private system suspected as being substandard and in poor condition. | 250 | |
| 10 | 15 | D15.3 | | Private system suspected as being substandard and in poor condition. | 250 | |
| 11 | 15 | D15.4 (new) | B1, sites 1 through 5 | There are medium to heavy offset joints and separation along the pipe system on east side of 63rd Ave SE from SE 24th St to SE 27th St. Several are severe along a 300 foot section. There are light roots coming through the pipe in multiple locations. This needs a follow up TV inspection. Shallow system along the shoulder is difficult to maintain. | 650 | A CIP has be However, for entire reach v center section be conducted |
| 12 | 16 | D16.1 | | Private system suspected as being substandard and in poor condition. Have not been able to TV system due to bad system. | 350 | |
| 13 | 16 | D16.2 | | Private system suspected as being substandard and in poor condition. | 250 | |
| 14 | 18 | D18c.1 | B2, sites 3 through 13 | System along 70th Ave SE from SE 29th St to SE 32nd St; light to heavy offsets; not all of reach could be completed; medium cracking, medium to heavy separation; recommend monitoring areas of heavy offset (site #9); much of the reach was observed to have no problems; some broken sections that should be replaced also observed - within a 700 foot section there are two substandard sections, one is 125 feet long and one is 50 feet long; site #5 needs grouting at a heavily offset joint; this is a 12-inch shallow system. | 175 | A CIP has be with12-inch c offset joint at investigation |
| 15 | 18 | D18c.2 | B2, sites 1 and 2 | First Hill Neighborhood. Some blocks (e.g., 70th and 71st) do not have formal drainage system. General area problem (e.g., plugged driveway culverts) that cause nuisance flooding of driveways, but no major flooding. | 1,900 | The section c and no proble requires invest |
| 16 | 19 | D19a.1 | | Culvert crossing W Mercer Way is suspected of poor condition and should be inspected. | 70 | |
| 17 | 20 | D20.1 | | Private system suspected as being substandard and in poor condition. Also noted as very steep. | 400 | |

Additional Comments

ce staff to remove the shovel and continue to surcharging, in addition to continuing to perform ing.

r problem (site #10) based on TV'ing, but additional on may be required. (Site #11 was determined not a 7 TV'ing.)

entified here (replace with12-inch-diameter concrete additional investigation is also required in the this

or problem, but additional investigation may be n addition to possibly having maintenance grout the te #5.

been identified here (replace with 12-inch concrete). for the CIP development, it was assumed that the sh will be replaced, but it could be that only the tion needs replacement; more investigation should ted to determine the extent of repair.

been defined for this area (replace bad sections h culvert), but maintenance staff may grout heavily at site #5 and continue to monitor. Additional on may be required.

n of pipe for 500 feet north of SE 32nd St was TV'd blems were identified. The rest of the system vestigation.

 Table 5-4

 Summary of Areas Requiring Additional Investigation and/or Maintenance

| No. | Basin | Problem No. | TV Site Designation (if applicable) | Problem Type/Description ⁽¹⁾ | Approximate Length (ft) | |
|-----|----------|----------------|---|--|----------------------------|--|
| 18 | 20 | D20.2 | <u> </u> | Private system suspected as being substandard and in poor condition. Also noted as very steep. | 300 | |
| 19 | 21 | D21.1 | | Private system suspected as being substandard and in poor condition. | 250 | |
| 20 | 21 | D21.2 | | Private system suspected as being substandard and in poor condition. | 150 | |
| 21 | 7 and 21 | D21.3 (new) | C3, sites | 83rd Ave SE from house #8225 to #3880. This section of pipe includes several heavy | | Maintenance |
| | | . , | 13,14,15 | joint offsets (some as much as 4") which need to be replaced at site #13; light roots | | and debris ar |
| | | | | growing into the pipe; some sections of the system are in good shape; area between CB | | 198, betweer |
| | | | | 201 and CB 202 (site #14) is broken and there is dirt blocking the pipe; section of pipe is | | CB 202), and |
| | | | | broken and full of dirt at site #16; could not complete the investigation at the end of the run. | | and monitorin |
| 22 | 22 | D22.1 | | Flat informal system subject to nuisance ponding. Currently planned overlay project will solve this problem. | 1,300 | |
| 23 | 23 | D23.1 | | deep 18-inch crossing of Forest Ave SE (80th Ave SE near Merrimount Dr SE) is in bad condition and in need of inspection and possible replacement. Have not been able to TV system. | 50 | |
| 24 | 25 | D25b.1 | F3, sites 1 through 5 | Some sloughing alongside Forest Avenue SE (between SE 48th Street and SE 49th Street) fills ditch. Also debris plugging of nearby cross culvert has been a problem. Recommend inspection of cross culvert and downstream system to lake. | 500 | Not a major p may be requi |
| 25 | 25 | D25b.2 | | Some debris plugging of West Mercer Way cross culvert. Also condition of cross culvert | 150 | |
| - | - | | | is old and deep. Inspection is recommended. | | |
| 26 | 28 | D28b.1 | | 1960 system installed in slide area. Any failure would have high risk of damage and inspection is recommended. Some root problems have occurred. There is also some concern that if bypass malfunctions all flows would return to channel and cause flooding. | 1,200 | |
| 27 | 29 | D29.1 | H3, sites 1 through 4 | Older concrete system between 80th Ave SE and 81st Ave SE from SE 65th Street to south of SE 70th St is 18-inch and/or 24-inch. The system has heavy root intrusion which blocks camera access so investigation could not be fully completed; roots are medium to large, but water can still flow through. | 1,800 | Maintenance investigation |
| 28 | | D29.2 | H3, site 5 | Medium to heavy cracking along the 24-inch pipe at site #5 which runs between two houses (on private property); the outlet section of the pipe at the watercourse is collapsed; this pipe needs replacement; the joints look okay. | 100 | A CIP has be where the cra should be con needs to be r length. |
| 29 | 31 | D31c.1 | | Private system suspected as being substandard and in poor condition. | 450 | |
| 30 | 31 | D31c.2 | H2, site 1 | Private system suspected as being substandard and in poor condition. | 800 | The north bra problem, but |
| 31 | 32 | D32a.1 | | Private system suspected as being substandard and in poor condition. System was previously TV'd by the Clty and lower portion was found in bad condition. | 1,000 | |
| 32 | 32 | D32a.2 | I2, site 1 | West Mercer Way - pipe material changes from CMP to concrete to CMP with poor connections across WMW. The pipe size increases as move downstream. Could not access from upstream end because of flow restrictor. Need more investigation from the upstream side and need to monitor. The crossing is not that deep. Monitor in the future and may want to try push camera. | 8 out of 60 | A CIP was identify the end). Fur the system. |
| 33 | 32 | D32b.1 | | Private system suspected as being substandard and in poor condition with root problems. | 400 | |
| 34 | 32 | none | I3, site 2 | Light cracking, heavy root intrusion, heavy offsets, broken pipe section, could not complete investigation. | | |

Additional Comments

ce staff can fix the areas where the pipe is broken and rock are blocking the pipe (from CB 199 to CB en CB 199 and CB 200 and between CB 201 and nd also fix the large offset. Additional investigation oring is recommended.

r problem based on TV'ing, but more investigation juired.

ce can cut the roots and remove. Additional system on also required.

been identified here (replace 24-inch pipe from cracking starts to the outlet). Further investigation conducted to determine how much of the section e replaced. The worst is the north end of the 100'

pranch was TV'd and determined to not be a ut more investigation of this reach is required.

identified (replace 8 feet of 12-inch CMP culvert at Further investigation is also required for the rest of

 Table 5-4

 Summary of Areas Requiring Additional Investigation and/or Maintenance

| No. | Basin | Problem No. | TV Site Designation (if applicable) | Problem Type/Description ⁽¹⁾ | Approximate Length (ft) | |
|-----|--------|----------------|--|--|----------------------------|--|
| 35 | 33 | D33a.1 | | Several West Mercer Way culvert crossings are old and in poor condition and need replacement. Several slides in area have occurred and repaired by the City. The pipe systems downstream from these culvert crossings were also noted as poor condition. The culvert at 7800 W Mercer was recently replaced (it's the furthest south). There is another culvert there that needs to be replaced. 40 feet of sewer main was also replaced. | 2,000 | No problems area should b |
| 36 | 35 | D35.1 | J3, site 3 (also sites 4 through 11) | Old system constructed along steep bank at 84th Ave SE and SE 83rd St. A past blowout occurred due to root intrusion resulting in flooding of home. If failure occurs, damage risk is high. There is a root along the invert of the pipe at 59 feet from CB 89 and then again at 78 feet; the pipe is nearly half full with debris and sediment. Approximately 50 feet of 18-inch pipe show root intrusion and debris to be removed. | 190 | Maintenance other debris. problems bec More investig reach in addi |
| 37 | 35 | none | J3, sites 1 and 2 | Medium root intrusion; could not complete investigation because end of pipe was submerged; one section of pipe was broken. | | |
| 38 | 36 | D36.1 | | Culvert/driveway crossing not functioning properly. Some settlement has occurred. May be private drainage problem. | 40 | |
| 39 | 37 | D37.1 | | Drainage system suspected of poor condition (not constant slope). Recommend inspection. | 200 | |
| 40 | 37 | D37.2 | | Drainage system suspected of poor condition (not constant slope). Recommend inspection. | 350 | |
| 41 | 37 | D37.3 | | Drainage system suspected of poor condition. Recommend inspection. | 300 | |
| 42 | 38 | D38.1 | | System near Terrywood Ln is constructed in steep sandy bank. Pipe is partially buried. City previously TV'd part of system and it was considered marginal. This system is a concern because if failure occurs there is high potential for damages. Downstream portion in park is considered okay. | 700 | |
| 43 | 40 | D40.a1 | | Informal drainage system in poor condition. A planned roadway/drainage improvement CIP will solve this problem. | 300 | |
| 44 | 40 | D40b.1 | | Culvert crossing suspected of poor condition. Recommend inspection. | 50 | |
| 45 | 46 | D46a.1 | | Culverts under East Mercer Way are suspected of poor condition and should be investigated. This site is also designated as a "Hot Spot". | 60 | |
| 46 | 47 | D47.1 | F5, site 2 | Culvert under East Mercer Way investigation revealed cracked 18-inch clay pipe, longitudinal cracks, oblong pipe has started to flatten out; cross culvert under major arterial; the pipe is collapsed at the end; embankment is shallow on west side but there are two large trees at the inlet end of the culvert; the culvert is much deeper on the east side; could not complete investigation. | 200 | A CIP was id also be requi |
| 47 | 49 | D49b.1 | | Existing pipe system is suspected of being undersized and should be investigated. | 150 | |
| 48 | 49 | D49b.2 | | East Mercer Way culvert crossing is in substandard condition (old clay and cracked, imploding) and needs replacement | 60 | |
| 49 | 50 | D50c.1 | | 18" cross culvert (at 4449 East Mercer Way) is failing and may need to be replaced. | 60 | |
| 50 | 51 | D51a.1 | | Private conveyance system at downstream end of watercourse is suspected of being undersized. | 250 | |
| 51 | 53 | D53.1 | | 4" storm drain is undersized. This may be a private system. | 250 | |
| 52 | Varies | General | | All culverts along East and West Mercer Way that were not inspected as part of this study should be inspected frequently and regularly. | Varies | |

Notes:

(1) Sources of information are the TV inspection reports for those systems TV'd and interviews with City staff.

Additional Comments

ns were observed with this TV investigation, but this d be monitored for future problems.

ice crew to address the issues of removing roots and is. This is the most urgent of the maintenance because it's on a hillside, near a heavily used trail. stigation could also be conducted throughout the dditional to what was TV'd this time.

identified at this location. More investigation may uired.

Table 5-5 CIP Summary

| Problem/ | | |
|----------|---------|------------------|
| Project | | |
| No. | Problem | Proposed Project |

EROSION PROJECTS

| 4.1 | Head cut is moving upstream creating a 30-foot long incised channel into till that is up to 7 feet deep | Channel stabilization along about 40 feet of creek. | \$45,000 |
|-------|---|---|-------------|
| 4.2 | Downstream of storm drain outlet, flow is scouring and undercutting toe of large slide. Two other storm drain outlets contribute flow. | Install manholes, anchor blocks and 12-inch-diameter butt-fused HDPE pipes along 100 feet of water course and 40 feet at two side drainage systems to stop erosion of | \$198,000 |
| | | slide toe. ⁽¹⁾ | |
| 6.1 | Downstream of surface storm drain outlet, flow is scouring and undercutting toe of small slide within an undeveloped | Extend 18-inch-diameter surface CPEP previously installed by city crews 75 feet | \$87,000 |
| | ravine. | past slide. | |
| 10.4 | Large subbasin from business district outlets in open channel lined with riprap. Rock may be undersized | Place 5 cy of large riprap at outlet of 60-inch-diameter pipe. | \$13,000 |
| 26.1 | High streamflows in the subbasin have caused channel down-cutting in the reach between Island Crest Way and West Mercer Way. The channel erosion is largely confined to an approximate 600- to 700-foot reach immediately west of Island Crest Way, including a significant headcut (up to nine feet in height) that has the potential to travel upstream during high flows. | This project is already being designed and is at the 30-percent design stage. The project includes stream channel restoration for approximately 660 feet of channel length. The project will stabilize the stream channel through the application of bioengineering techniques including placement of woody debris, log weirs, coir fabric, natural streambed rock material, and riparian planting. | \$1,061,000 |
| 27a.1 | 30 LF of streambed and bank erosion with head cut | Install 30 feet of channel stabilization creating a rounded rock channel. | \$34,000 |
| 27a.3 | 110 LF of deeply incised channel in glacial till with three head cuts in undeveloped ravine | Stream restoration and lay back the top of the banks in undeveloped ravine. | \$120,000 |
| 27a.6 | 4-foot high timber dam is failing | Construct 40 feet of boulder cascade. | \$54,000 |
| 29.1 | Drop at culvert outlet at West Mercer Way and severe bank erosion and down cutting along approximately 600 feet of stream below West Mercer Way. Slope instability is being created such that slides have occurred along much of the Reach. In addition, there is also some less severe downcutting in the channel at some locations downstream of this 600 foot section before it enters a culvert crossing at 77 th Ave SE | This project is already being designed and is at the 90-percent design stage. The project includes a combination of stream highflow bypass and channel regrading and restoration for the upper approximately 530 feet of channel. The highflow bypass includes a 24-inch diameter HDPE pipeline buried below the restored channel bottom. The highflow bypass will carry high stream flows to reduce ongoing channel erosion. Channel restoration includes raising the grade of the stream, installation of rock revetments, placement of larger woody debris, and plantings. In addition, the project includes minor channel armoring using log deflectors and rock placement at select locations downstream of the highflow bypass. | \$959,000 |
| 29.2 | Very steep channel has created a head cut and incised into the east bank of the main stem of the creek. The small, narrow channel is up to 12 feet deep. | Butt-fused HDPE bypass pipe from West Mercer Way down the steep bank to the ravine bottom, a distance of 140 feet. New manhole and anchor near the street. All flow will be conveyed in the pipe. | \$115,000 |
| 32b.1 | Below the outlet of a 48 inch diameter, half round CMP conveyance pipe, the channel is scoured and drops 3 to 5 vertical feet over 15 to 20 linear feet. Channel is also scouring horizontally below culvert outlet. Water is also flowing along the underside of the half round pipe. Banks are steep, unvegetated, composed of very dense silt and retreating. Channel bottom lacks any substrate and consists of smooth, very dense silt | Construct approximately 30 linear feet of boulder cascade for outfall protection below half round pipe outlet. | \$38,000 |
| 32b.2 | Approximately 5 to 7 foot deep headcut through very dense silt. Below headcut channel is highly incised with vertical, unvegetated banks. Channel bottom has little loose substrate, and consists of very dense silt. | Construct approximately 50 linear feet of boulder cascade, regrade upper banks and replace invasive plants with native vegetation. | \$55,000 |
| 37b.1 | Outfall erosion and erosion from street runoff is threatening driveway | Solution being designed by homeowner's engineer. | \$64,000 |
| 39a.1 | 40 LF of minor streambed erosion | Install channel stabilization along the reach. These would be located on private property, so easements will be required. Temporary access could be accomplished from the private drive. | \$28,000 |
| 42.1 | Bank protection and check dams of sandbag and geotextile were installed for temporary protection of this reach. The dams are up to 4 feet high and are beginning to fail. Some bank erosion is also occurring. There is a large amount of fine grained sand behind the dams and in the channel. South bank appears to be slide material. | Replace about 12 sandbag check dams with rock check dams or rock vortex weirs. Check dams are less expensive but rock vortex weirs may be needed to provide fish passage. Also install logs/large woody debris for bank protection. | \$200,000 |
| 42.1A | Two sandbag and geotextile check dams and sandbag and geotextile bank protection were temporarily installed for protection of this reach. These are beginning to fail. Some bank erosion is also occurring on the south bank. | Replace sandbag check dams with rock check dams or rock vortex weirs. Check dams are less expensive but rock vortex weirs may be needed to provide fish passage. Also provide bank protection and stream restoration along about 60 feet of bank. Stream restoration would include logs/large woody debris, boulders, bank regrading and planting. | \$122,000 |

ect Solution

Table 5-5 CIP Summary

| Problem Project No. | Problem | Proposed Project Solution | Estimated Costs |
|---------------------------|--|---|------------------|
| 42.2 | About 100 feet of the south bank of this 300-foot reach s experiencing erosion and needs bank protection and | 100 feet of stream restoration/bank protection and repairs to two rock check dams. | \$116,000 |
| 12.2 | restoration. Two large rock check dams need repairs. | | \$110,000 |
| 42.3 | South bank is a landslide area and consists of soft, wet material that is subject to loss by flowing water and by spring sapping. About 90 feet of this 270-foot reach has problematic erosion. | Stream restoration to increase bank stability along about 90 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles. | \$91,000 |
| 42.4 | Bank sloughing and spring sapping exists along about one-third of the south bank of this 400-foot reach. Previous restoration work done but additional work is needed. On the north bank the creek runs adjacent to sanitary sewer manhole and is armored with quarry spalls which may be too small in size for adequate protection. | Stream restoration to increase bank stability along about 130 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles. Also place riprap on creekside of sanitary sewer manhole. | \$136,000 |
| 42.6 | Erosion and head cutting of soft bed and banks in small steep water course with undeveloped drainage area. | 60 of channel stabilization. | \$65,000 |
| 42.8 | Erosion or soil movement in very small channel with limited drainage area, 40 percent gradient and erodible soil which is mapped as slide material. Soil loss is caused by spring sapping and flowing water. | Install wattles of willows or shade-tolerant plants such as Pacific ninebark perpendicular to the channel. Each wattle dam should be 4 to 8 feet wide. Space wattles 6 feet apart. All work would be manual. | \$28,000 |
| 42.8A | About 30 feet of the south bank is experiencing erosion and spring sapping. North bank composed of large rock to protect sanitary sewer main and no erosion is evident. Total reach length is about 140 feet. Large rock check dams are also okay. | Stream restoration to increase bank stability along about 30 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles. | \$45,000 |
| 42.9 | There are two erosion problems at this site;1) a 5-foot drop from the 18-inch-diameter CMP culvert under a private driveway which is undergoing moderate erosion and 2) 30 feet of channel down cutting located 100 feet downstream of the culvert. The soft, wet east bank has wetland characteristics. Site is located in undeveloped ravine. Work may need to be done primarily by hand due to site conditions. | Install culvert outlet protection and 30 feet of stream restoration. | \$79,000 |
| 42.10 | Existing public drainage system consists of a manhole with a sound CMP outlet pipe on top of the ravine about 50 feet long, about 30 feet of half round CMP, an above ground transition from the half-round pipe to a 24-inch-diameter corrugated polyethylene pipe (CPEP) and 80 feet of corrugated polyethylene pipe which lies on the ground in the bottom of the small ravine. Only one of the CPEP joints is capable of handling thrust. There is leakage from the pipe and seepage from the hill slope. The seepage has contributed to slope instability particularly on the south bank. | Install manhole at the downstream end of the sound, buried CMP. Remove half round pipe and replace with 24-inch-diameter corrugated polyethylene pipe (CPEP) extend from the new manhole to the existing 24-inch-diameter CPEP. Cover CPEP with 150 cy of well draining material to stabilize this pipe as well as the slopes. It may be possible to deliver fill with chute or blower truck. | \$70,000 |
| 45b.1 | Existing quarry spall check dams effective but need some bank protection | Partial stream restoration along 300 feet of channel involving repairs and additions to existing check dams as well as habitat friendly bank protection. | \$179,000 |
| 45b.3 | Stream down cutting has exposed 120 feet of sewer and generated considerable sediment, which is a maintenance problem downstream. South bank subject to sliding. | Stream restoration along 450 feet of channel is needed along with reconstruction of 120 feet of sanitary sewer. Erosion problem upstream previously solved by installation of piping in the water course. | \$444,000 |
| 45b.4 | Drop at culvert outlet of 12-inch-diameter CMP culvert under private drive is eroding partially protected steep slope. Erosion also occurring downstream of the outlet. | Replace culvert with manhole, concrete anchor and 120 feet of butt-fused HDPE pipe to ravine bottom. | \$77,000 |
| 46a.3 | Large scale slope movement into creek is pinching channel along 250-foot reach. Creek erosion of toe and fill south of street may be contributing to slope movement. This is a large source of sediment. The slope and much of the contributing area is mapped as a slide. | Install 250 feet of 12-inch-diameter CPEP along channel. Environmental and permitting concerns may be significant. Additional investigation should be done to determine if another alternative, rock lining and removal of fill at the top of the slope along the road, would stabilize the slope. | \$109,000 |
| 46a.4 | Downstream of pipe outlet, channel is down cutting along 100 feet of soft fill and slide material. This tributary stream is located south of 53 rd Place on city open space. | Stream restoration along 100 feet to stabilize soft bed and banks. | \$99,000 |
| 49b.1 | Pipe system outlet from East Mercer Way and SE 47 th Street discharges onto East Mercer Way embankment eroding a deep channel and 2 foot drop at outlet. Pipe outlet is also partially crushed. | Replace 50 feet of outlet ditch and line with riprap. | \$12,000 |

Table 5-5 CIP Summary

| Problem/ Project | | |
|---------------------|--|---|
| No. | Problem | Proposed Project |
| 49b.2 | Moderate bank erosion and head cutting along portions of 250 feet of channel. | Partial stream restoration along 250 feet of cha |
| 49b.4 | Large scale, severe erosion at an existing 12-inch-diameter storm drainage outlet which drops six feet into a steep | Install 12-inch-diameter HDPE pipeline with ma |
| | channel in sandy soil. Channel incision is about 100 feet long and the depth varies from 5 to 20 feet. | downstream end. May be desirable to fill the e |
| 51a.1 | 50 feet of south bank erosion and outlet erosion at 18-inch-diameter culvert may threaten embankment of East Mercer | Install outlet protection and 50 feet of check da |
| | Way. Considerable sand in channel from upstream | slope for stabilization. |
| 52.1 | Rapid bed erosion, bank erosion and head cuts in a small channel with a bottom width of 2 feet and a depth of 3 to 7 | Installation of channel stabilization measure of |
| | feet on downstream side of East Mercer Way. Bed and banks consist of erodible sandy material and fill. May have | |
| | been accelerated by addition of collection area to the 18-inch-diameter pipe under East Mercer Way. | |

DRAINAGE SYSTEM PROJECTS

| D9.3 | Upstream pipe is partially collapsed and needs replacement (site #2) at the crossing of 80th Ave SE near house #2227; some parts of the system could not be accessed; several joint offsets of 3 to 6 inches or more were identified; root intrusion and debris (rocks) present. | Replace approximately 40 feet of 12-inch-diame |
|--------|--|---|
| D15.4 | There are medium to heavy offset joints and separation along the pipe system on east side of 63rd Ave SE from SE 24th St to SE 27th St. Several are severe along a 300 foot section. There are light roots coming through the pipe in multiple locations. This needs a follow up TV inspection. Shallow system along the shoulder is difficult to maintain. | Replace approximately 650 feet of 12-inch-diam |
| D18c.1 | System along 70th Ave SE from SE 29th St to SE 32nd St; light to heavy offsets; not all of reach could be completed; medium cracking, medium to heavy separation; recommend monitoring areas of heavy offset (site #9); much of the reach was observed to have no problems; some broken sections that should be replaced also observed - within a 700 foot section there are two substandard sections, one is 125 feet long and one is 50 feet long; site #5 needs grouting at a heavily offset joint; this is a 12-inch shallow system. | Replace approximately 175 feet of 12-inch-diam |
| D29.2 | Medium to heavy cracking along the 24-inch pipe at site #5 which runs between two houses (on private property); the outlet section of the pipe at the watercourse is collapsed; this pipe needs replacement; the joints look okay. | Replace approximately 100 feet of 24-inch-diam starts to the outlet (further investigation may sho need to be replaced). |
| D32a.2 | West Mercer Way - pipe material changes from CMP to concrete to CMP with poor connections across WMW. The pipe size increases as move downstream. Could not access from upstream end because of flow restrictor. Need more investigation from the upstream side and need to monitor. The crossing is not that deep. Monitor in the future and may want to try push camera. | Replace approximately 8 feet of 12-inch-diameter of the 60-foot-long reach. Additional investigation other sections of the reach need to be replaced. |
| D47.1 | Culvert under East Mercer Way investigation revealed cracked 18-inch clay pipe, longitudinal cracks, oblong pipe has started to flatten out; cross culvert under major arterial; the pipe is collapsed at the end; embankment is shallow on west side but there are two large trees at the inlet end of the culvert; the culvert is much deeper on the east side; could not complete investigation. | Replace approximately 200 feet of 18-inch-diam bursting methods. |

SUBTOT

NOTES:

(1) This is the preferred solution approach based on the field investigation. It is recommended that additional investigation be conducted to consider additional alternatives described in the Project Summary. Consultation with WDFW is also recommended prior to selection of the preferred alternative for construction.

(2) The cost estimate for this project is based on this solution. However, other alternatives are presented in the Project Summary. It is recommended that the City consult with WDFW prior to selection of the preferred alternative for construction.

| ect Solution | Estimated Cos |
|---|---------------|
| channel. | \$150,000 |
| manhole energy dissipator at the erosion scar. ⁽²⁾ | \$195,000 |
| dams to contain flow. Fill along toe of | \$45,000 |
| of 150 feet of this small water course. | \$105,000 |
| SUBTOTAL EROSION PROJECTS: | \$5,238,000 |
| ameter concrete pipe. | \$44,000 |
| liameter concrete pipe. | \$585,000 |
| liameter concrete pipe. | \$176,000 |
| liameter pipe from where the cracking show that the entire length does not | \$92,000 |
| meter concrete pipe in the lower section gations are necessary to determine if any ced. | \$25,000 |
| liameter concrete pipe using pipe | \$243,000 |
| DTAL DRAINAGE SYSTEM PROJECTS: | \$1,165,000 |
| TOTAL CIP PROJECTS: | \$6,403,000 |



R:\Seattle\004541 City of Mercer Island\11-00996-10000 Comprehensive Basin Review & Watercourse Monitoring\11-00996-10001 Phase 2\GIS Mapping And Figures, 06/07/0

Section 6 STORMWATER PROGRAM POLICIES



6.1 Overview of Stormwater Program Policies

In order to formalize some of the more important stormwater program policies for the City, issues associated with these policies were reviewed and input was solicited from the City's Utility Board. Formalized policies will help define what is included in the CIP as well as manage day-to-day operation of the program. The goals of this process also included having stormwater policies that support the delivery of consistent services that the community desires and can afford and that support compliance with regulatory requirements.

The key policy issues that were identified with City staff and evaluated include:

- CIP prioritization
- Erosion, easements, and regulatory compliance
- Fee-in-lieu of detention
- Maintenance easements for stormwater facilities on private property
- Filling of roadside ditches

This work did not include comparing the City's existing stormwater program with what is necessary to be in compliance with the pending regulatory requirements, such as NPDES Phase II, because the regulations are not yet fully defined.

6.2 Recommended Policy Changes

For the selected policy issues, this Section describes the City's current practices and provides discussion and recommendations toward defining and documenting these policies, based on the study conducted with R.W. Beck, City staff, and the City's Utility Board.

6.2.1 CIP Prioritization

The City currently constructs surface water capital projects on a pay-as-you-go basis as funds are available through the Storm and Surface Water Utility and attempts to construct the highest priority projects first. Projects are generally categorized into one of three types: large projects, spot improvement projects, and neighborhood projects. Large projects are typically \$150,000 to \$500,000 and are associated with watercourse restoration. Spot improvement projects are typically \$50,000 to \$150,000 and are associated with watercourse restoration. Neighborhood projects are typically within

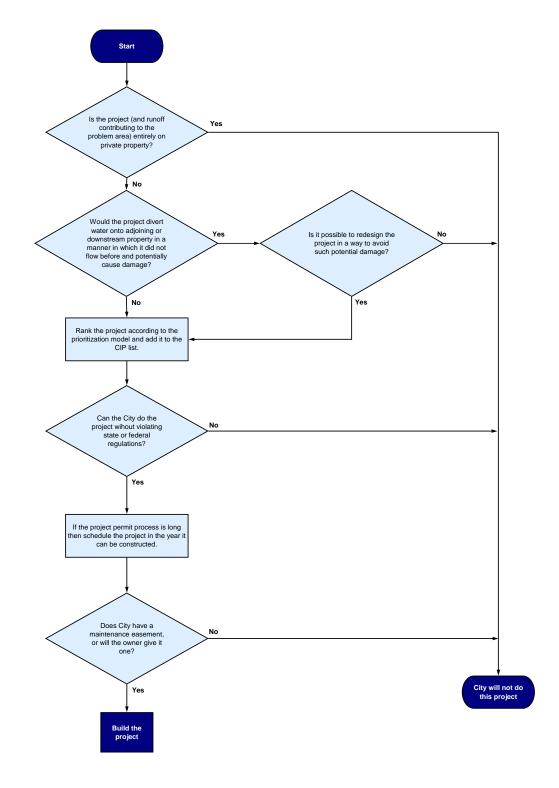


the City right-of-way and are associated with catch basin and/or pipe installation/replacement.

Many factors can affect the order in which projects are constructed. For example, a less expensive project may be built before a more expensive project because of the limited funds available. In addition, the City attempts to balance its capital expenditures across the City's geographic areas, so that if the two most severe problems are near each other, the City may construct just one of them while building other projects in other areas.

The project team, City staff, and the City's Utility Board discussed options for prioritization and it was recommended that the City formalize a prioritization process. With a documented process in place, it is possible to more clearly describe the merits of a particular project, and to explain and document to ratepayers and elected officials why one project gets built before another. Also, having this documented process will help to ensure that priorities are established in a consistent manner from year to year.

Working with City staff and the City's Utility Board, the project team developed two components of a prioritization program. The first element is a prioritization process flow chart that helps decide whether or not the City should implement a project. For example, some problems that are entirely on private property where no public drainage contributes to the problem should not be addressed using public funds. This process diagram can be used to screen out projects such as this. The process diagram is shown on Figure 6-1. The process is also designed to consider the timing of permits needed for a project and the ability to obtain private easements where needed. The second element of the prioritization program is a prioritization model (or spreadsheet). A prioritization model was developed that ranks projects according to several scored criteria such as magnitude of the problem and cost effectiveness, as well as several other criteria. The detailed prioritization model and results is presented in Section 7.





6.2.2 Erosion, Easements, and Regulatory Compliance

There area a number of legal type issues the City is faced with when dealing with erosion problems which are most often on private property within ravines. Legal issues were discussed with the City staff, the City legal staff, and the City's Utility Board. The following paragraphs describe the main conclusions of these discussions:

- When implementing stormwater and erosion projects, any legal risks need to be reviewed on a case-by-case basis by the City.
- Where new development is adjacent to watercourses, proactively seeking easements during development review to allow future access to streams for CIP projects does not require the City to take over responsibility for correcting future problems in perpetuity because of the availability of the easement. The rights associated with the ownership of an easement do not extend to complete assumption of liability. The City is not responsible for drainage systems (pipes, ravines, watercourses) on private property that convey drainage from uphill City streets and private properties. There can be exceptions to this on a case-by-case basis.
- Any state or federal regulations implicated by a particular project must be given careful scrutiny and necessary permits must be obtained in order to avoid any regulatory compliance problems.
- The City should review the legal risks of potential CIP projects on a case-bycase basis and ensure that the project complies with any applicable state or federal regulations.

6.2.3 Fee-in-Lieu of Detention

Mercer Island City Code (section 15.11.030.A) currently allows private property owners to pay a fee-in-lieu of detention "when authorized by the City Engineer." The code states that the City Engineer will disallow a fee-in-lieu proposal "if, in the opinion of the City Engineer, undetained runoff from the development may materially adversely exacerbate an existing problem." However, the City previously had no written policy that explains how the City Engineer makes this decision.

The City Engineer currently considers many factors such as the location of the development within the subbasin, the magnitude of development, downstream drainage system conditions, the expected increase in stormwater runoff, etc. This practice has worked well, but it was concluded that these factors need to be documented as a part of this effort.

Based on the recommendations of the study with City staff and the City's Utility Board, the City developed the following set of review criteria to help guide decisionmaking on application of the fee-in-lieu of detention:

• The existence of known drainage system problems downstream of the project site, especially in a ravine/watercourse and whether they are worsening.

- The timing of future capital improvements planned in the ravine/watercourse and the benefit of applying fee-in-lieu monies toward the CIP compared to onsite detention.
- The history of landslides or instability in or along the downstream ravine/watercourse.
- The relative longitudinal slope, soil conditions, and peak flows in the ravine/watercourse. This is used as an indicator of potential erosion as well as how "flashy" the stormwater response is due to level of imperviousness in the subbasin. This is not quantified, but based rather on general observations and any historical knowledge.
- History of litigation regarding flooding or erosion in the subbasin.
- The extent to which the development increases peak flows into the system. Developments that either do not increase peak flows or where good downstream conditions exist are favorable candidates for fee-in-lieu of detention.
- Subbasin size, the project location within the subbasin, and the overall level of development in the basin. Detention in the lowest segments of the subbasin typically does not provide the same benefit as in the upper portions.

When the fee-in-lieu is determined to be an acceptable alternative to providing detention, the property owner's civil engineer will still need to perform an analysis of the downstream system for one quarter mile to confirm that there are no capacity problems. If a problem is identified, the property owner will either need to correct the problem in addition to paying the fee-in-lieu or forego the fee and provide stormwater detention on the project site.

6.2.4 Maintenance Easements

The surface water system that falls within the jurisdiction of the Storm and Surface Water Utility includes the entire system within the city, both public and private. The system consists of naturally existing ravine watercourses and constructed pipes, culverts and channels. The "City or public drainage system" means those elements of the storm and surface water system within the City that are located on property owned by the City or within the public right-of-way, or are located on property on which the City has an easement. Some portions of the surface water system flow over private property for which there is not an easement. This type of system is referred to as a "private system."

There are many of these private systems within the City. For private systems (where the City does not have an easement), the City is not responsible for the system operation nor does it have any rights to perform maintenance, improvements, or access the property. It is recognized that these private systems sometimes convey upstream runoff that includes public areas (such as roads). A malfunction of the system (such as plugging or pipe failure) could not only cause damage to the private property itself, but upstream or downstream properties. Therefore, in some cases where public drainage flows through private property, there may be some public benefit for the City to obtain maintenance easements to ensure that the system is reliable.

Following are some situations where obtaining a drainage easement may be desirable:

- The City would like to construct a capital project that results in public benefit, such as a watercourse stabilization project.
- The City would like to obtain an easement for future maintenance and/or replacement of a currently private system that conveys public drainage and it is in the public's interest to ensure that adequate maintenance is performed.
- When the City is reviewing a development proposal for a property with a private system that conveys public runoff and it is in the best public interest to obtain an easement.

It is not necessary to obtain drainage easements for all private systems. Therefore, the City should consider these situations on a case-by-case basis.

Based on the input from the City staff and the City's Utility Board, it is recommended that before the City performs maintenance or rehabilitation of systems on private property, the City obtain a maintenance easement from the property owner. This will allow the City to access the site and maintain the system. If an easement is not provided, the City should not work on the system. This requirement for an easement is also reflected in the CIP prioritization process shown on Figure 6-1.

It is also recommended that the City consider obtaining easements at the time a private property starts the permit process for development or redevelopment.

Note that these two recommendations do not include emergency projects, such as where a drainage problem caused by a recent storm poses an immediate danger. If there is an emergency, the City may need to access private property.

The following should be considered for obtaining an easement in accordance with either of the recommendations above:

- Obtaining an easement for a drainage system by the utility would provide a public benefit.
- Necessary and appropriate property rights are offered by the property owner at no monetary cost. Restoring property after completion of project improvements such as landscaping may be considered.
- That the system/facility substantially meets current engineering standards, as determined by the utility, or is brought up to current engineering standards by the owner or the City as part of a capital project.
- That there is access for utility maintenance.
- That the utility has adequate resources to maintain the facility.

6.2.5 Filling of Roadside Ditches

Many of the City's streets have roadside ditches and no pedestrian paths or shoulders. Private property owners often request that the City replace roadside ditches with piped systems. In considering these requests, the City must look at a number of factors, including:

- The desire of private property owners to have more parking or landscaping in front of their property.
- The safety of cyclists and pedestrians on narrow roadways.
- Water quality treatment provided by vegetated ditches.
- Water quantity control by allowing some infiltration (groundwater recharge) compared to piped systems.

On arterials that do not have much shoulder space, such as East Mercer Way, the City has piped ditches to provide additional space for bicycles and pedestrians. On residential streets with low traffic volumes, the water quality of runoff is likely better than arterials and other high traffic volume streets. Because the water quality on these streets is better, the water quality benefit of grassy ditches may be less compared to high traffic volume streets.

When the City has approved the filling of neighborhood ditches, it historically has also provided assistance. Property owners pay the cost of materials (pipe and backfill), and the City contributes the labor needed to install the materials and fill the ditch.

Based on input from the City's Utility Board, the City developed a set of criteria shown on Table 6-1 in order to help guide decision-making on preserving ditches. The decision to fill an existing ditch will be based on the type of street, whether it has a shoulder, and the water quality/quantity benefits provided. In addition, consideration of the water quality/quantity benefits should consider the basin conditions (e.g., whether there are erosion, flooding, or water quality problems and its location in the basin). Generally, on arterial streets with shoulders, existing ditches should be retained for their water quality/quantity benefits. For arterials without sufficient shoulders, safety is likely a higher priority than the water quality/quantity benefit of ditches. It is recognized that this table is simplified and the City may take other factors not listed here into consideration when determining whether to allow filling of a ditch. Note that no category is included for commercial areas because most of these areas do not have ditches.

| Type of Street | Roadside Ditch Filling Policy |
|-------------------------------------|--|
| Arterial ¹ with shoulder | Generally not allowed in order to maintain the water quality/quantity benefits. In some locations, the safety of bicyclists and pedestrians may outweigh water quality/quantity benefits. |
| Arterial ¹ w/o shoulder | Generally allowed. |
| Residential Street | Generally allowed unless in a basin that is subject to downstream water quality/quantity problems where continued filling of ditches in the basin will worsen current conditions. |

Table 6-1. Ditch Filling Policy by Street Type

¹Arterial roads as defined in the Comprehensive Land Use Plan

In addition, in situations where ditch filling is allowed and it is requested by a property owner, the City will provide the labor and the property owner will purchase the materials. All costs associated with filling ditches when part of a development or redevelopment shall be solely the responsibility of the property owner.

Section 7 CIP PRIORITIZATION



7.1 Approach

As discussed in Section 6, the project team, City staff, and City's Utility Board worked together to develop a prioritization process or method. The process includes using evaluation criteria, weighing the relative importance of each evaluation criterion, and assessing the identified projects with respect to how well they meet each of the evaluation criteria. The result is a simple spreadsheet model that includes weighted criteria, scoring of the CIPs as to how well they meet the criteria and an overall ranking or prioritization. The scoring of individual projects was developed with City input to provide a prioritized ranking. The spreadsheet is further described in this section.

7.2 Criteria and Evaluation

The criteria that were evaluated for each CIP include the following:

- Magnitude of the problem (To help define the magnitude of problems, this criterion was further subdivided into separate criteria for risk to health and safety, risk to property, rate of degradation/project urgency, and the flows or size of the drainage area)
- Impact to water quality and stream habitat
- Cost effectiveness
- Special opportunity
- Reduction in maintenance and operation costs
- Neighborhood advocacy/complaints
- Permitting effort
- Overall project cost

Each of these criteria are defined and assigned a weighting factor on Table 7-1. The weighting factors range from 1 to 5 and were determined during meetings with City staff and the City's Utility Board. For each criterion, the projects were evaluated in terms of severity level. The definitions for each severity level are also defined on Table 7-1. The severity for each criteria is evaluated on a scale of 0 (none) to 3 (high). For each CIP project, all criteria are evaluated and scored according to severity. The total severity score for each project is the sum of the severity score times the weighting factor for each criterion.



Scoring for both erosion and drainage system CIPs was developed with input from the City. The prioritization results are presented in Table 7-1 for erosion problems and in Table 7-2 for drainage system problems. The projects with the highest scores reflect the highest priority projects and the projects are arranged from left to right. The spreadsheet model is set up to automatically update the ranking when the scoring is modified. In this way, the City can update the prioritization as more information about problems becomes available. A digital copy of the prioritization models is included in Appendix D for the City's future use.

7.3 Summary of Program Recommendations

The following paragraphs present a summary of the recommendations developed during the course of this study. These recommendations reflect City input as well as input received during City's Utility Board meetings.

- 1. Use the prioritization method developed to rank and implement projects.
- 2. Continue and expand erosion problem monitoring to provide additional data that can be input into the prioritization model and help the City make decisions on CIP implementation.
- 3. Continue to investigate drainage systems as summarized on Table 5-4 to identify and fix drainage system problems. Special emphasis should be placed on inspection and monitoring of the East Mercer Way and West Mercer Way culverts because these are critical structures.
- 4. The City should apply the formalized policies as presented in Section 6.
- 5. Continue investigation of erosion problems categorized as "medium" in Phase 1 and shown on Plate 3 and Table 4-1. Due to limited resources, only the "high" category problems were investigated as part of this study, but as additional resources become available, the City should continue investigations.

Table 7-1 Erosion CIP Prioritization

Rank Criterion Definition Severity 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 32b.1 oject 27a.1 42.10 iject 42.1a 45b.3 49b.4 27a.6 46a.3 ject 51a.1 45b.4 ject 37b.1 42.8a g oject 26.1 oject 52.1 ject 10.4 oject 29.1 29.2 45b. 49b.1 42.1 oject 4.2 ect oject (ject ject ject ject ject ect ject 2 (Medium) 3 (High) 0 (No) 1 (Low) Magnitude of the Problem Low, problem is likely imited to property (land) failure has a potential t be a public safety Risk to Health and Safety What is the risk for public 5.0 None failure can clearly resu in public safety hazard ealth and safety? damage (public or private) and no public hazard to residential residential structure 2 2 1 2 2 1 1 3 3 2 2 2 2 2 1 2 1 1 2 1 1 structure or road (publi road or a public health health hazard or private) or public hazard. health hazard. 1 to 2 ancillary Risk to Property What is the risk for 3.0 no structures or roads one or more property damage? risk is only to land structures, undergrou eighborhood residen 1 2 2 2 2 2 2 1 2 2 3 3 3 3 3 1 1 3 2 1 erosion or flooding of utility or private road is dwelling or public road i one or more yards at risk Situation is slowly at risk Rate of Degradation/Project Situation is rapidly Is the situation getting 2.0 Situation has and is worse quickly? How imminent is significant expected to getting worse and damage could occur getting worse and there is significant damage of Urgency approximately remain 2 3 3 3 3 3 3 2 2 2 2 2 2 2 2 2 2 3 2 3 1 damage/failure? the same and damage soon risk if not completed will not occur in the nea (e.g., rusted culvert future. likely to fail soon) Flows and/or Size of Drainage <30 acres How large is the tributary 30 to 80 acres > 80 acres 1 2 2 2 3 3 3 1 1 1 1 1 3 1 3 1 3 3 1 1 rainage area? o what degree does the Area Benefit to water Benefit to water Benefit to water mpact to Water Quality and project help improve water quality and stream habitat quality/habitat will be low for repairing small local quality/habitat will be quality/habitat will be Stream Habitat² medium for repairing high for repairing large watercourse erosion small local watercours scale watercourse problems that have a low rate of degradation erosion problems that have a high rate of erosion problems that have a high rate of 3 2 3 2 2 3 3 3 3 2 2 2 3 2 3 2 1 2 1 2 1 degradation; or for degradation. repairing large scale erosion problems that have a low rate of degradation. dium. "Avoided cost Cost Effectiveness How does the project Doesn't Apply (can' Low. "Avoided cost " High. "Avoided cost" avoided cost1 compare to quantify the avoided less than expected "project cost" (if avoided is approximately the same as expected higher than expected "project cost" (if avoide the project cost? cost) 3 3 3 3 3 3 3 2 2 3 3 3 3 2 2 3 2 1 2 1 2 cost can be computed) "project cost" (if avoided cost can be computed cost can be computed) Special Opportunity Would the opportunity to Yes No do this project go away (either because of other 0 0 0 0 0 3 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 development, or unique inding source)? I reduction in Reduction in Maintenance How much would the ise in Mai Moderate reduction in Significant reduction in improvements reduce the City's current M&O costs? Cost costs M&O costs (\$1,000 to M&O costs (\$>4,000/y 1 2 2 1 1 and Operation Costs 2 3 2 2 1 1 1 1 2 2 1 1 2 1 (< \$1,000/yr) \$4,000/yr) Neighborhood Has the City received 0 property owner 1 or 2 property owne 3 or 4 property own 5 or more property 2 0 2 0 0 0 0 0 2 3 1 0 0 1 0 1 1 0 0 dvocacy/Complaints complaints about the complaints received complaints received complaints received owner complaints blem? received How large is the permittin effort (HPA, watercourse ermitting Effort High Medium Low 2 3 2 2 3 2 2 2 2 2 2 1 1 3 3 2 3 1 2 2 2 variance, etc.)? Overall Project Cost How does the project cost High. Cost is high Medium. Cost is Low. Cost is low relativ compare to that of other similarly ranked projects? ative to other simila ranked projects comparable to other similarly ranked project to other similarly ranke projects 2 2 3 2 2 3 2 2 3 2 1 2 3 2 3 3 3 1 29 53 52 43 43 41 40 39 39 39 38 37 36 35 32 31 30 30 29 29 Project Total Score (severity x weighting factor) 41 roject Cost (Rounded to nearest \$1000) \$959 \$444 \$1,061 \$195 \$54 \$64 \$115 \$105 \$179 \$198 \$12 \$200 \$109 \$45 \$13 \$70 \$122 \$77 \$45 \$34 \$38

Notes:

1. Avoided costs are costs associated with any impacts that could result if the project is not implemented.

2. Most projects in Mercer Island that will have a water quality/habitat benefit associated with them are the water course projects since they will reduce the amount of sediment

| 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------|-------------|---------------|---------------|---------------|-------------|
| Project 32b.2 | Project 42.2 | Project 42.8 | Project 42.3 | Project 42.6 | Project 42.9 | Project 46a.4 | Project 42.4 | Project 6.1 | Project 27a.3 | Project 49b.2 | Project 39a.1 | Project 4.1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| 3 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| 2 | 2 | 2 | 1 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| 28 | 27 | 26 | 26 | 26 | 25 | 25 | 25 | 23 | 23 | 22 | 19 | 16 |
| \$55 | \$116 | \$28 | \$91 | \$65 | \$79 | \$99 | \$136 | \$87 | \$120 | \$150 | \$28 | \$45 |

Table 7-2 Drainage System CIP Prioritization

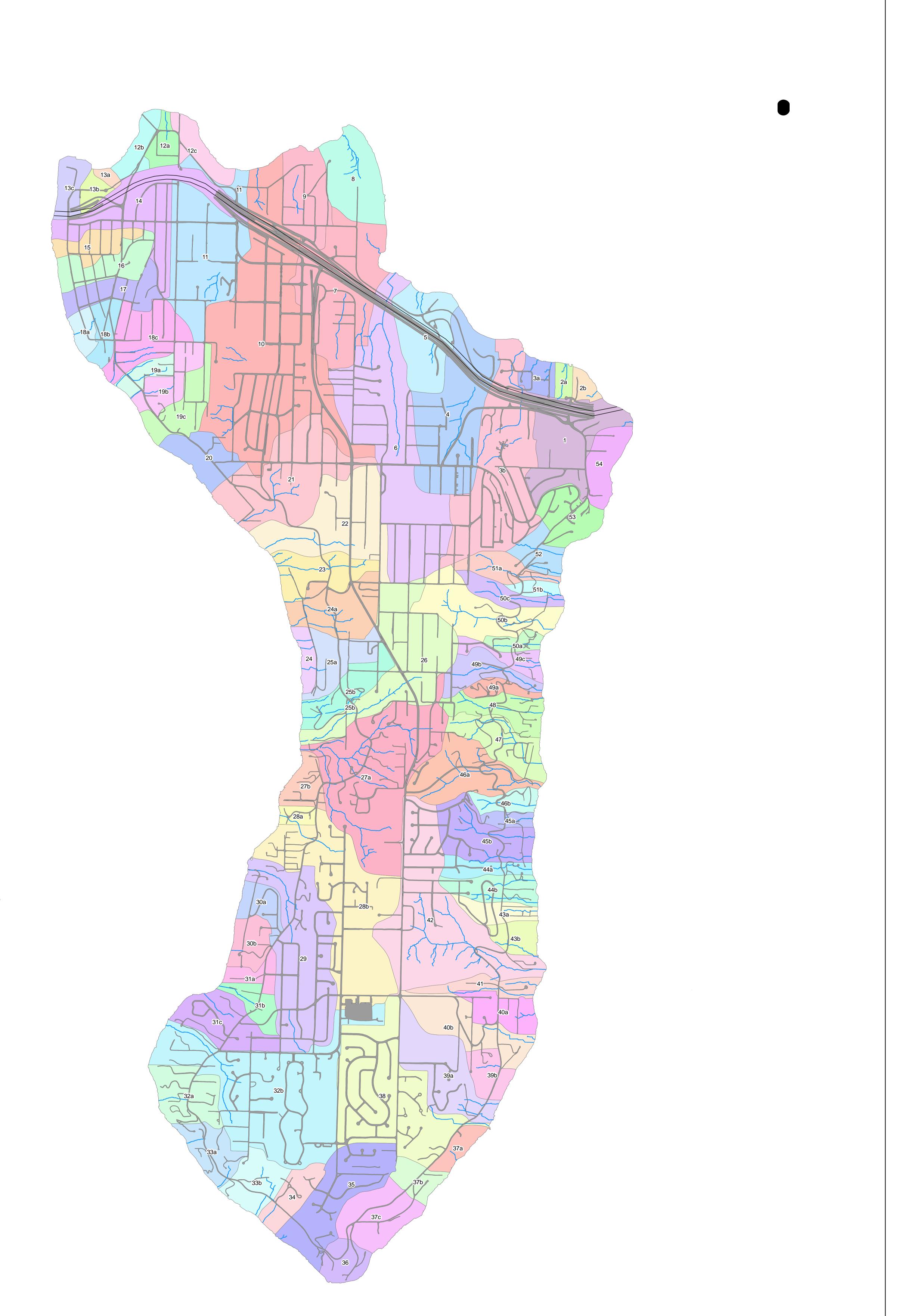
| | | | | | | | | | | Rank | | | | | |
|--|---|-----------|---|--|--|--|--------------|--------------|---------------|--------------|-------------|--------------|--|--|--|
| Criterion | Definition | Weighting | | Sev | erity | | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| | | Factor | 0 (No) | 1 (Low) | 2 (Medium) | 3 (High) | Project 47.1 | Project 29.2 | Project 32a.2 | Project 15.4 | Project 9.3 | Project 18c. | | | |
| Magnitude of the problem | - | | | - | - | - | | | | | | | | | |
| | What is the risk for public health and safety? | 5.0 | None | Low, problem is likely limited to property (land) damage (public or private) and no public health hazard | failure has a potential to be a public safety hazard to residential structure or road (public or private) or public health hazard. | failure can clearly result in public safety hazard to residential structure or road or a public health hazard. | 3 | 2 | 2 | 1 | 0 | 0 | | | |
| Risk to health and safety | | | | | · | | | | | | | | | | |
| Risk to property | What is the risk for property damage? | 3.0 | | no structures or roads risk is only to land erosion or flooding of one or more yards | 1 to 2 ancillary structures, underground utility or private road is at risk | one or more neighborhood residential dwelling or public road is at risk | 3 | 2 | 3 | 1 | 1 | 1 | | | |
| Rate of Degradation/Project Urgency | Is the situation getting worse quickly? How imminent is significant damage/failure? | 2.0 | | Situation has and is expected to approximately remain the same and damage will not occur in the near future . | Situation is slowly getting worse and damage could occur soon | Situation is rapidly getting worse and there is significant damage or risk if not completed (e.g., rusted culvert likely to fail soon) | 2 | 3 | 1 | 2 | 2 | 2 | | | |
| Flows and/or Size of Drainage Area | How large is the tributary | 1.0 | | <30 acres | 30 to 80 acres | > 80 acres | 1 | 2 | 1 | 1 | 1 | 1 | | | |
| Impact to Water Quality and Stream Habitat | drainage area? To what degree does the project help improve water quality and stream habitat? | 2.0 | | Benefit to water quality/habitat will be low for repairing small local watercourse erosion problems that have a low rate of degradation. | Benefit to water quality/habitat will be medium for repairing small local watercourse erosion problems that have a high rate of degradation; or for repairing large scale erosion problems that have a low rate of degradation. | | | 0 | 0 | 0 | 0 | 0 | | | |
| Cost Effectiveness | How does the project avoided cost ¹ compare to the project cost? | 2.0 | Doesn't Apply (can't quantify the avoided cost) | Low. "Avoided cost " is less than expected "project cost" (if avoided cost can be computed) | Medium. "Avoided cost" is approximately the same as expected "project cost" (if avoided cost can be computed) | High. "Avoided cost" is higher than expected "project cost" (if avoided cost can be computed) | 3 | 2 | 2 | 1 | 1 | 1 | | | |
| Special Opportunity | Would the opportunity to do this project go away (either because of other development, or unique funding source)? | | No | | | Yes | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Reduction in Maintenance and Operation Costs | How much would the improvements reduce the City's current M&O costs? | 1.0 | Increase in Maintenance Cost | Small reduction in M&O costs (< \$1,000/yr) | Moderate reduction in M&O costs (\$1,000 to \$4,000/yr) | Significant reduction in M&O costs (\$>4,000/yr) | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Neighborhood Advocacy/Complaints | Has the City received complaints about the problem? | 1.0 | 0 property owner complaints received | 1 or 2 property owner complaints received | 3 or 4 property owner complaints received | 5 or more property owner complaints received | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Permitting Effort | How large is the permitting effort (HPA, watercourse variance, etc.)? | 1.0 | | High | Medium | Low | 3 | 3 | 3 | 3 | 3 | 3 | | | |
| Overall Project Cost | How does the project cost compare to that of other similarly ranked projects? | 1.0 | | High. Cost is high relative to other similarly ranked projects | Medium. Cost is comparable to other similarly ranked projects | Low. Cost is low relative to other similarly ranked projects | 1 | 2 | 3 | 1 | 3 | 1 | | | |
| Project Total Score (severity x weighting factor) | | | | | | | 39 | 33 | 32 | 19 | 16 | 14 | | | |
| | | | | | | | | | | | | <u>.</u> | | | |
| | | | | | | | | | | | | | | | |

Notes: 1. Avoided costs are costs associated with any impacts that could result if the project is not implemented.

LIST OF PLATES

- Plate 1 Study Area
- Plate 2 Geology and Landslides
- Plate 3 Erosion Susceptibility
- Plate 4 Erosion and Drainage Problems





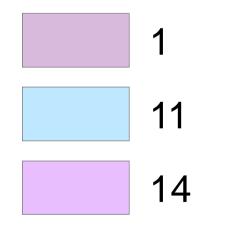






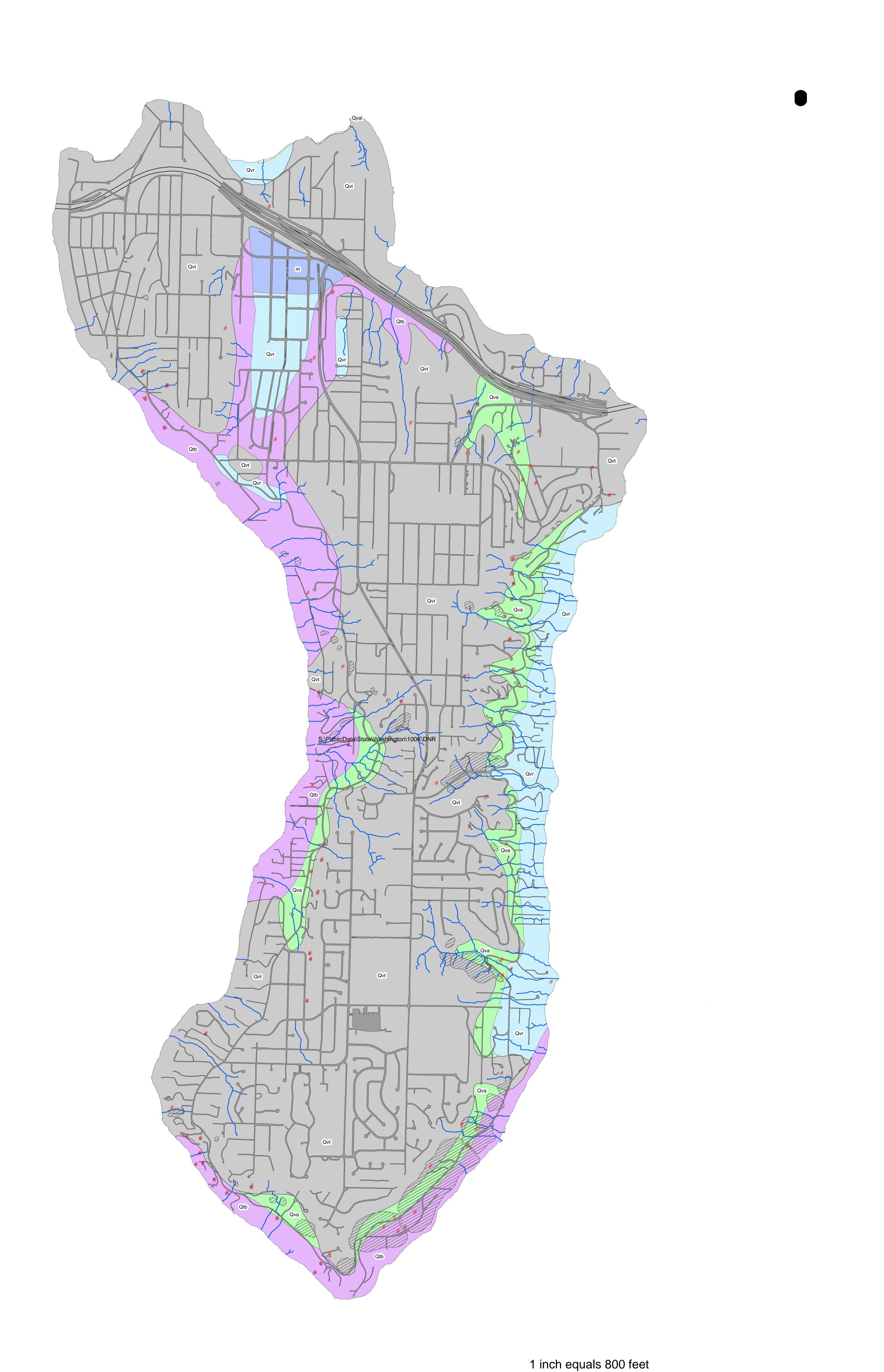
Watershed Subbasins

Basin Number



4,000 6,000 8,000 1,000 2,000 10,000 0 E Feet 1 Miles 0.5 By Check Rev GEOENGINEERS Revision Description Date Notes: Data Sources: Imagery and LiDAR data obtained from King County GIS. Orthophotography has 15 cm pixel resolution. LiDAR data interpolated to DEM with 3 feet GSD. Coordinate System is Washingto State Plane North (HARN) Feet, projected to Horizontal Datum NAND83; Vertical Datum is NAVD88. Digital Terrain Model (DTM) created by GeoEngineers from LiDAR ground points. All LiDAR derivative grid data sets generated by GeoEngineers using ESRI Spatial Analyst or 3D-Analyst Extension. Derivative vector data sets and other generated layers created and subsequently edited or modified using EditTools Vs. 9.1. R'W'BEC PLATE **STUDY AREA** This map is for information purposes only. It is intended to show the approximate location of features such as water bodies, streams, drains and roads relative each other and to local topography in the vicinity. Accuracy and completeness are limited by the integrity of the orignal data, the sources of which do not guarantee the same beyond accuracies specified in the metadata. While due care and attention has been applied within the time and budget available to generate the informatin depicted on this map, by using the information for design or engineering purposes, the user acknowledges the inherent limitations and relative inaccuracies of the underlying data and assumes all risk and liability for relations there on rany deficiencies that may manifest in a final work product. Data Projection to: Washington State Plane North (HARN) Feet. NAD1983. Earth Science + Technology think. challenge. change. 1 Mercer Island, WA 8410 154th Ave NE Redmond, WA 98052 Ph. (425-861-6000) Fx. (425-861-6050) 1001 4th Ave Redmond, WA 98052 Ph. (206-695-4700) Fx. (206-695-4701)

1 inch equals 800 feet



Legend

Landslide Locations #



800 1,600 3,200 4,800 6,400 8,000 9,600 0.5 1 Miles By Check Rev GEOENGINEERS Description Revision Date Notes: Data Sources: Imagery and LiDAR data obtained from King County GIS. Orthophotography has 15 cm pixel resolution. LiDAR data interpolated to DEM with 3 feet GSD. Coordinate System is Washingto State Plane North (HARN) Feet, projected to Horizontal Datum NAND83; Vertical Datum is NAVD88. Digital Terrain Model (DTM) created by GeoEngineers from LiDAR ground points. All LiDAR derivative grid data sets generated by GeoEngineers using ESRI Spatial Analyst or 3D-Analyst Extension. Derivative vector data sets and other generated layers created and subsequently edited or modified using EditTools Vs. 9.1. R'W'BECI **GEOLOGY AND LANDSLIDES** PLATE This map is for information purposes only. It is intended to show the approximate location of features such as water bodies, streams, drains and roads relative each other and to local topography in the vicinity. Accuracy and completeness are limited by the integrity of the orignal data, the sources of which do not guarantee the same beyond accuracies specified in the metadata. While due care and attention has been applied within the time and budget available to generate the informatin depicted on this map, by using the information for design or engineering purposes, the user acknowledges the inherent limitations and relative inaccuracies of the underlying data and assumes all risk and liability for relations there on rany deficiencies that may manifest in a final work product. Data Projection to: Washington State Plane North (HARN) Feet. NAD1983. CITY OF MERCER ISLAND Earth Science + Technology think. challenge. change. 2 8410 154th Ave NE Redmond, WA 98052 Ph. (425-861-6000) Fx. (425-861-6050) 1001 4th Ave Seattle, WA 98154 Ph. (206-695-4700) Fx. (206-695-4701)



Legend

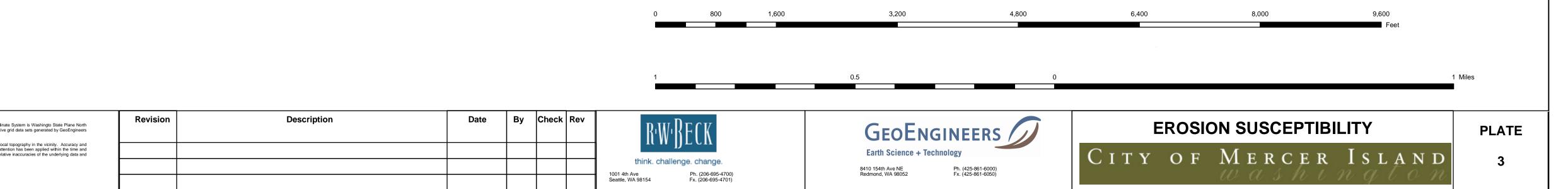
Roads



Erosion Susceptibility

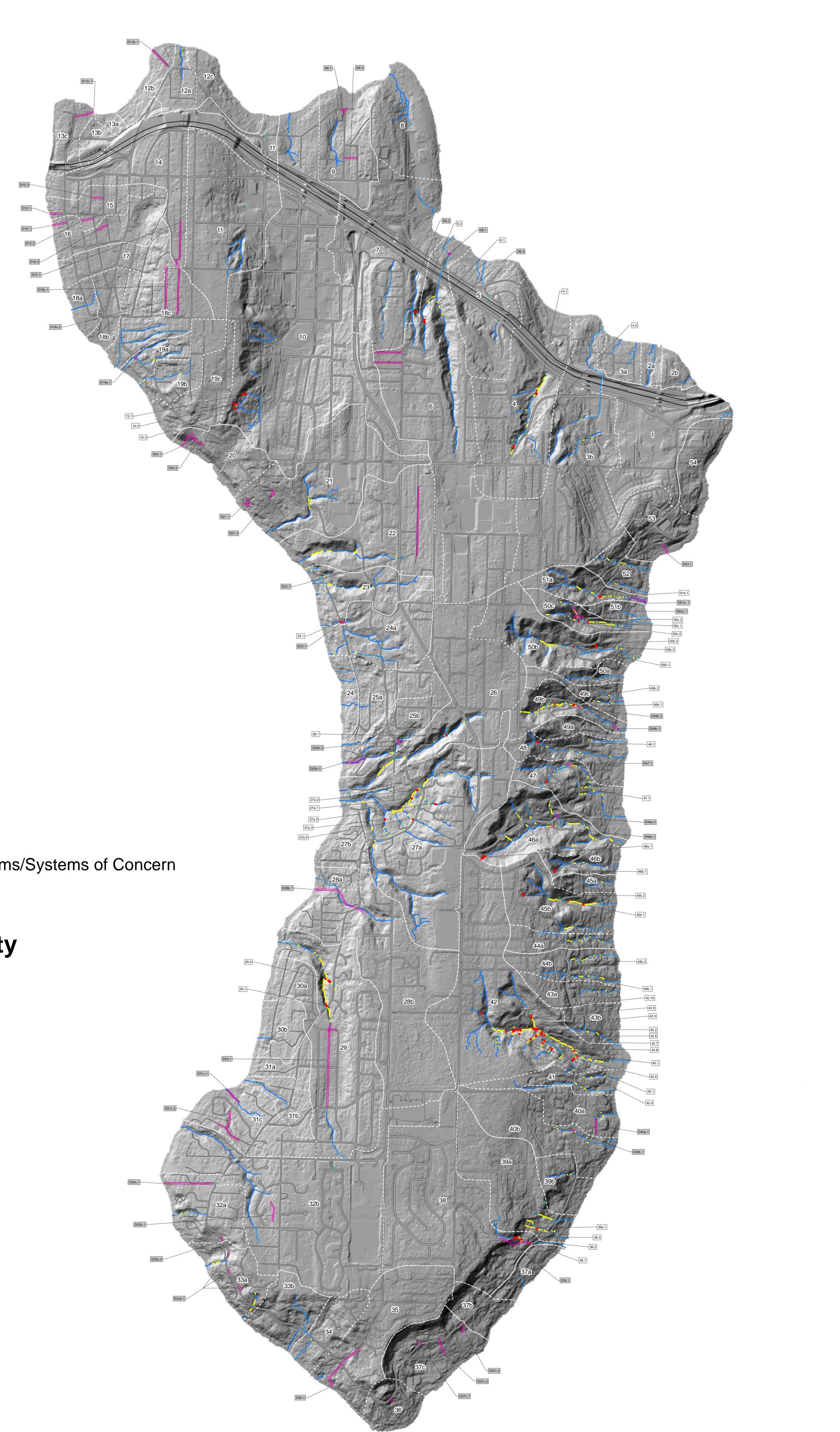
Low Moderate High

1 inch equals 800 feet



Notes: Data Sources: Imagery and LIDAR data obtained from King County GIS. Orthophotography has 15 cm pixel resolution. LiDAR data interpolated to DEM with 3 feet GSD. Coordinate System is Washingto State Plane North (HARN) Feet, projected to Horizontal Datum NAD83; Vertical Datum is NAVD88. Digital Terrain Model (DTM) created by GeoEngineers from LIDAR ground points. All LIDAR derivative grid data sets generated by GeoEngineers using ESRI Spatial Analyst or 3D-Analyst Extension. Derivative vector data sets and other generated layers created and subsequently edited or modified using EditTools Vs. 9.1.

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Legend

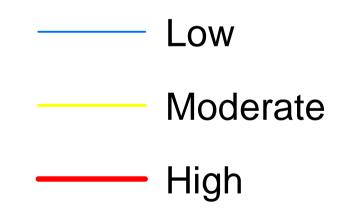




Problem Drainage Systems/Systems of Concern

Drainage Hot Spots

Erosion Susceptibility



| | | | | | 1 inch equals 800 fe | et. | | |
|------|-------|-----|---------------------------|----------------------------|----------------------|--------------|-----------------|---------|
| | | | 0 800 1,6 | 00 3,200 | 4,800 | 6,400 | 8,000 9,600 | |
| | | | | | | | | |
| | | | 1 | 0.5 | 0 | | | 1 Miles |
| By (| Check | Rev | B ·W· B ECK | GeoEngin | EERS | EROSION & DR | AINAGE PROBLEMS | PLATE |
| | | | think. challenge. change. | Earth Science + Technology | | City of M | ercer Island | 4 |

Notes: Data Sources: Imagery and LiDAR data obtained from King County GIS. Orthophotography has 15 cm pixel resolution. LiDAR data interpolated to DEM with 3 feet GSD. Coordinate System is Washingto State Plane North (HARN) Feet, projected to Horizontal Datum NAD83; Vertical Datum is NAVD88. Digital Terrain Model (DTM) created by GeoEngineers from LiDAR ground points. All LiDAR derivative grid data sets generated by GeoEngineers using ESRI Spatial Analyst or 3D-Analyst Extension. Derivative vector data sets and other generated layers created and subsequently edited or modified using EditTools Vs. 9.1.

Revision

Description

Date

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COMPREHENSIVE BASIN REVIEW AND WATERCOURSE MONITORING

VOLUME 2 - APPENDICES

City of Mercer Island

in association with GeoEngineers, Inc.

December 2006



Appendix A PHASE 1 COST ESTIMATES



Summary of Unit Cost

| Solution Type | Access | Unit | Construction Cost | Construction Contingency (40%) | Subtotal | Engineering/ Admin/Permi tting (@45%) | Total | Rounded | Minimum (if applicabl | |
|-------------------------------|-------------------------|------|----------------------|-----------------------------------|----------|---|----------|----------|-----------------------------|--|
| | | | | | | | | Houndou | •/ | |
| Stabilize Knickpoint | Difficult Access | Ea | \$40,000 | \$16,000 | \$56,000 | \$25,200 | \$81,200 | \$80,000 | | |
| Stabilize Knickpoint | Non-Difficult Access | EA | \$15,000 | \$6,000 | \$21,000 | \$9,450 | \$30,450 | \$30,000 | | |
| Outfall Stabilization | | EA | \$8,000 | \$3,200 | \$11,200 | \$5,040 | \$16,240 | \$16,000 | | |
| Instream | | | | | | | | | | |
| Stabilization | Difficult Access | LF | \$900 | \$360 | \$1,260 | \$567 | \$1,827 | \$1,800 | \$15,000 | Based on two redmond projects |
| Instream Stabilization | Non-Difficult Access | LF | \$700 | \$280 | \$980 | \$441 | \$1,421 | \$1,400 | \$15,000 | Based on two redmond projects |
| High Flow Bypass | | LF | \$400 | \$160 | \$560 | \$252 | \$812 | \$800 | | Based on surface HDPE pipeline and new stream work |
| Field Inpsection | | LF | \$4 | | | | | | \$800 | \$2 for tv plus 1/2 field crew of 2 |
| Simple System Replacement | | LF | \$200 | \$80 | \$280 | \$126 | \$406 | \$400 | | Up to 18-inch pipe. Includes roadway restoration. |
| Complex System Replacement | | LF | \$300 | \$120 | \$420 | \$189 | \$609 | \$600 | | Greater than 18-inch pipe, tight conditions, deep. |
| Culvert Replacement | | LF | \$900 | \$360 | \$1,260 | \$567 | \$1,827 | \$1,800 | | Based on 8' cmp arch, 60' long, 12 deep |

۰.

Appendix B EROSION GIS ATTRIBUTE TABLES



HIGH EROSION POTENTIAL AREAS TABLE

| Image: Provide state Image: Provide state Stope Stope Stope Provide state Provide state | Deale | | Tat | Russent | | Minle | r | - · | | | | 1 | ···· |
|---|------------|--------|-----|---------|---------|---------|-------------|------------|-------|---------|---------------------------------------|--------|---|
| 4. 4.1 50 90 0.00 > 4490 yrs Embin Downaling 12 Channel indicirchane contined by large in 4.2 4. 4.2 6 4.4 4.4 6 4.2 1.4 1.0 1. | Basin # | l abol | Tot | Suscept | Geology | Nick | Convertity | Slope | Slida | Outfall | Known Broblom | Length | Broh Type |
| 4 4.2 4.2 4.9 1.4 0.7 4.96 1.0 | | | | | | μι | COnvertig | | | Outian | | | |
| 6 6.1 6.2 7 0.1 Ensept Devnoting 100 Ince point and incidence 6 6.2 9 4 Ort Vest Anticet 7 Vest Anticet 10 6.1 9 4 Ort Vest Anticet 7 Vest Anticet 10 6.1 12 Ort Vest Anticet 7 Vest Anticet 10 6.1 12 12 0.1 Vest Anticet 7 Vest Anticet 10 6.2 12 12 0.0 Vest Anticet 7 Vest Anticet 10 10.1 12 12 0.0 Vest Anticet 12 12 Vest Anticet 12 Vest Anticet 12 12 12 12 Vest Anticet 12 Vest Antice 12 <td< td=""><td></td><td></td><td>_</td><td></td><td></td><td>ves</td><td></td><td></td><td></td><td></td><td>Erosion Downcatting</td><td></td><td></td></td<> | | | _ | | | ves | | | | | Erosion Downcatting | | |
| d. d. 2. 39 4. Ort yes 0 150 162 47 lock and 10 10.2 47 12.4 0.4 yes 10 10.5 10 10.5 10 10.5 10 10.5 10 10.5 10 10.5 10 10.5 10 10.5 | 6 | | | | | | | | | | Erosion Downcutting | | |
| 10 102 4.7 17.1 15.7 15. | 6 | 6.2 | 39 | 4 | Qvt | yes | | 0 - 15% | no | | ŭ | 47 | · · · · · · · · · · · · · · · · · · · |
| 10 103 30 4 Ord yes | 10 | 10.1 | 39 | 4 | Qvt | yes | | 0 - 15% | no | | | 65 | knick point |
| 10 20.1 52. 17.1 Orth print 19 Vick point 19 27.8 7.8.1 50 300 Ore 211-37.3 240.5 70 Ferrison Downsulting 3 Charnel Insiden 27.8 27.8 50 30 Over 211-37.3 240.5 70 Ferrison Downsulting 3 Charnel Insiden 27.8 27.8 20 31 30 0.0 Ver 211-37.5 Version Downsulting 3 Ontered Insiden 27.8 28.0 30 30 Over 211-37.5 Version Downsulting 3 Ontered Insiden 28.2 30 30 Over 221-137.5 Version Downsulting 4 Ontered Insiden 28.2 30 30 Over 221-137.5 Version Downsulting 3 Ontered Insiden 38.3 40 7 C2 Over Version Downsulting 4 Ontered Insiden 38.3 40 92 C2 Ove | 10 | 10.2 | 47 | 12 | Qvt | yes | 21.1 - 37.5 | 15 - 30% | no | | | 27 | knick point and incision |
| 128 281 580 290 100 yee 14 Inth print pricing 278 | | | | | | yes | | | no | | | 85 | knick point |
| T2B T2A T2A <tht2a< th=""> <tht2a< th=""> <tht2a< th=""></tht2a<></tht2a<></tht2a<> | | | | | | | | | | | Erosion Downcutting | | • |
| 278 278.2 30 30 Orea 211-37.5 540% no Final Endom 12 Channel Invision 278 278.4 30 30 Ova 211-37.5 540% no 10 Verick point 278 278.4 30 30 Ova 211-37.5 540% no 2 Outfall Focusion 28 30 30 Ova 211-37.5 540% no Ension Downcating 2 Outfall Focusion 29 212 07 22 Ova 211-37.5 240% no Ension Downcating 4 Outfall Focusion 38 38.1 30 Ova 211-37.5 240% yes 4 Verick point and incision 38 38.3 40 7 Ovd yes 10 Outfall Focusion 6 Outfall Focusion 38 38.3 40 14 Ovd yes 10 Outfall Focusion 10 Verick point and incision <t< td=""><td></td><td></td><td></td><td></td><td></td><td>yes</td><td></td><td></td><td></td><td>yes</td><td></td><td></td><td></td></t<> | | | | | | yes | | | | yes | | | |
| 278 278.3 50 10 13 Initial feature 278 274.5 47 12 0.44 9.40 9.40 9.40 20 0.41 Ension 278 274.5 47 12 0.44 9.40 70 9.40 30 0.40 9.40 30 0.40 12 12.1 | | | | | | | | | | | | | |
| 170 1774 178 178 171 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>21.1 - 37.5</td> <td></td> <td></td> <td></td> <td>Erosion Downcutting</td> <td></td> <td></td> | | | | | | | 21.1 - 37.5 | | | | Erosion Downcutting | | |
| 278 778.5 47 172 Ord Part 1 Output State State< | | | | | | yes | 211-375 | | | VAS | | | · · · · · · · · · · · · · · · · · · · |
| 29 29.1 30 Own 21.1 > 24.0% no. Lyse Erosion Downcutton 32.2 Outfail Erosion 29 28.2 30 30 Ovn 21.1.77.5 > 40% no. Erosion Downcutton 3 Channel Incision 29 28.2 30 30 Ovn 21.1.77.5 > 40% No. Erosion Downcutton 4 Encloped 38 30.0 30 Ovn 21.1.77.5 > 40% No. Substandard System 11 Channel Incision 38 38.3 40 20 Ovn Yes > 40% No. Erosion Downcutton 5 Nink point and Incision 38 38.3 47 12 Ovn Yes > 40% No. Erosion Downcutton 5 Nink point and Incision 38 38.3 47 12 Ovn Yes > 40% No. Erosion Downcutton 3 Nink point and Incision 38 38.3 49 14 | | | | | | ves | 2111-01.0 | | | yc5 | | | |
| Base Base Qva 21.1.37.6 9.40% no Erosion Downuting 4 Channel Inciden 28 28.2 37 22 07w 22 07w 22 07w 22 07w 22 07w 21.1.37.5 40% no Erosion Downuting 4 Biselin 0.00 0.00 0.00 0.00 1 0.00 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>ves</td> <td>Erosion Downcutting</td> <td></td> <td></td> | | | | | | | | | | ves | Erosion Downcutting | | |
| 29 29.2 67 22 CVar yes 4.0% no 1 1 Channel Incision 38 38.1 30 30 Ovar 21.1 - 37.5 > 40%, yes Subthaderd System 5 Channel Incision 38 38.3 0.2 Ovar 21.1 - 37.5 > 40%, yes 4 Inck point and Incision 38 38.3 40 0.2 Ovar yes 1 5 Inck point and Incision 38 38.3 42 7 Qut yes > 40%, no 1 5 Inck point and Incision 38 38.3 47 12 Out yes > 40%, no 1 4 Inck point and Incision 38 38.3 46 12 Out yes > 40%, no 1 4 Inck point and Incision 38 38.3 40 14 Out yes 4.721 > 40%, no 1 4 Inck point and Incision 38.3 40 | 29 | 29.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | | 1 |
| 38 39.1 30 Cova 21.1.37.5 30%; res Substandard System 11. Channel Incision 38 38.3 00 25 Ova yes > 40%; res 4 kink pint and incision 38 38.3 42 7 Ovit yes 15.30%; no 5 No 5 kink pint and incision 38 38.3 42 7 Ovit yes 3.40%; no 5 kink pint and incision 38 38.3 47 12 Ovit yes > 40%; no 6 6 Hink pint and incision 38 38.3 47 12 Ovit yes > 40%; no 1 4 Hink pint and incision 38 38.3 49 14 Ovit yes 2.40%; no 1 4 Hink pint and incision 38 38.3 44 14 Ovit yes 1.721 1.90%; no 1 1 Hink pint and incision 38 38.3 | 29 | 29.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 3 | Channel Incision |
| 38 39.2 90 Ora 211-375 > 40% yes 0 5 Channel Incision 38 38.3 42 7 Ovt yes 15.30% no 5 Nick point and incision 38 38.3 44 9 Ovt yes 32.40% 0 2 Nick point and incision 38 38.3 47 12 Ovt yes 32.40% 0 5 Nick point and incision 38 38.3 47 12 Ovt yes 30.40% no 14 Nick point and incision 38 38.3 49 14 Ovt yes 3.40% no 2 Nick point and incision 38 38.3 49 14 Ovt yes 1.72 >40% no 2 Nick point and incision 38 38.3 49 14 Ovt yes 1.72 >40% no 2 Nick point and incision 38.3 | | 29.2 | 57 | | Qva | yes | 4.7-21 | > 40% | no | | | 46 | knickpoint |
| 38 39.3 90 25 Ora yes 42 74 44 1612 gold 38 38.3 44 9 Ord yes 39.40% no 25 1616 gold and inciden 38 38.3 47 12 Ord yes > 40% no 25 1616 korit kopint and inciden 38 38.3 47 12 Ord yes > 40% no 15 1616 kopint and inciden 38 38.3 47 12 Ord yes > 40% no 15 1616 kopint and inciden 38 38.3 49 14 Ord yes 211.375 30.40% no 2 1616 kopint and inciden 38 38.3 49 14 Ord yes 211.375 30.40% no 2 1616 kopint and inciden 38 38.3 49 14 Ord yes 240% no 2 1616 kopint and inciden 38 38.3 49 14 | | | | | | | | | yes | | Substandard System | | |
| 38 38.3 42 7 Out yes 15 30% no 5 brick point and inciden 38 38.3 47 12 Out yes > 40% no 5 brick point and inciden 38 38.3 47 12 Out yes > 40% no 5 brick point and inciden 38 38.3 47 12 Out yes > 40% no 14 brick point and inciden 38 38.3 47 12 Out yes 34.40% no 14 brick point and inciden 38 38.3 49 14 Out yes 3.40% no 1 brick point and inciden 38 38.3 49 14 Out yes 4.721 > 40% no 2 brick point and inciden 38 38.3 49 14 Out yes 4.721 3.0% no 2 brick point and inciden | | | | | | | 21.1 - 37.5 | | . 1 | | | | |
| 38 38.3 44 9 Ord yes 32.40% no 2 Switz point and inciden 38 38.3 47 12 Ord yes > 40% no 15 Writz point and inciden 38 38.3 47 12 Ord yes > 40% no 15 Writz point and inciden 38 38.3 47 12 Ord yes > 40% no 15 Writz point and inciden 38 38.3 49 14 Ord yes 211-37.5 30-40% no 2 Writz point and inciden 38 38.3 49 14 Ord yes 211-37.5 30-40% no 4 Writz point and inciden 38 38.3 49 14 Ord yes 4.721 30-40% no 4 Writz point and inciden 38 38.3 40 14 Ord yes 4.721 30-40% no 4 Kritz poi | | | | | | · · · · | | - | | | | | |
| 38 38.3 47 12 Ort yes > 40% no 5 Inick point and incision 38 38.3 47 12 Ort yes > 40% no 15 Nick point and incision 38 38.3 49 14 Ort yes 20 - 40% yes 14 Nick point and incision 38 38.3 49 14 Ort yes 21.1 - 37.5 20 M% no 2 Nick point and incision 38 38.3 49 14 Ort yes 47.21 > 40% no 1 Nick point and incision 38 38.3 49 14 Ort yes 47.21 > 40% no 2 Nick point and incision 38 38.3 44 9 Ort yes 47.21 30.40% no 2 Nick point and incision 38 38.3 48 14 Ort yes 47.21 30.40% no 2 Nick point and incision 39 39.30 30.30 Ova 21.1 - 37 | | | | | | -Y- | | | | | | | |
| 38. 39.3 47 12 Ort yes > 40% no 15 Nick point and maxim 38. 39.3. 47 12 Ort yes > 40% no 14 Nick point and maxim 38. 39.3. 49 14 Ort yes 1.1 37.5 > 40% no 1 Nick point and maxim 38. 39.3. 49 14 Ort yes 1.1 37.5 > 40% no 2 Nick point and maxim 38. 38.3. 49 14 Ort yes 4.721 > 20% no 4 Nick point and maxim 38. 38.3. 49 14 Ort yes 4.721 > 20% no 2 Nick point and maxim 38. 38.3. 49 14 Ort yes 4.721 > 20% no 2 Nick point and maxim 39.3.1 30.30 Ort yes 4.721 > 20% no 0 Diration 16 Nick point and maxim 39.3.1 30.30 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<> | | | | | | | | | | | | | |
| 38 38.3 47 12 Ort yes > 40% not 14 Nick point and incision 38 38.3 49 14 Ort yes 21.1-37.5 30.40% no 3 3 Nick point and incision 38 38.3 49 14 Ort yes 11.37.5 30.40% no 2 Nick point and incision 38 38.3 49 14 Ort yes 47.21 > 40% no 4 Nick point and incision 38 38.3 49 14 Ort yes 47.21 > 40% no 2 Inick point and incision 38 38.3 49 14 Ort yes 4.721 > 40% no 4 Nick point and incision 38 38.3 130 30 Ora 21.1-37.5 > 40% yes 0 Othall point and incision 38.4 39.1 30 Ora 21.1-37.5 > 40% yes 4 Nick point and incision 42 42.2 30 Ora <t< td=""><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<> | | | | - | | | | | | | | | |
| 38 39.3 49 14 Ovt yes 30 40 14 Vert yes 10 4 knick point and incision 38 38.3 49 14 Ovt yes 11.375 5 40% no 2 knick point and incision 38 38.3 49 14 Ovt yes 47.21 > 40% no 2 knick point and incision 38 38.3 49 14 Ovt yes 47.21 > 50% no 2 kinck point and incision 38 38.3 46 11 Ovt yes 47.21 > 50% no 2 kinck point and incision 39 39.3 130 30 Ovt yes 47.21 > 60% yes yes 0 Charial incision 39 39.3 130 30 Ova 211.375 5 40% yes yes 2 Outfall crosion and channel incision 42 42.2 30 | | | | | | | | | | | | | |
| 38 38.3 49 14 Ovt yes 211.375 > 40% no 2 knick point and inciden 38 38.3 49 14 Ovt yes 47.21 > 40% no 1 knick point and inciden 38 38.3 49 14 Ovt yes 47.21 > 40% no 4 knick point and inciden 38 38.3 49 14 Ovt yes 47.21 > 30% no 2 knick point and inciden 38 38.3 49 14 Ovt yes 4.721 30.40% no 2 knick point and inciden 38 38.3 49 14 Ovt yes 4.721 30.40% pe 9 9 2 knick point and inciden 398 38.1 30 30 Cvar 211.375 30% yes Erosion Downouting To caroin Inciden 10 indiano 10 indianone 10 indian | | | | | | | | | | | | | |
| 38 39.3 52 17 Qut yes 21.1 37.5 > 40% no 2 kink point and incision 38 38.3 49 14 Qut yes 4.721 > 40% no 1 kink point and incision 38 38.3 44 9 Qut yes 4.721 15.30% no 2 kink point and incision 38 38.3 46 11 Qut yes 4.721 15.30% no 2 kink point and incision 38 38.1 30 30 Qut 4.721 3.40% yes yes 0 Outfall Erosion 38a 38a.1 30 30 Qut 21.1-37.5 44% yes yes 2 Outfall Erosion 38a 38a.1 30 Qut 25 Qut 2.1-37.5 44% yes yes Hot Spots 3 Channel Incision 42 42.2 30 Qut | | | | | | * | 21.1 - 37.5 | | | | | | |
| 33 33.3 49 14 Ord yes 47-21 5-40% no 2 knick point and incision 33 33.3 46 11 Out yes 47-21 5-30% no 2 knick point and incision 33 33.3 46 14 Out yes 4.7-21 5-40% yes yes 5 Outfail Erosion 38 38.3 49 14 Out yes 4.7-21 >40% yes yes 5 Outfail Erosion 398 38.1 30 Ova 21.1-37.5 >40% yes yes 0 Channel Incision 42 42.1 30 Ova 21.1-37.5 >40% yes Hot Spots 3 Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40% yes Hot Spots 3 Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40% yes Hot Spots 3 Channel Incision 42 42.2 30< | 38 | 38.3 | 52 | 17 | Qvt | yes | 21.1 - 37.5 | > 40% | no | | | 2 | |
| 33 33.3 44 9 Ord yes 47.21 15 - 30%, no 2 Inick point and incision 33 38.3 46 11 Ord yes 47.21 30 - 40%, no 2 Inick point and incision 38 38.3 49 14 Ord yes 4.721 >40%, no 4 Inick point and incision 398 38.1 30 30 Ova 2.11 - 37.5 >40%, yes 9 0 Channel Incision 398 38.1 30 30 Ova 2.11 - 37.5 >40%, yes yes Hot Spots 2 Cutral Incision/channel Confined by large lan 42 42.2 30 30 Ova 2.11 - 37.5 >40%, yes Hot Spots 3 Channel Incision 42 42.2 30 30 Ova 2.11 - 37.5 >40%, yes Hot Spots 13 Channel Incision 42 42.2 30 30 Ova 2.11 - 37.5 >40%, yes Erosion Downcutting </td <td>38</td> <td>38.3</td> <td>49</td> <td>14</td> <td>Qvt</td> <td>yes</td> <td>4.7-21</td> <td>> 40%</td> <td>no</td> <td></td> <td></td> <td>1</td> <td>knick point and incision</td> | 38 | 38.3 | 49 | 14 | Qvt | yes | 4.7-21 | > 40% | no | | | 1 | knick point and incision |
| 38 38.3 48 11 Ovt yes 4.7.21 30 -40% no 2 knick point and incision 38 38.1 30 30 Ova 21.1-37.5 >40% yes yes 0 Outfall Frosion 39a 38a.1 30 30 Ova 21.1-37.5 >40% yes yes 0 Channel Incision 42 42.1 30 30 Ova 21.1-37.5 >40% yes Yes Outfall crosion and channel Incision 42 42.1 30 Ova 21.1-37.5 >40% yes Hot Spots Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40% yes Hot Spots 1 Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40% yes Erosion Downcuting 7 Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40% yes | 38 | 38.3 | 49 | 14 | Qvt | yes | 4.7-21 | > 40% | no | | | 4 | knick point and incision |
| 38 38.3 49 14 Ovt yes 240% yes yes 5 Outfall Erosion 39a 39a.1 30 30 Ova 21.1-37.5 >40%, yes yes 0 Channel Incision 39a 39a.1 30 30 Ova 21.1-37.5 >40%, yes yes 1 Outfall erosion and channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40%, yes Froston Downcutting 5 Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40%, yes Hot Spots 3 Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40%, yes Erosion Downcutting 7 Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40%, yes Erosion Downcutting 7 Channel Incision 42 42.2 30 30 Ova 21.1-37.5 >40%, yes Erosion Downcutting | | | | | | yes | | | no | | | | knick point and incision |
| 39a 39a.1 30 Ora Join > 40% yes yes 5 Outfall Erosion 39a 39a.1 30 Ova 21.1-37.5 > 40%, yes yes 0 Channel Incision 42 42.1 30 Cva 21.1-37.5 > 40%, yes yes Freeson Downouting 5 Outfall crossion and channel Incision 42 42.1 30 Gva 21.1-37.5 > 40%, yes Hot Spots 3 Channel Incision 42 42.2 30 30 Qva 21.1-37.5 > 40%, yes Hot Spots 2 Channel Incision 42 42.2 30 30 Qva 21.1-37.5 > 40%, yes Hot Spots 13 Channel Incision 42 42.2 30 30 Qva 21.1-37.5 > 40%, yes Erosion Downouting 13 Channel Incision 42 42.2 30 Qva 4.7.21 > 40%, yes Erosion Downouting 13 Channel Incision | - | | | | | - | | | | | | | |
| 39a 39a 30a 25a Our 211.1-37.5 540% yes Erosion Downcutting 5 Toe erosion and chamel Incision 42 42.2 30 30 Ova 211.1-37.5 >40% yes Hot Spots 3 Channel Incision 42 42.2 30 30 Ova 211.1-37.5 >40% yes Hot Spots 3 Channel Incision 42 42.2 30 30 Ova 211.1-37.5 >40% yes Erosion Downcutting 7 Channel Incision 42 42.2 30 30 Ova 211.1-37.5 >40% yes Erosion Downcutting 13 Channel Incision 42 42.2 30 Ova 211.1-37.5 >40% yes Erosion Downcutting 13 | | | | | | yes | 4.7-21 | | | | | | |
| 39a 39a.1 35 35 Ova 211.97.5 > 40% yes res 22 Outfall erosion and channel Incision 42 42.1 30 25 Qw 211.97.5 > 50% yes Erosion Downcutting 5 Toe erosion, landsliding and channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Hot Spots 2 Channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Hot Spots 2 Channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Erosion Downcutting 7 Channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>01.1.07.5</td> <td></td> <td></td> <td>yes</td> <td></td> <td></td> <td></td> | | | | | | | 01.1.07.5 | | | yes | | | |
| 42 42.1 30 25 Qwr 211.375 15.30% yes Erosin Downcutting 5 To e erosion, landsliding and channel Incision 42 42.2 30 30 Qva 211.37.5 > 40%, yes Hot Spots 3 Channel Incision 42 42.2 30 30 Qva 211.37.5 > 40%, yes Hot Spots 2 Channel Incision 42 42.2 30 30 Qva 211.57.5 > 40%, yes Hot Spots 10 Channel Incision 42 42.2 30 30 Qva 211.57.5 > 40%, yes Hot Spots 13 Channel Incision 42 42.2 30 30 Qva 211.37.5 > 40%, yes Erosion Downcutting 13 Channel Incision 42 42.2 30 30 Qva 211.37.5 > 40%, yes Erosion Downcutting 13 Channel Incision 42 42.2 30 30 Qva 211.37.5 > 40%, yes | | | | | | | | | | | | | |
| 42 42.2 30 30 Qva 211.37.5 > 40% yes Hot Spots 3 Channel Incision/channel confined by large lan 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Hot Spots 2 Channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Hot Spots 13 Channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Hot Spots 13 Channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 30 30 Qva 21.1.37.5 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 32 32 Qva 4.7.21 > 40% yes Erosion Downcutting 2 Annel Incision 42 42.2 32 | | | | | | | | | | yes | Erosion Downoutting | | |
| 42 42.2 30 30 Qva 21.1 - 37.5 > 40%, yes Hot Spots 2 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 > 40%, yes Hot Spots 2 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 > 40%, yes Hot Spots 13 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 > 40%, yes Erosion Downcutting 7 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 > 40%, yes Erosion Downcutting 13 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 > 40%, yes Erosion Downcutting 13 Channel Incision 42 42.2 35 35 Qva 4.7-21 > 40%, yes Erosion Downcutting 2 Channel Incision 42 42.2 32 32 Qva 21.1 - 37.5 30.40%, yes Erosion Downcutting 1 Channel Incision 42 42.2 32 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td></t<> | | | | | | | | | - | | | | |
| 42 422 42 42 43 30 Qva 21.1 - 37.5 > 40% yes Hot Spots 10 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 > 40% yes Hot Spots 13 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 7 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 35 30 Qva 4.7-21 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting Channel Incision 42 42.2 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting Channel Incision 42 42.2 32 32 Qva 2.11 - 37.5 30 - 40% yes Erosion Downcutting Chann | | | | | | | | | | | · · · · · · · · · · · · · · · · · · · | | |
| 42 422 422 30 30 Qva 21.1 - 37.5 > 40% yes Hot Spots 13 Channel Incision 42 422 30 30 Qva > 40% yes Erosion Downcutting 7 Channel Incision 42 422. 30 30 Qva > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 35 35 Qva 2.1.1 - 37.5 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 35 35 Qva 4.7.21 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 32 32 Qva 4.7.21 > 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 32 Qva 2.1.1 - 37.5 30 - 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 32 Qva 2.1.1 - 37.5 > 40% yes Erosion Downcutting 0 Channel | | | | | - | | | | | | The opene | | |
| 42 42.2 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 65 30 Qva yes > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 25 35 Qva 4.7.21 > 40% yes Erosion Downcutting 2 Kinkk point 42 42.2 32 Qva 4.7.21 > 40% yes Erosion Downcutting Channel Incision 42 42.2 32 Qva 4.7.21 > 40% yes Erosion Downcutting Channel Incision 42 42.2 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting Channel Incision 42 42.2 32 33 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting Channel Incision 42 42.3 32 32 | | | 30 | | | | | ** | | | Hot Spots | | |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | 42 | 42.2 | 30 | 30 | Qva | | | | | | | | |
| 42 42.2 65 30 Qva yes > 40% yes Erosion Downcutting 26 knick point 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 30 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 30 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 32 Qva 21.1 - 37.5 40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 40% yes Erosion Downcutting 3 Channel Incision 42.4 3.3 <t< td=""><td>42</td><td>42.2</td><td>30</td><td>30</td><td>Qva</td><td>_</td><td>21.1 - 37.5</td><td>> 40%</td><td>yes</td><td></td><td></td><td>3</td><td>Channel Incision</td></t<> | 42 | 42.2 | 30 | 30 | Qva | _ | 21.1 - 37.5 | > 40% | yes | | | 3 | Channel Incision |
| 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 13 Channel Incision 42 42.2 32 Qva 4.7-21 > 40% yes Erosion Downcutting 2 Channel Incision 42 42.2 32 Qva 4.7-21 > 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 Qva 21.1 - 37.5 > 40% | | | | | | | | | yes | | | | |
| 42 42.2 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 2 Channel Incision 42 42.2 30 30 Qva 4.7-21 > 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 30 30 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting <td></td> <td></td> <td></td> <td></td> <td>Qva</td> <td>yes</td> <td></td> <td></td> <td>yes</td> <td></td> <td>Erosion Downcutting</td> <td>26</td> <td>knick point</td> | | | | | Qva | yes | | | yes | | Erosion Downcutting | 26 | knick point |
| 42 42.2 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 30 30 Qva 211.937.5 30.40% yes Erosion Downcutting 4 Channel Incision 42 42.2 32 32 Qva 21.1.37.5 30.40% yes Erosion Downcutting 2 Channel Incision 42 42.2 35 35 Qva 21.1.37.5 30.40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1.37.5 >40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1.37.5 >40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1.37.5 >40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 4.7.21 >40% yes Erosion Downcutting 3< | | | | | | | | | | | | | |
| 42 42.2 30 30 Qva > 40% yes Erosion Downcutting 4 Channel Incision 42 42.2 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 0 Channel Incision 42 42.2 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1< | | | | | | | | | | | | | |
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| 42 42.2 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 15 - 30% yes Eros | | + | | | | | 211.275 | | | | | | |
| 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 30 30 Qva 24.4% yes Erosion Downcutting 1 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td> | | | | | | | | | _ | | | | |
| 42 42.2 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 15 - 30% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 40% yes Erosion Downcuttin | | | | | | | | | | | | | |
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| 42 42.3 32 32 Qva 21.1 - 37.5 30 - 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 15 - 30% yes Erosion Downcutting 7 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 15 - 30% yes Erosion Downcutting 7 Channel Incision 42 42.3 30 30 Qva >40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva >40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva 47.21 >40% yes Erosion Downcutting 2 Channel Incision 42 42.3 32 32 Qva 47.21 >40% yes Erosion Downcutting 2 Channel Incision 42 42.3 32 32 Qva 21.1 - 37.5 >40% yes Erosion Downcutting 3 Channel Incision | 42 | 42.3 | 32 | 32 | Qva | | | | | | | | Channel Incision |
| 42 42.3 30 30 Qva 21.1 - 37.5 15 - 30% yes Erosion Downcutting 7 Channel Incision 42 42.3 30 30 Qva >40% yes Erosion Downcutting 20 Channel Incision 42 42.3 30 30 Qva >40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva >40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva 4.7-21 >40% yes Erosion Downcutting 2 Channel Incision 42 42.3 32 32 Qva 4.7-21 >40% yes Erosion Downcutting 1 Channel Incision 42 42.3 32 32 Qva 4.7-21 >40% yes Erosion Downcutting 1 Channel Incision 42 42.3 35 35 Qva 21.1 - 37.5 >40% yes Erosion Downcutting 3 Channel Incision 42 | | | | | Qva | | 4.7-21 | > 40% | yes | | Erosion Downcutting | 3 | Channel Incision |
| 42 42.3 30 30 Qva va >40% yes Erosion Downcutting 20 Channel Incision 42 42.3 30 30 Qva va >40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva va >40% yes Erosion Downcutting 0 Channel Incision 42 42.3 32 32 Qva 4.7-21 >40% yes Erosion Downcutting 2 Channel Incision 42 42.3 32 32 Qva 4.7-21 >40% yes Erosion Downcutting 1 Channel Incision 42 42.3 32 32 Qva 4.7-21 >40% yes Erosion Downcutting 1 Channel Incision 42 42.3 35 35 Qva 21.1-37.5 >40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1-37.5 >40% yes Erosion Downcutting 4 Channel Incisi | | | | | | | | | yes | | v | | |
| 42 42.3 30 30 Qva > 40% yes Erosion Downcutting 10 Channel Incision 42 42.3 30 30 Qva > 40% yes Erosion Downcutting 0 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 2 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Frosion Downcutting 4 Channel Incision 42 42.4 57 22 Qvt 21.1 - 37.5 > 40% yes Erosion Downcutting 12 knick point | | | | | · · | | 21.1 - 37.5 | | yes | | | | |
| 42 42.3 30 30 Qva >40% yes Erosion Downcutting 0 Channel Incision 42 42.3 32 32 Qva 4.7-21 >40% yes Erosion Downcutting 2 Channel Incision 42 42.3 32 32 Qva 4.7-21 >40% yes Erosion Downcutting 1 Channel Incision 42 42.3 32 32 Qva 4.7-21 >40% yes Erosion Downcutting 1 Channel Incision 42 42.3 35 35 Qva 21.1 - 37.5 >40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 >40% yes 7 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 >40% yes 7 Channel Incision 42 42.4 57 22 Qvt yes >40% no Erosion Downcutting 12 knick point 42 42.5 55 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> | | | | | | | | | - | | | | |
| 42 42.3 32 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 2 Channel Incision 42 42.3 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes 7 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 4 Channel Incision 42 42.4 57 22 Qvt yes > 40% yes Erosion Downcutting 12 knick point 42 42.5 55 20 Qvr yes > 40% no 28 knick point <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td></t<> | | | | | | | | | | | - | | |
| 42 42.3 32 32 32 Qva 4.7-21 > 40% yes Erosion Downcutting 1 Channel Incision 42 42.3 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Frosion Downcutting 4 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 4 Channel Incision 42 42.4 57 22 Qvt yes > 40% yes Erosion Downcutting 12 knick point 42 42.5 55 20 Qvr yes > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no 12 Outfall Erosion | | | | | | | 47.01 | | | | | | |
| 42 42.3 35 35 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 3 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes 7 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Erosion Downcutting 4 Channel Incision 42 42.4 57 22 Qvt yes > 40% yes Erosion Downcutting 12 knick point 42 42.5 55 20 Qvr yes > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no Erosion Downcutting 6 Channel Incision 42 42.5 30 | | | | | | | | | | | | | |
| 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes 7 Channel Incision 42 42.3 30 30 Qva 21.1 - 37.5 > 40% yes Frosion Downcutting 4 Channel Incision 42 42.4 57 22 Qvt yes > 40% yes Erosion Downcutting 12 knick point 42 42.4 57 22 Qvt yes > 40% yes Erosion Downcutting 12 knick point 42 42.5 55 20 Qvr yes > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no Erosion Downcutting 6 Channel Incision 42 42.6 60 25 Qva yes > 40% yes 33 knick point | | | | | | | | | | | | | |
| 42 42.3 30 30 Qva 21.1 - 37.5 > 40% no Erosion Downcutting 4 Channel Incision 42 42.4 57 22 Qvt yes > 40% yes Erosion Downcutting 12 knick point 42 42.4 57 22 Qvt yes > 40% yes Erosion Downcutting 12 knick point 42 42.5 55 20 Qvr yes > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no yes 12 Outfall Erosion 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no Erosion Downcutting 6 Channel Incision 42 42.6 60 25 Qva yes > 40% yes 33 knick point | | | | | | | | | - | | Crosion Downoutling | | |
| 42 42.4 57 22 Qvt yes > 40% yes Erosion Downcutting 12 knick point 42 42.5 55 20 Qvr yes > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no 12 Outfall Erosion 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no Erosion Downcutting 6 Channel Incision 42 42.6 60 25 Qva yes > 40% yes 33 knick point | | | | | | | | | | | Erosion Downcutting | | |
| 42 42.5 55 20 Qvr yes > 40% no 28 knick point 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no yes 12 Outfall Erosion 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no yes 12 Outfall Erosion 42 42.6 60 25 Qva yes > 40% yes 33 knick point | | | | | - | yes | 57.5 | | | | • | | |
| 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no yes 12 Outfall Erosion 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no Erosion Downcutting 6 Channel Incision 42 42.6 60 25 Qva yes > 40% yes 33 knick point | | | | | | | | | | | g | - | |
| 42 42.5 30 30 Qvr 21.1 - 37.5 > 40% no Erosion Downcutting 6 Channel Incision 42 42.6 60 25 Qva yes > 40% yes 33 knick point | | | | | | | 21.1 - 37.5 | | | yes | | | |
| 42 42.6 60 25 Qva yes 33 knick point | 42 | 42.5 | 30 | 30 | Qvr | | | | | | Erosion Downcutting | | |
| 42 427 30 30 0vg 211-375 > 40% vgs 7 Channel Insister | | | | | | yes | | | yes | | | | |
| | 42 | 42.7 | 30 | 30 | Qva |] | 21.1 - 37.5 | > 40% | yes | | | | Channel Incision |
| 42 42.7 30 30 Qva 21.1 - 37.5 > 40% yes 3 Channel Incision | 42 | 42.7 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | | 3 | Channel Incision |

HIGH EROSION POTENTIAL AREAS TABLE

| Basin | | Tot | Suscept | | Nick | | | [| | | Length | |
|-------|-------|-----|---------|---------|------|-------------|----------|-------|---------|---------------------|--------|--------------------------------------|
| # | Label | val | val | Geology | pt | Convexity | Slope | Slide | Outfall | Known Problem | - | Prob Type |
| 42 | 42.7 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | | 2 | Channel Incision |
| 42 | 42.8 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | | 13 | Channel Incision |
| 42 | 42.8 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | | 6 | Channel Incision |
| 42 | 42.9 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 4 | Channel Incision |
| 42 | 42.9 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 3 | Channel Incision |
| 42 | 42.9 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 10 | Channel Incision |
| 42 | 42.10 | 47 | 12 | Qvt | yes | | > 40% | yes | | | 17 | knick point |
| 44b | 44b.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | yes | | 1 | Outfall Erosion |
| 44b | 44b.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | yes | Problem Solved | 0 | Outfall Erosion |
| 45b | 45b.1 | 60 | 25 | Qva | yes | | > 40% | no | | Erosion Downcutting | 13 | knick point |
| 45b | 45b.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 3 | Channel Incision |
| 45b | 45b.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 1 | Channel Incision |
| 45b | 45b.2 | 47 | 12 | Qvt | yes | | > 40% | no | | | 41 | knick point |
| 46a | 46a.1 | 39 | 4 | Qvt | yes | | 0 - 15% | no | | | 87 | knick point |
| 46b | 46b.1 | 52 | 17 | Qvt | yes | 21.1 - 37.5 | > 40% | no | | | 61 | knick point and incision |
| 47 | 47.1 | 47 | 12 | Qvt | yes | | > 40% | no | | | 21 | knick point |
| 48 | 48.1 | 47 | 12 | Qvt | yes | | > 40% | no | | Problem Solved | 23 | knick point and incision |
| 48 | 48.1 | 47 | 12 | Qvt | yes | | > 40% | no | | Problem Solved | 2 | knick point |
| 49b | 49b.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 12 | Channel Incision |
| 49b | 49b.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 3 | Channel Incision |
| 50b | 50b.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | yes | | 4 | Outfall Erosion |
| 50b | 50b.2 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 0 | Channel Incision |
| 50b | 50b.3 | 55 | 20 | Qva | yes | | > 40% | по | | _ | 12 | knick point |
| 50b | 50b.3 | 57 | 22 | Qva | yes | 4.7-21 | > 40% | no | | | 3 | knick point |
| 50b | 50b.3 | 57 | 22 | Qva | yes | 4.7-21 | > 40% | no | | | 3 | knick point |
| 50b | 50b.3 | 60 | 25 | Qva | yes | 21.1 - 37.5 | > 40% | no | | | 3 | knick point |
| 50b | 50b.3 | 55 | 20 | Qva | yes | | > 40% | no | | | 20 | knick point |
| 50c | 50c.1 | 30 | 30 | Qva | | | > 40% | no | yes | Erosion Downcutting | 4 | Outfall Erosion |
| 50c | 50c.1 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | no | | Erosion Downcutting | 1 | Channel Incision |
| 50c | 50c.2 | 30 | 30 | Qva | | | > 40% | yes | | Erosion Downcutting | 6 | Channel Incision |
| 50c | 50c.3 | 30 | 30 | Qva | | 21.1 - 37.5 | > 40% | yes | | | 1 | Channel Incision |
| 51a | 51a.1 | 30 | 30 | Qva | | | > 40% | no | yes | Erosion Downcutting | 28 | Outfall erosion and channel Incision |
| 51a | 51a.1 | 32 | 32 | Qva | | 21.1 - 37.5 | 30 - 40% | no | yes | Erosion Downcutting | 2 | channel Incision |
| 51a | 51a.1 | 35 | 35 | Qva | | 21.1 - 37.5 | > 40% | no | yes | Erosion Downcutting | 0 | channel Incision |
| 51a | 51a.1 | 32 | 32 | Qva | | 4.7-21 | > 40% | no | yes | Erosion Downcutting | 6 | channel Incision |

Explanation:

Suscept val: Susceptibility value that represents the modeled value for erosion potential susceptibility that includes factors of geology, erodibility, convexity, slope %, and presence of landslides Tot val: Total value that equals the Susceptibility value plus a knick point factor (35 points).

Geology:

Qva: Quaternary age Vashon Advance Outwash

Qvt : Quaternary age Vashon Till

Qvr: Quaternary age Vashon Recessional Outwash

Qtb: Quaternary age Transitional Beds

Known Problem: Known problem areas identified by the City of Mercer Island staff.

Length: The linear channel distance (feet) subject to high erosion potential.

BUILDINGS 100 FT FROM GROUPINGS

| BasinNum | Group Label | House Count |
|----------|-------------|-------------|
| 4 | 4.1 | 0 |
| 4 | 4.2 | 2 |
| 6 | 6.1 | 0 |
| 6 | 6.2 | 0 |
| 10 | 10.1 | 1 |
| 10 | 10.2 | 1 |
| 10 | 10.3 | 1 |
| 23 | 23.1 | 2 |
| 29 | 29.1 | 1 |
| 38 | 38.1 | 2 |
| 38 | 38.2 | 3 |
| 38 | 38.3 | 3 |
| 42 | 42.1 | 0 |
| 42 | 42.10 | 1 |
| 42 | 42.2 | • 0 |
| 42 | 42.2 | 1 |
| 42 | 42.2 | 0 |
| 42 | 42.2 | 0 |
| 42 | 42.2 | 0 |
| 42 | 42.2 | 0 |
| 42 | 42.3 | 0 |
| 42 | 42.3 | 0 |
| 42 | 42.3 | 0 |
| 42 | 42.3 | 0 |
| 42 | 42.3 | 0 |
| 42 | 42.3 | 0 |
| 42 | 42.3 | 0 |
| 42 | 42.4 | 0 |
| 42 | 42.4 | 0 |
| 42 | 42.4 | 0 |
| 42 | 42.5 | 0 |
| 42 | 42.6 | 0 |
| 42 | 42.6 | 0 |
| 42 | 42.6 | 0 |
| 42 | 42.7 | 1 |
| 42 | 42.8 | 0 |
| 42 | 42.9 | 0 |
| 47 | 47.1 | 5 |
| 48 | 48.1 | 1 |
| 27a | 27a.1 | 2 |
| 27a | 27a.1 | 2 |
| 27a | 27a.1 | 2 |
| 27a | 27a.2 | 1 |
| 27a | 27a.3 | 0 |
| 27a | 27a.4 | 2 |
| 27a | 27a.5 | 1 |
| 39a | 39a.1 | 1 |
| 44b | 44b.1 | 3 |
| 44b | 44b.2 | 3 |

| 45b | 45b.1 | 0 | | | | | | | |
|--------------|-----------------|-----------|--|--|--|--|--|--|--|
| 45b | 45b.2 | 4 | | | | | | | |
| 46b | 46b.1 | 3 | | | | | | | |
| 49b | 49b.1 | 2 | | | | | | | |
| 49b | 49b.1 | 2 | | | | | | | |
| 49b | 49b.1 | 2 | | | | | | | |
| 49b | 49b.1 | 2 | | | | | | | |
| 49b | 49b.1 | 2 | | | | | | | |
| 49b | 49b.1 | 2 | | | | | | | |
| 49b | 49b.2 | 4 | | | | | | | |
| 50b | 50b.1 | 0 | | | | | | | |
| 50b | 50b.2 | 0 | | | | | | | |
| 50b | 50b.2 | 0 | | | | | | | |
| 50b | 50b.2 | 0 | | | | | | | |
| 50b | 50b.3 | 2 | | | | | | | |
| 50c | 50c.1 | 1 | | | | | | | |
| 50c | 50c.2 | 5 | | | | | | | |
| 50c | 50c.3 | 5 | | | | | | | |
| 51a | 51a.1 | 0 | | | | | | | |
| 51a | 51a.1 | 0 | | | | | | | |
| 51a | 51a.1 | 0 | | | | | | | |
| 51a | 51a.1 | 0 | | | | | | | |
| 51a | 51a.1 | 0 | | | | | | | |
| 51a | 51a.1 | 0 | | | | | | | |
| Explanation: | Explanation: | | | | | | | | |
| | number of house | es within | | | | | | | |
| | of high erosion | | | | | | | | |
| | | | | | | | | | |

Appendix C WATERCOURSE MONITORING DATA

- C-1. Phase 1 Monitoring Results C-2. Phase 2 Monitoring Results



Appendix C-1 Phase 1 Monitoring Results



GEOENGINEERS

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www.geoengineers.com

| SUBJECT: | Monitoring Prescription for Basin 26 Site | |
|----------|---|--|
| FILE: | 0817-017-00 | |
| DATE: | December 15, 2004 | |
| FROM: | Mary Ann Reinhart | |
| TO: | City of Mercer Island | |

This memorandum provides a summary of information related to the Basin 26 monitoring site. The location of the site is southwest of the intersection of SE 47th street and Island Crest Way in Mercer Island. The site is accessed traversing downslope from the southwest corner of the church parking lot area located southwest of the intersection.

The site includes an abrupt knick point or "headcut" within a channel that is apparently eroding upstream, as shown in the attached Sketch Map Site Plan, Figure 1. Our reconnaissance on November 18, 2004 was conducted to provide baseline measurements to the knick point from labeled points on site for comparison with future measurements to be obtained by the City of Mercer Island Staff. The purpose of future measurements is to assess whether the knick point is migrating upstream (headward) or if the channel is scouring at the base (toe?) of the knick point over time.

The monitoring site includes two fixed points labeled Nail 1 and Nail 2, as shown on the Sketch Map Figure 1. The fixed points are marked by orange painted nails on two hardwood trees. Nail 1 is located on a dying broken top-tree that is close to the axis of the channel. The numeral of each point is painted onto the trunk of each tree.

We have identified specific features of the knick point, as shown in Figure 2. Figures 1 and 2 also show the locations of site photographs 32 through 37. The photographs show the key features of the knick point observed at the time of the monitoring site setup. Monitoring points HC1 through HC5 are designated to monitor the height and length from the top of the bank to the toe of the slope, as shown in Figure 2. We also identified an area of undercutting that ranges from a depth of 0.3 to 0.4 foot and a height of approximately 0.6 to 0.8 foot, as shown in Figure 2. Lastly, we identified an area of localized scour, as shown in Figure 2.

The following instructions provide guidelines for measuring and interpreting the data from future measurements at Basin 26. Instructions are provided looking from the top of the knick point downslope toward the feature.

Measurements:

- From Nail 1 on the right bank side of the channel, measure to HC1, HC2, HC3, HC5 and the point (*) on the ground adjacent to the holly tree on the right bank side of the knick point (see Figure 1 for comparison).
- From Nail 2 on the right bank side of the channel, measure HC1, HC2, HC3, HC5 and the point (*) on the ground adjacent to the holly tree on the right bank side of the knick point (see Figure 1 for comparison).

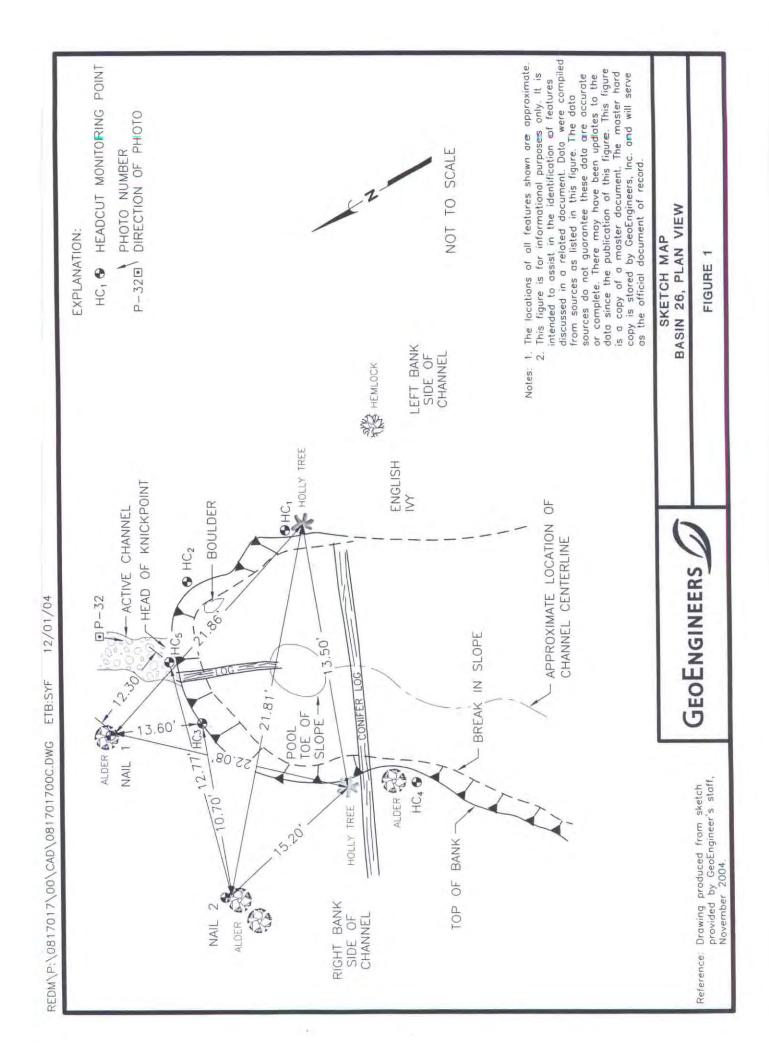
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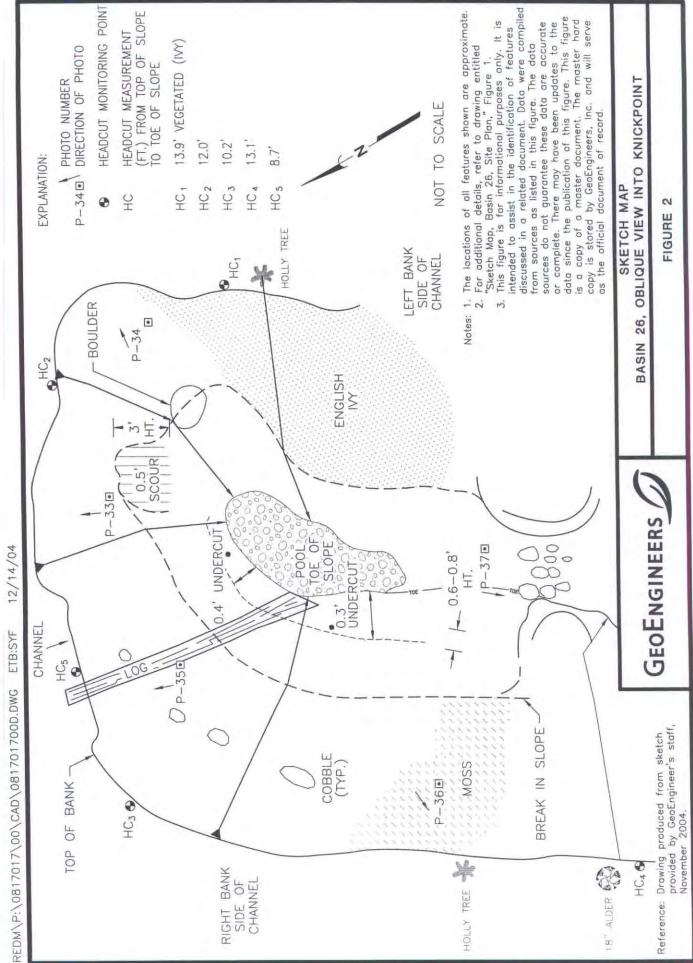
Memorandum to City of Mercer Island December 15, 2004 Page 2

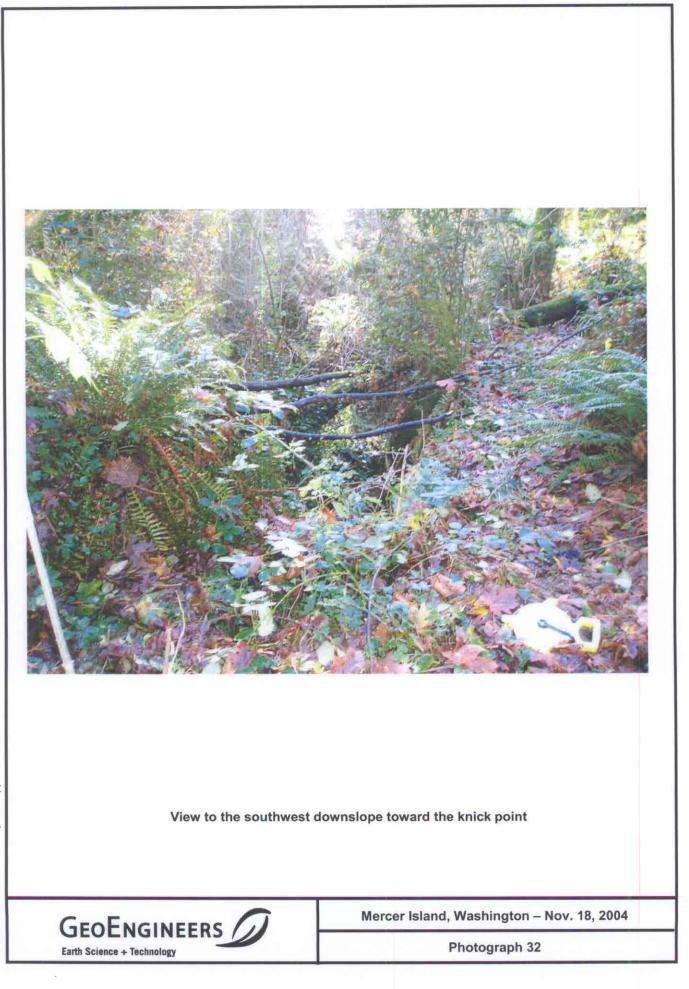
- From the top of slope at HC1, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.
- From the top of slope at HC2, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.
- From the top of slope at HC3, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.
- From the top of slope at HC4, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.
- From the top of slope at HC5, measure the distance to the toe of the slope (see Figure 2). The features were marked with orange paint.
- Measure the depth and height of the undercut and scour features (see Figure 2).

Interpretation:

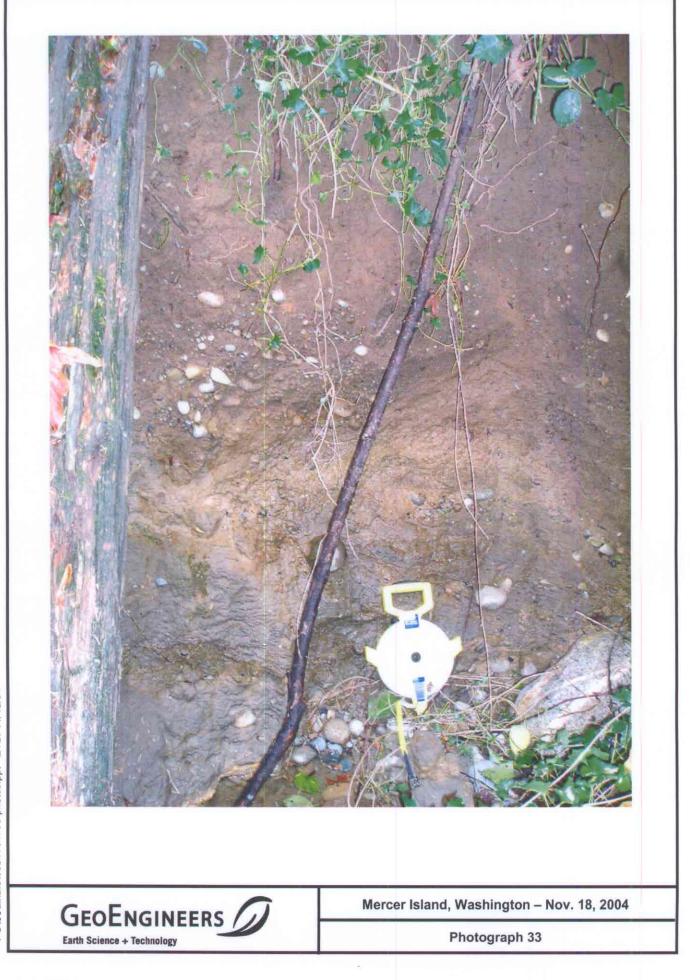
- Future measurements from Nail 1 and Nail 2 on the right bank side of the channel to HC1, HC2, HC3, HC5 and the point (*) on the ground adjacent to the holly tree on the right bank side of the knick point compared to the baseline data will reflect any change in geometry of the knick point. For example, a decrease in the distance from Nail 1 to HC5 would indicate recession. An increase in the distance from Nail 2 to HC5 would also indicate recession.
- For the height of the points HC1 through HC5, if the future height of the knick point is greater than the baseline data, then base scour has occurred.
- An increase in the depth of undercutting compared to the baseline data indicate an increased potential for upstream migration of the knick point.
- For the last two items above, if both base scour and undercutting are increasing, then the potential for upstream migration of the knick point (headcut) has increased.



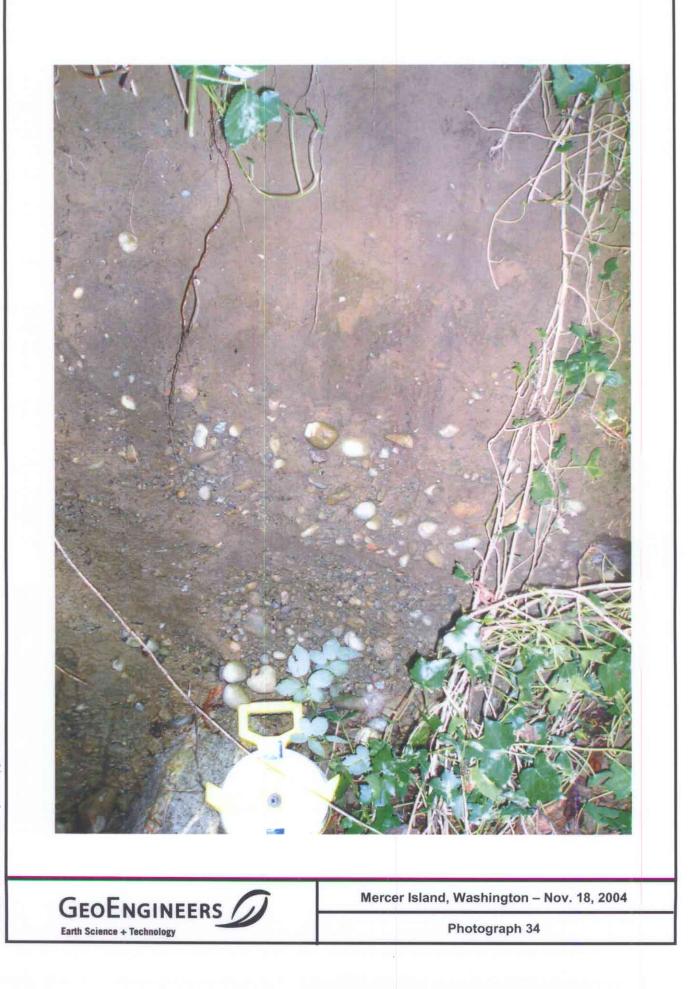




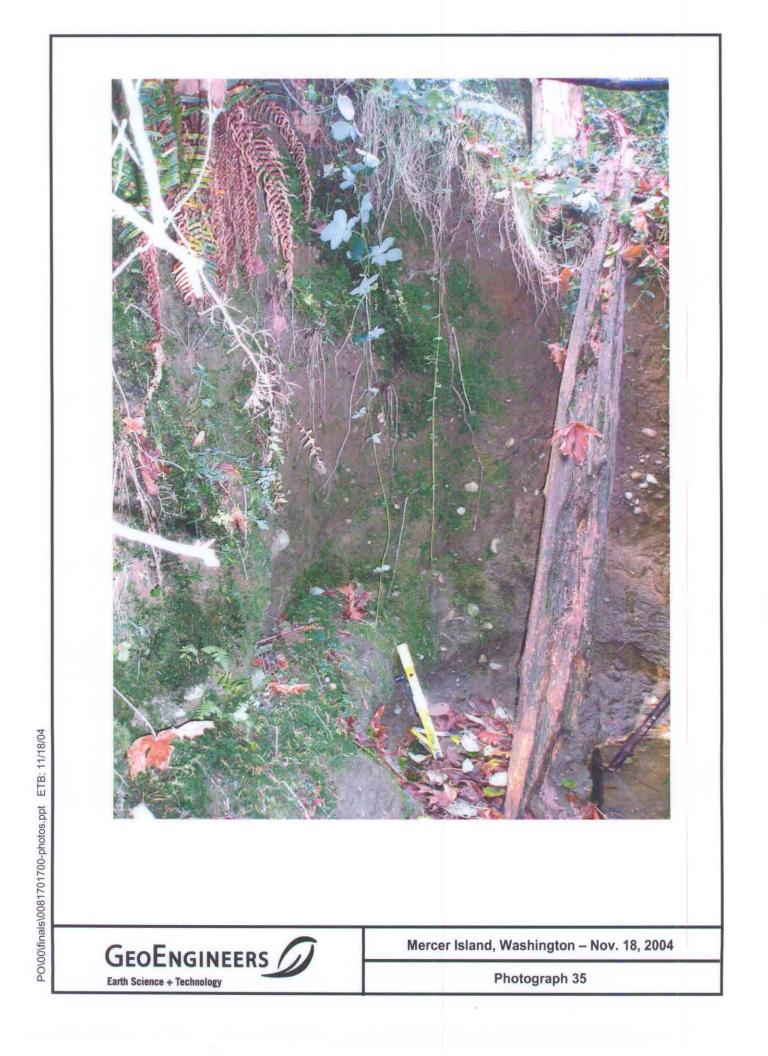
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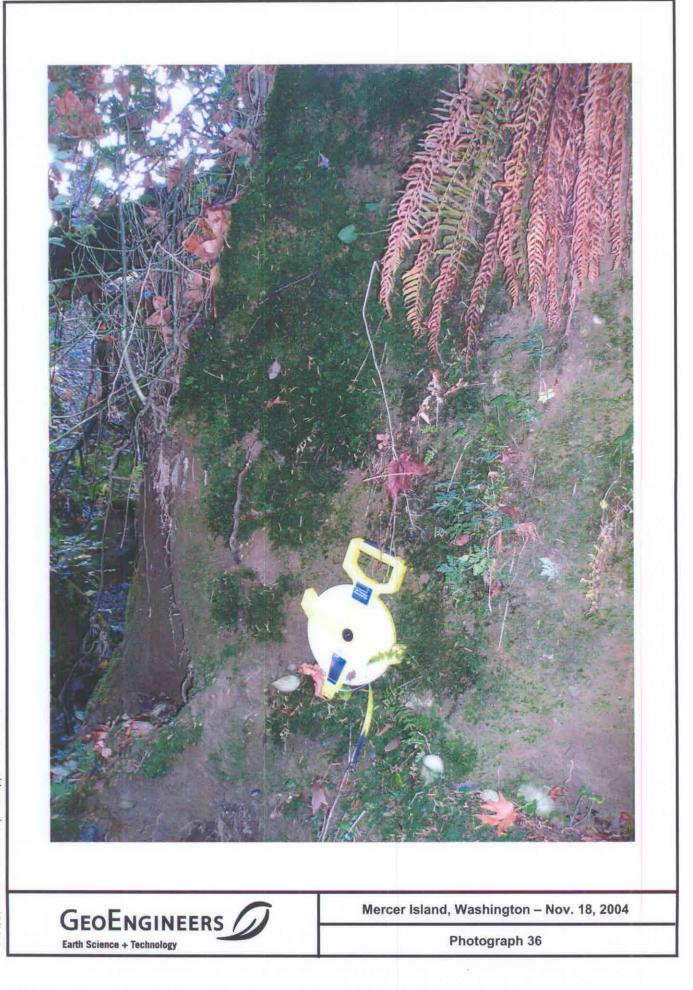


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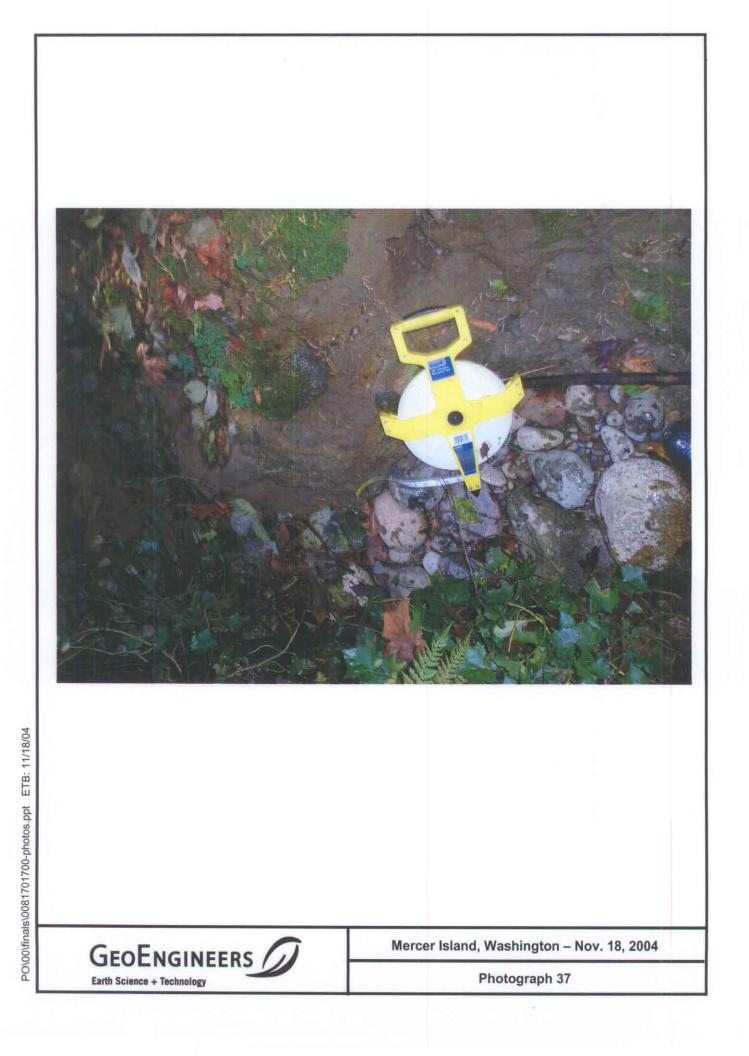


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| To: | City of Mercer Island |
|----------|---|
| FROM: | Mary Ann Reinhart |
| DATE: | December 15, 2004 |
| FILE: | 0817-017-00 |
| SUBJECT: | Monitoring Prescription for Basin 29 Site |

This memorandum provides a summary of information related to the Basin 29 monitoring site. The location of the site is approximately 350 feet downstream from the culvert downslope of West Mercer Way. The site is accessed by parking along the West Mercer Way shoulder northwest of the intersection with 79th Avenue SE and traversing the embankment north to the channel.

The monitoring site includes an area where the right bank is failing into the channel, as shown on the Sketch Map Figure 1. Left and Right bank designations are made looking downstream. Our reconnaissance on November 18, 2004 was conducted to provide baseline measurements of the bank failure from a labeled point on site for comparison with future measurements to be obtained by the City of Mercer Island Staff. The purpose of future measurements is to assess whether the bank failure is migrating upstream (head ward) or if the channel is undercutting at the toe of the bank failure over time.

The monitoring site includes a fixed point labeled Nail, as shown on the Sketch Map Figure 1. The fixed point is marked by an orange painted nail driven into a fallen log on the left bank side of the channel.

We identified specific features of the bank failure, as shown in Figure 2. Figure 2 also shows the locations of site photographs 10 through 20. The photographs show the key features of the bank failure observed at the time of the monitoring site setup. We identified several monitoring points, labeled 1 through 7, to measure the distance from the fixed Nail point, as shown in Figure 1. The points 1 through 7 represent the break-in-slope contact between loose (disturbed) sediment and in-situ (undisturbed) bank material. We also identified an area of undercutting that ranges from a depth of 0.4 to 0.5 foot and a height of approximately 0.6 to 0.8 foot, as shown in Figure 2.

The following instructions provide guidelines for measuring and interpreting the data from future measurements at Basin 29.

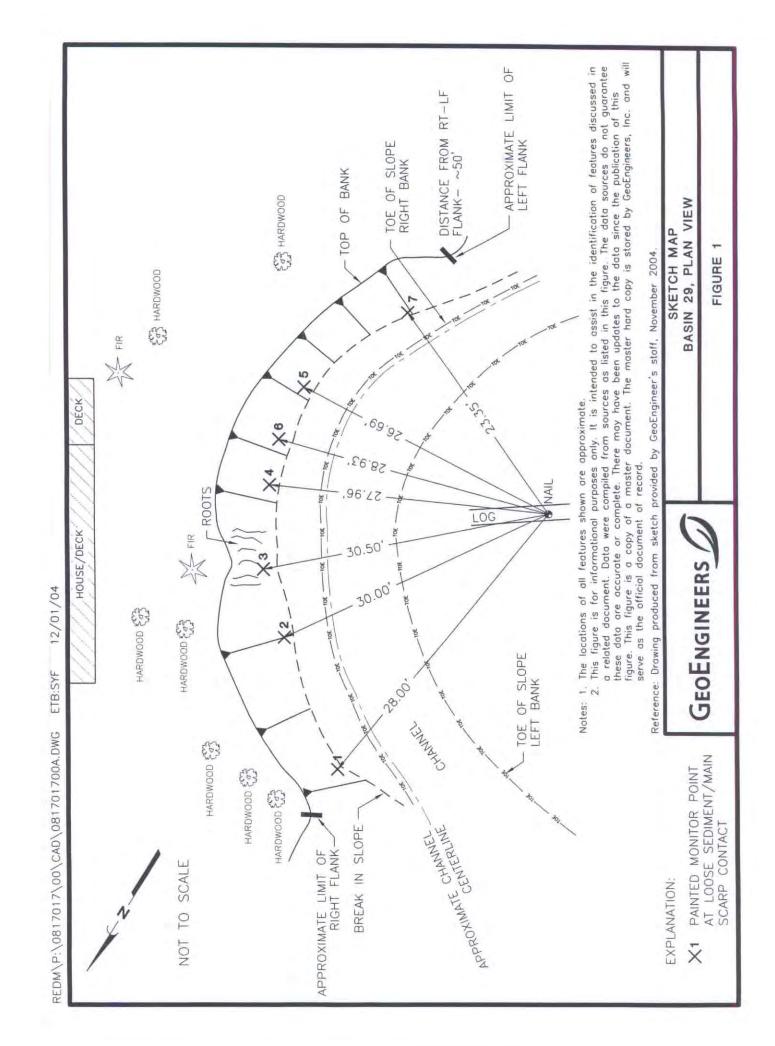
Measurements:

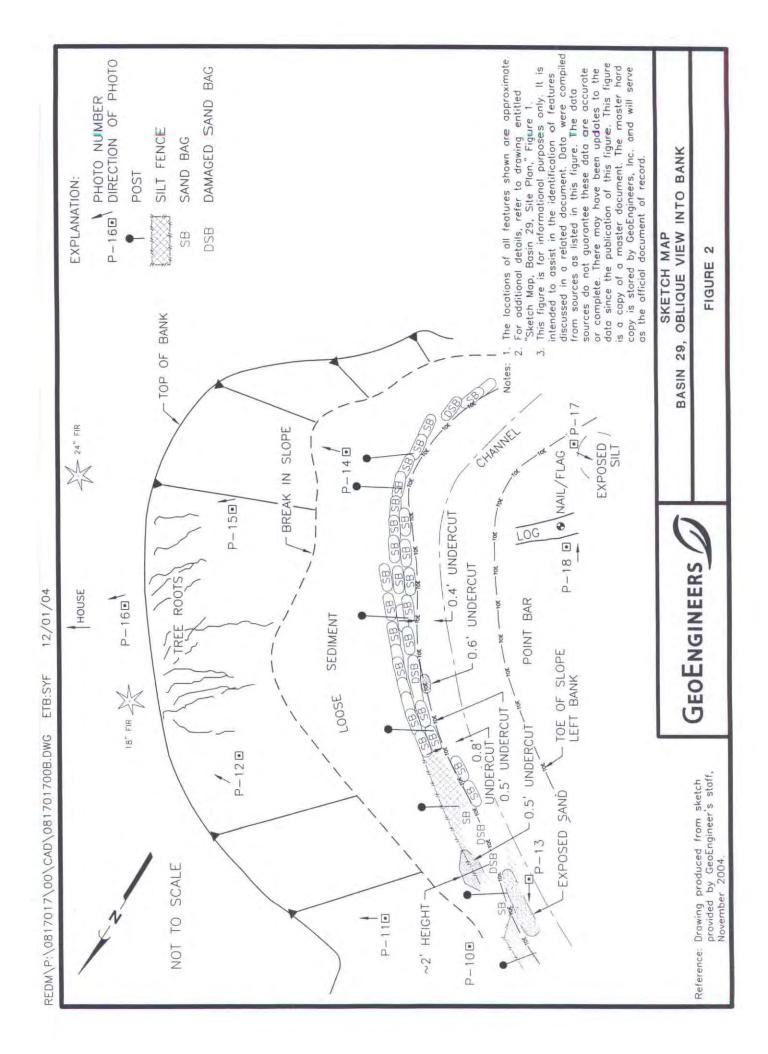
- From the Nail measure across the channel to points 1 through 7.
- Observe new areas of damaged sand bag (DSB).
- Measure the depth into the slope and height of the undercut features.

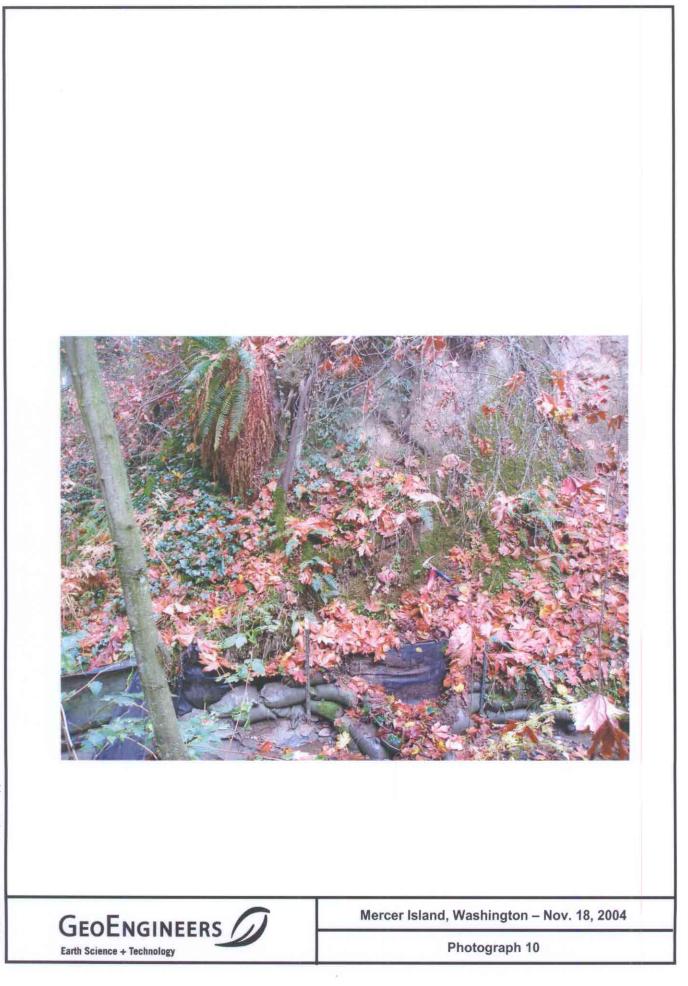
Interpretation:

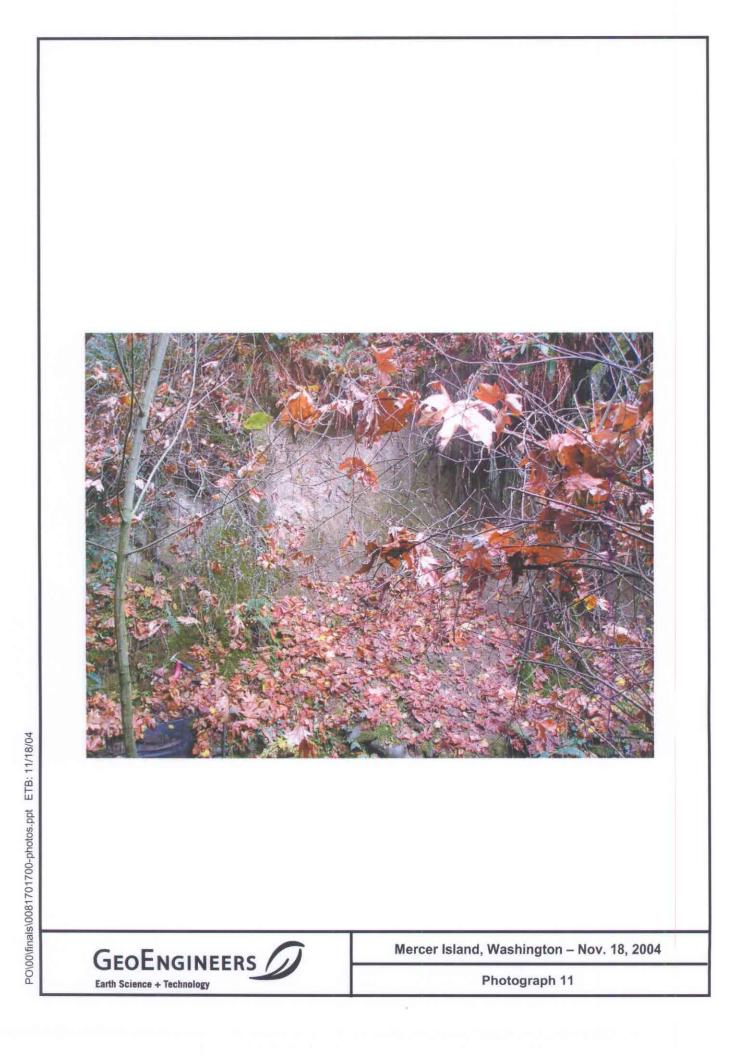
- The measurements from Nail to points 1 through 7 compared to the baseline data will reflect the change in geometry of the bank failure. For example, an increase in the distance from the Nail to points 1 through 7 would indicate that the bank is receding (eroding).
- If the sand bags undergo further deformation compared to the baseline, then erosion is occurring.
- An increase in the depth of undercutting compared to the baseline data would indicate an increased potential for additional failure.

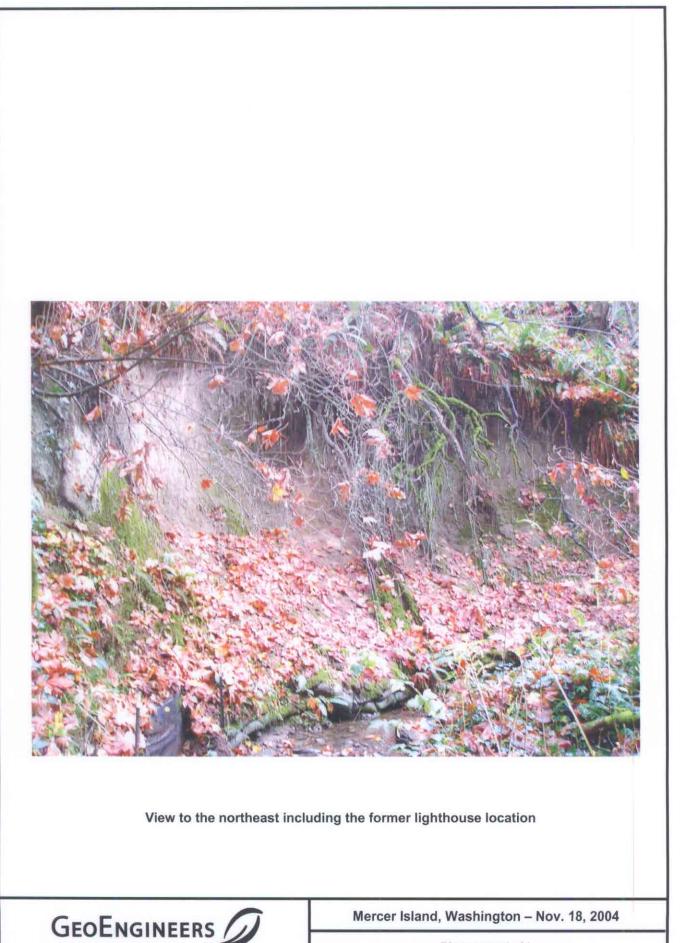
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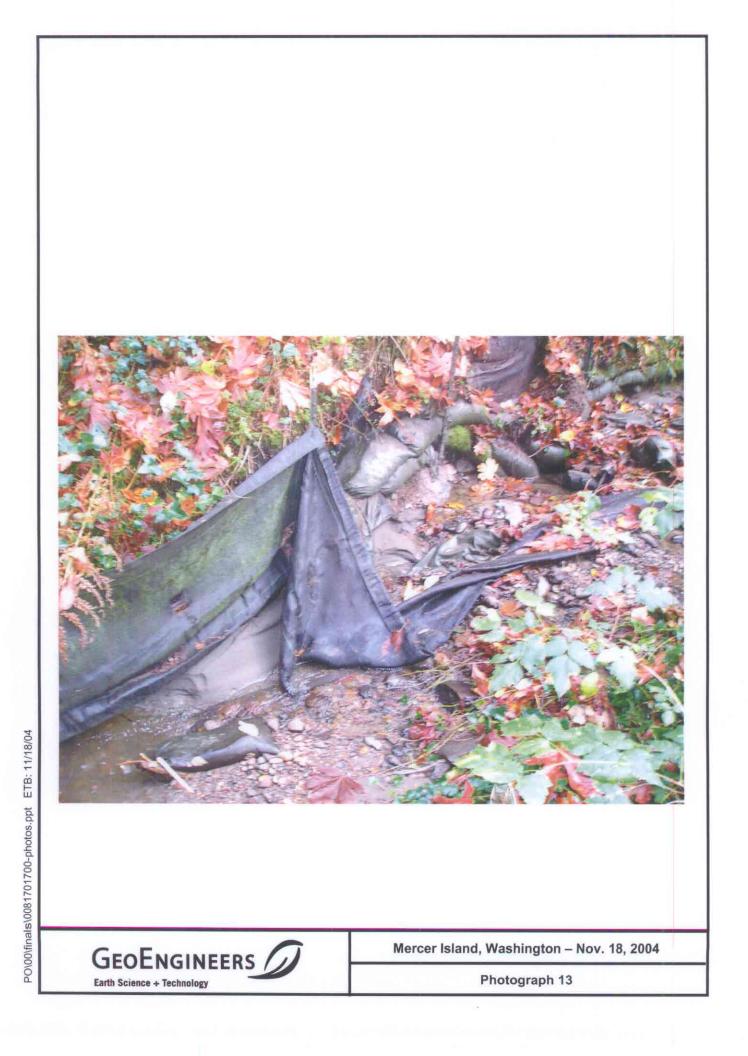


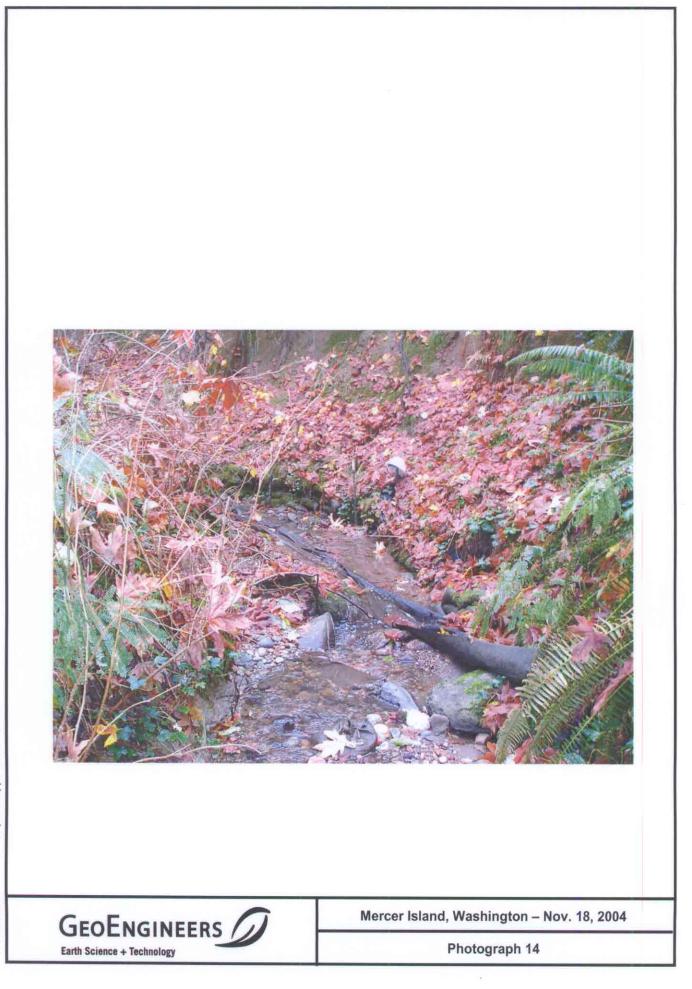




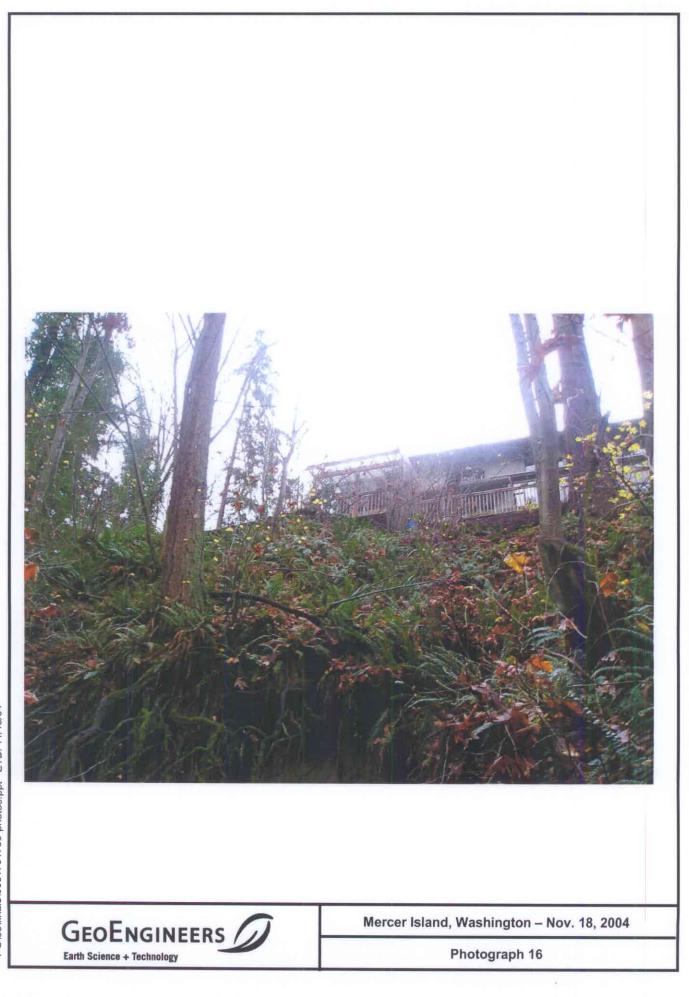
Earth Science + Technology

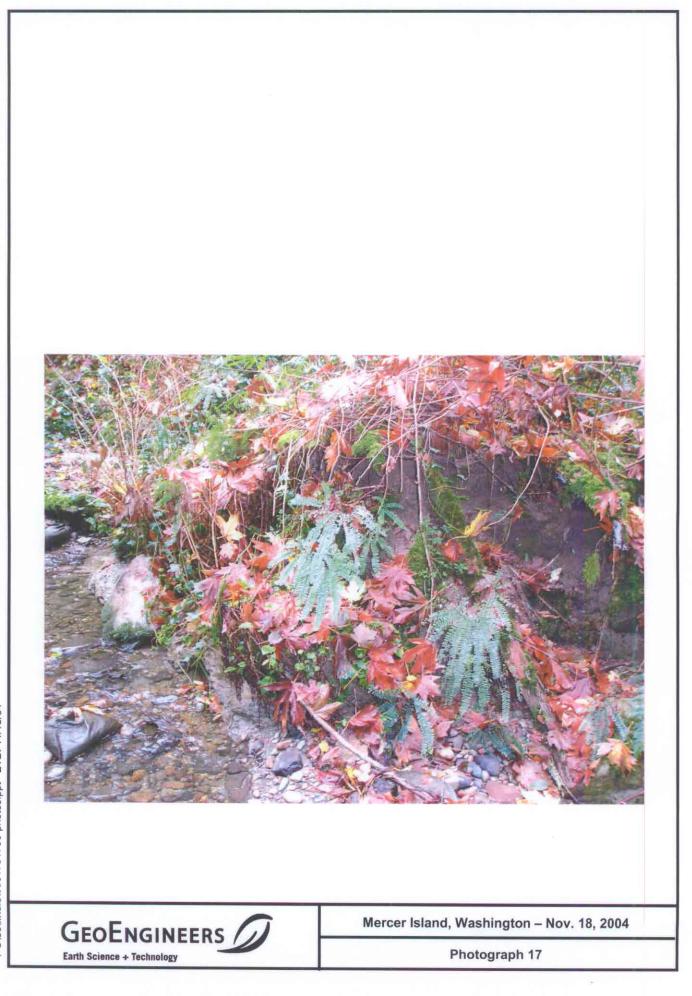
Photograph 12



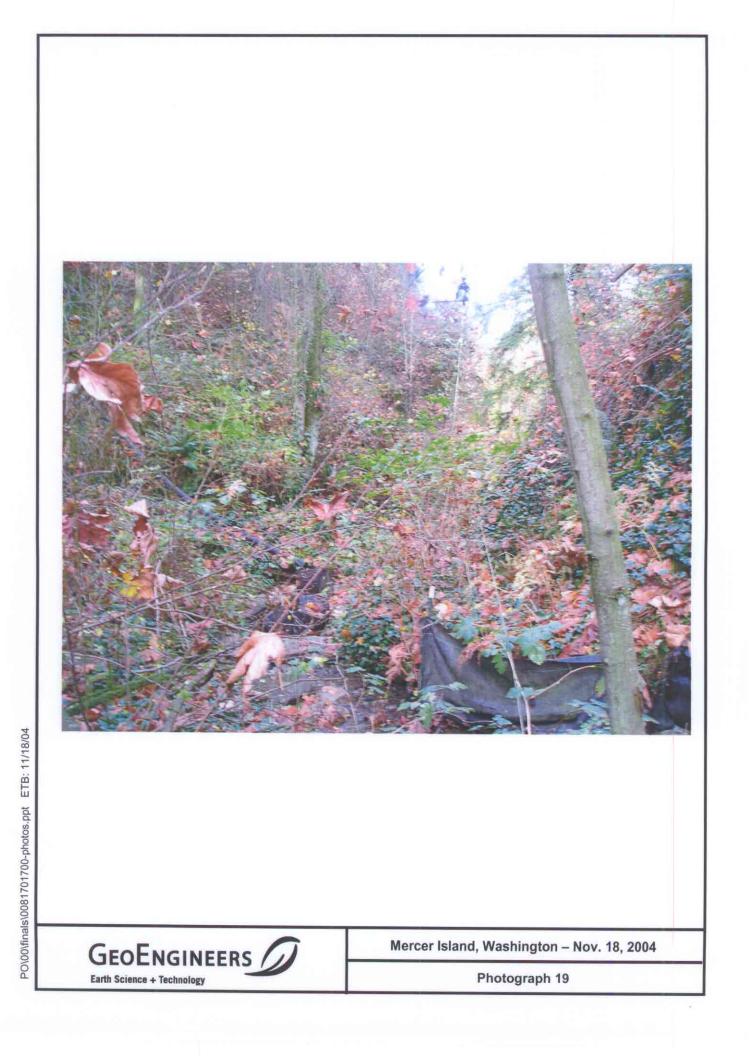


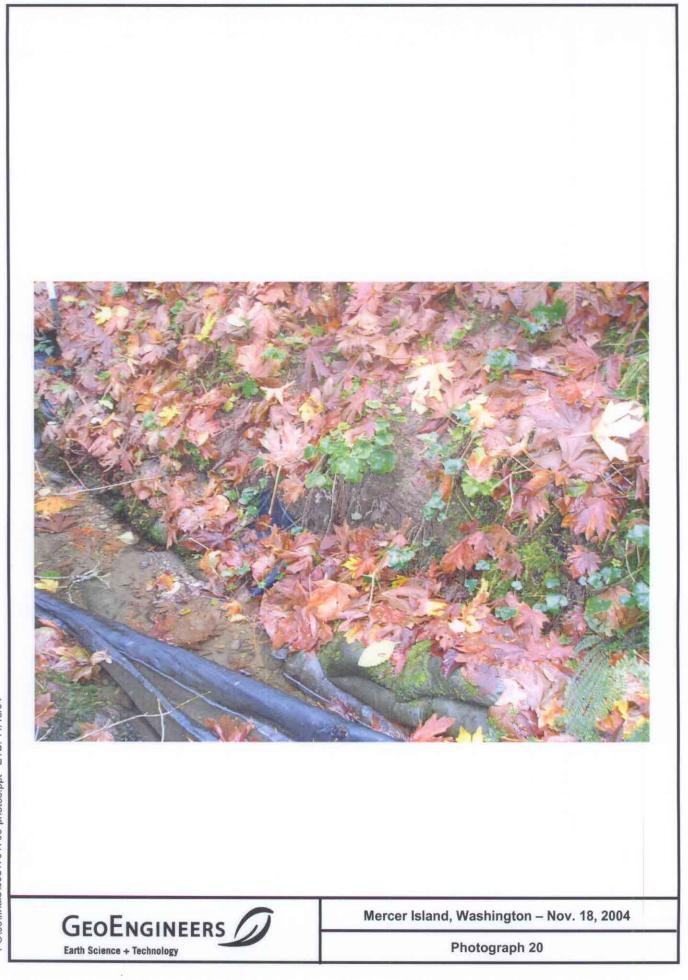












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MEMORANDUM

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| To: | City of Mercer Island |
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| FROM: | Mary Ann Reinhart |
| DATE: | December 15, 2004 |
| FILE: | 0817-017-00 |
| SUBJECT: | Monitoring Prescription for Basin 32a site |

This memorandum provides a summary of information related to the Basin 32a monitoring site. The location of the site is approximately 200 feet downslope from the Henkle residence located along the north side of Holly Hill Drive in Mercer Island, Washington. Holly Hill Drive is a side street off the west side of West Mercer Island Drive. The site is accessed by parking along Holly Hill Drive near the second residence on the right (north) side of the road and traversing the embankment to the channel. The site includes an area of channel incision, as shown in the Sketch Map site plan, Figure 1.

Our reconnaissance on November 24, 2004 was conducted to provide baseline measurements of the channel from labeled points on site for comparison with future measurements to be obtained by the City of Mercer Island Staff. The purpose of future measurements is to assess whether the channel is undergoing bank erosion, incision, or both, over time.

The monitoring site includes two fixed points, labeled Nail 1 and Nail 2, as shown on the Sketch Map Figure 1. Left and Right bank designations are made looking downstream. The left bank fixed point Nail 1 is marked by orange painted nails on a cedar tree. The right bank fixed point Nail 2 is marked by a orange painted nail on a hardwood tree. Also, the numeral of each point is painted onto the trunk of the tree.

We have also identified specific channel features included in the Monitoring Profile, Figure 2. Figure 1 shows the locations of site photographs 53 through 62. The photographs show the key channel features of the channel observed at the time of the monitoring site setup and the contact between the overlying sand and the fine-grained transitional bed deposits (Qtb) as shown on Figure 2. We also measured the approximate channel gradient both upstream and downstream of the A-A' section and area of incision that ranges from a depth of 0.8 to about one foot, as shown in Figure 1.

The following instructions provide guidelines for measuring and interpreting the data from future measurements from the Basin 32a monitoring site.

Measurements:

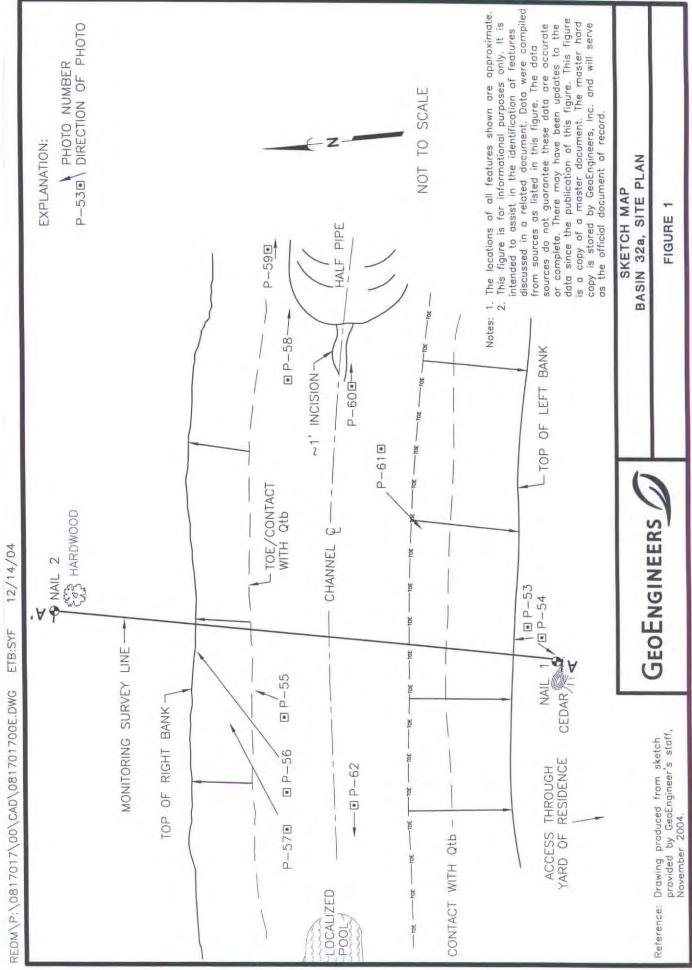
- Resurvey the elevation of and relative distance between points 1 to 12 including Nail 1 to Nail 2 (see Figure 2). We used an assume elevation for surveying.
- Measure the approximate channel gradient. The gradient was approximately 15% as measured immediately up and downstream of section A-A' on November 24, 2004.

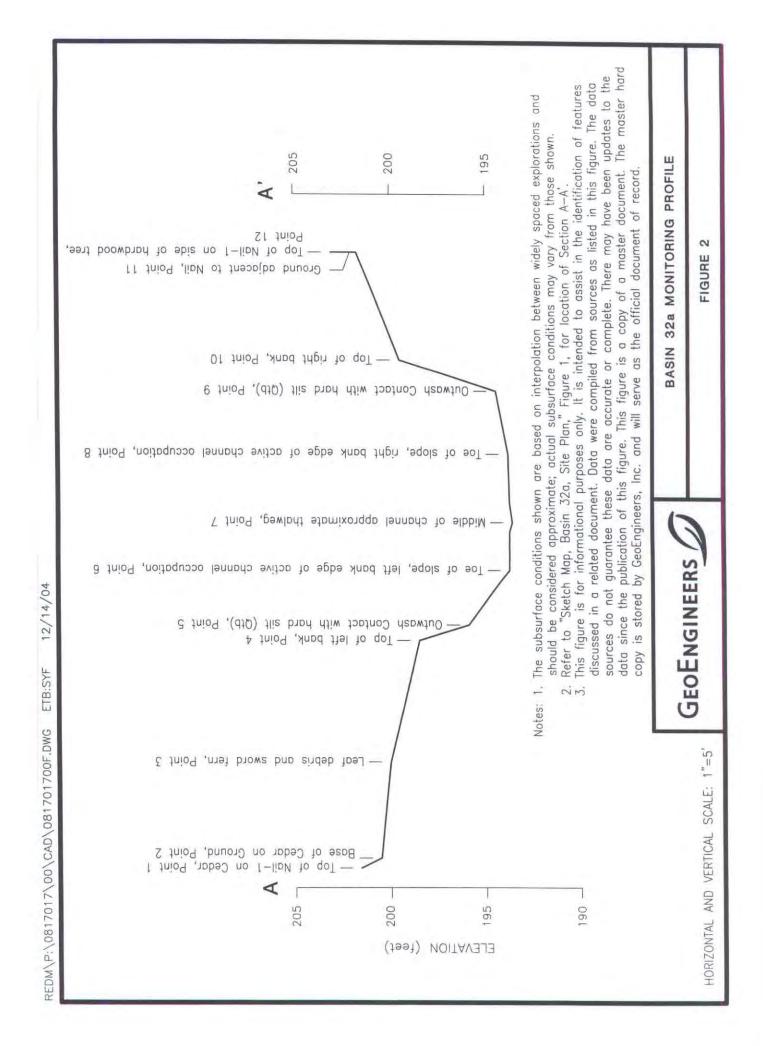
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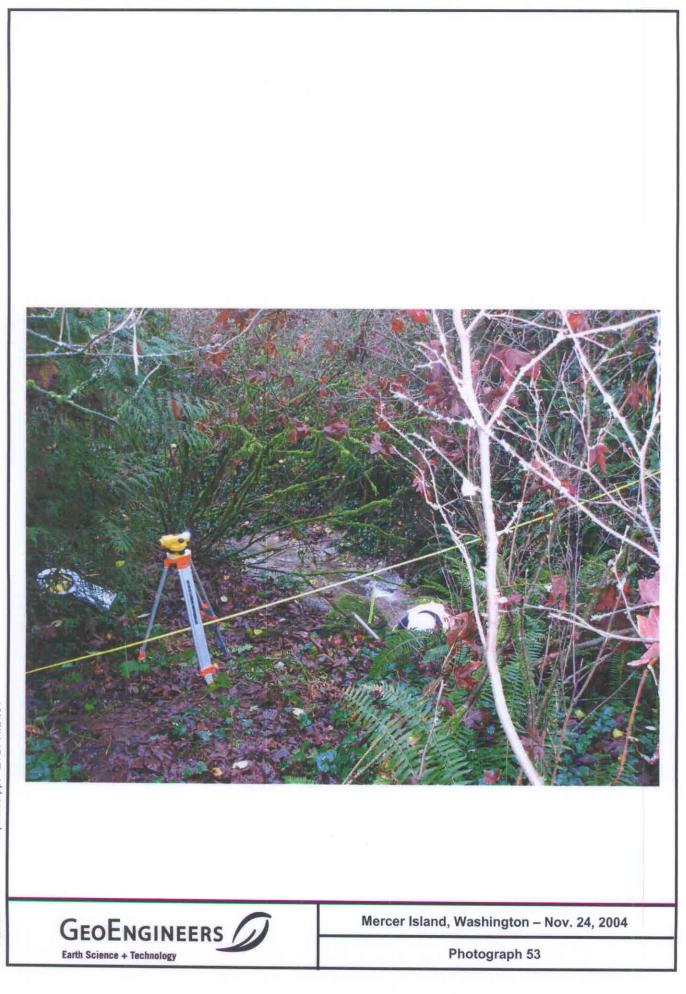
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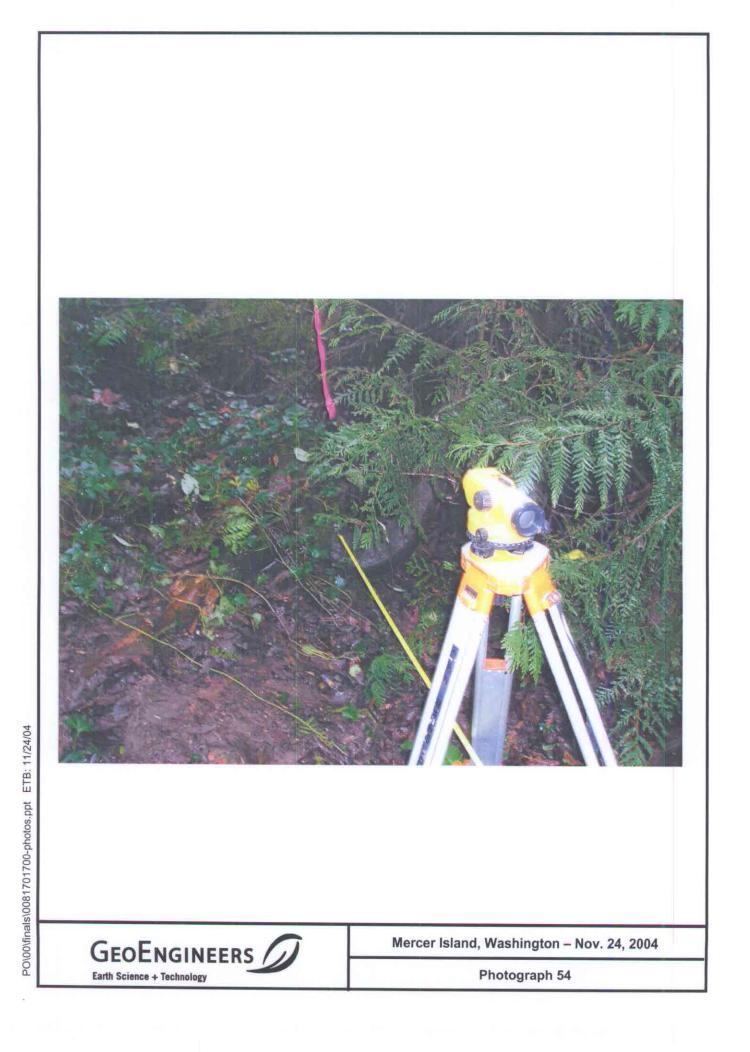
Interpretation:

- The measurements from Nail 1 to points 4 through 10 compared to the baseline data will reflect the change in geometry of the channel. For example, a decrease in the distance from the Nail 1 to the top of the left bank (point 4) would indicate that the left bank is eroding. An increase in the distance from Nail 1 to the top of the right bank (point would indicate that the right bank is eroding.
- A decrease in elevation at the middle of the channel (approximate thalweg) would indicate that the channel is undergoing incision or down cutting (i.e. increased channel depth).
- A change in channel gradient would likely provide supporting information regarding erosion or incision. For example, a decrease in gradient would indicate an increased potential for bank erosion or that bank erosion is occurring. By contrast, an increase in gradient would indicate an increased potential for incision or that incision is occurring.



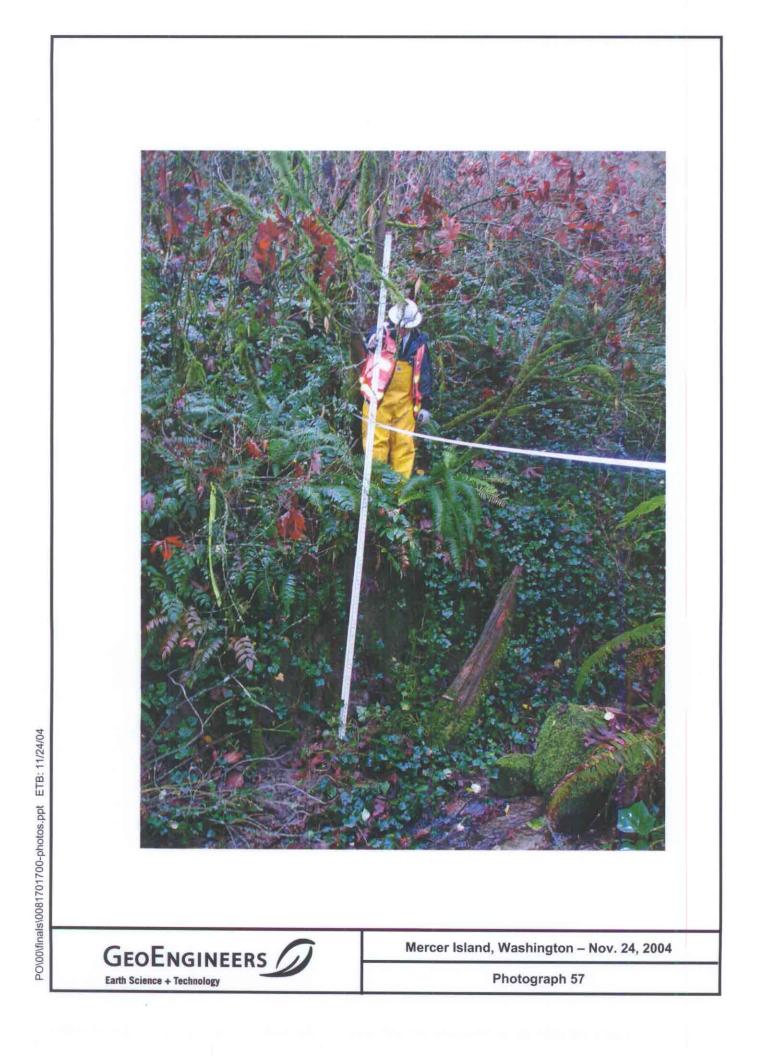


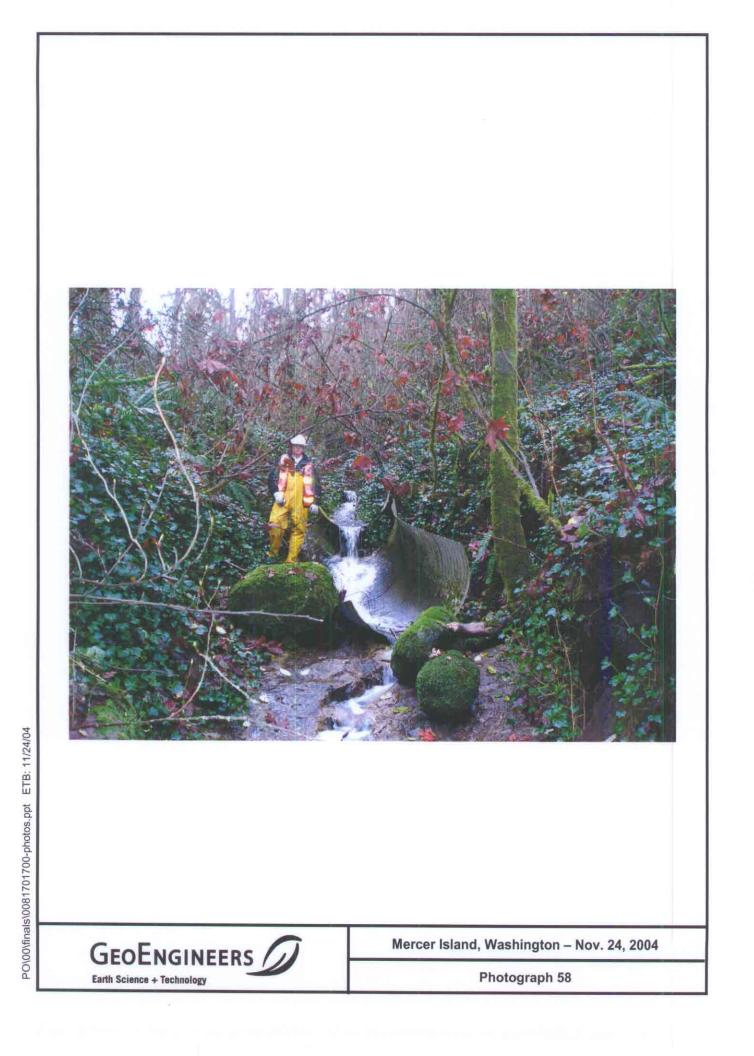


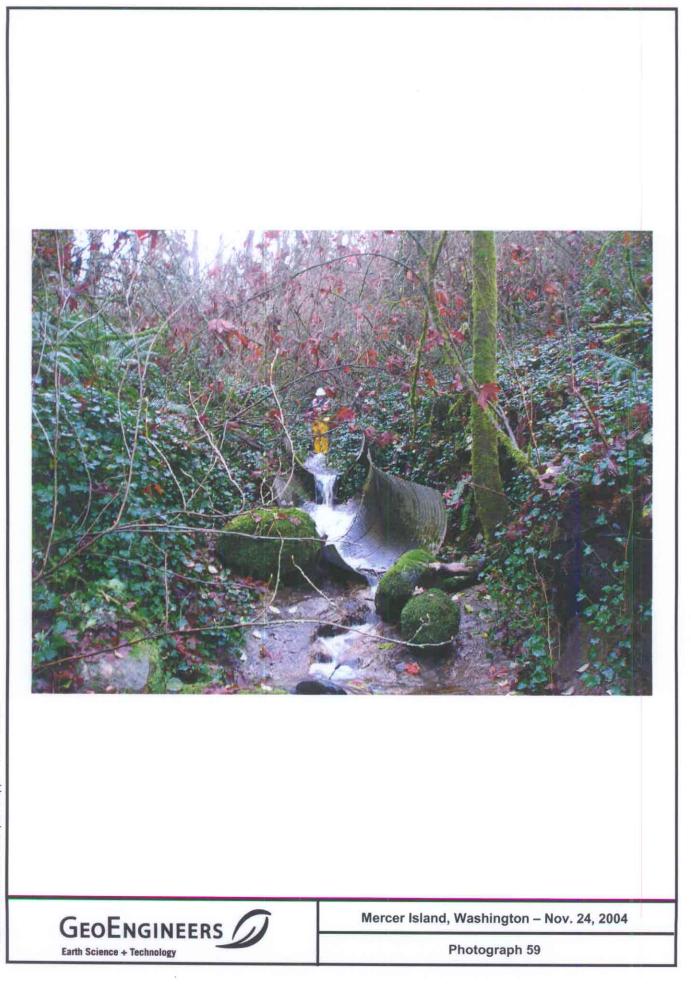






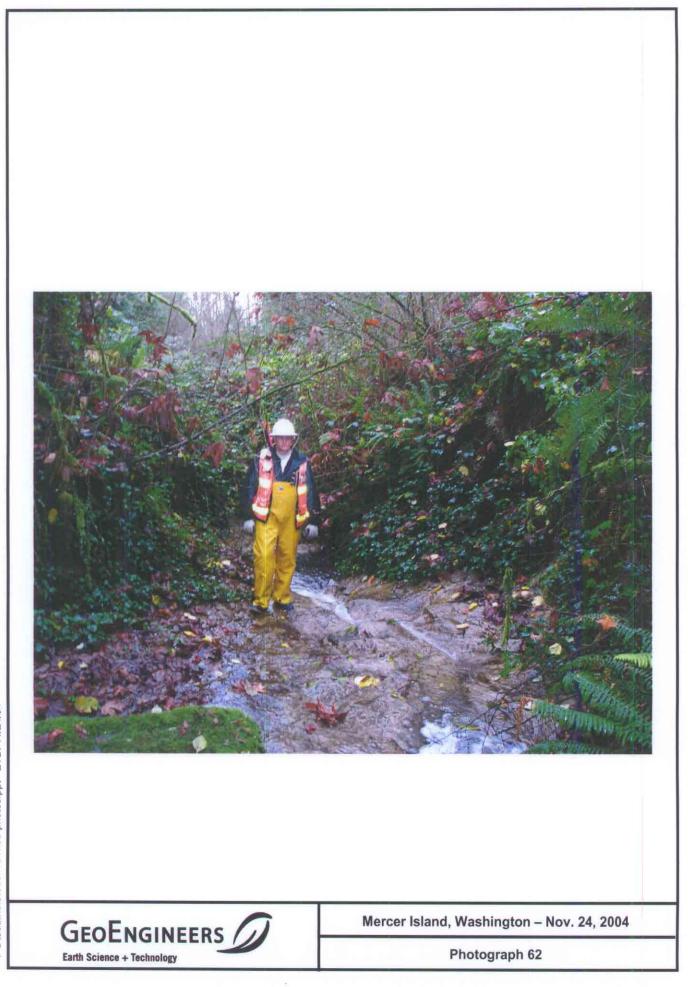












Appendix C-2 Phase 2 Monitoring Results



Water Course Monitoring Data subbasin 26

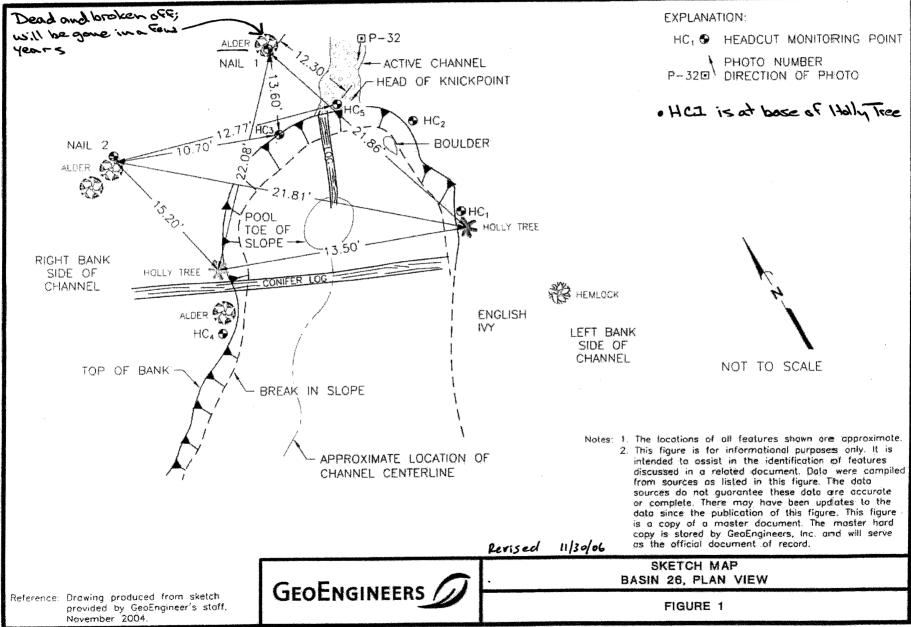
1 k

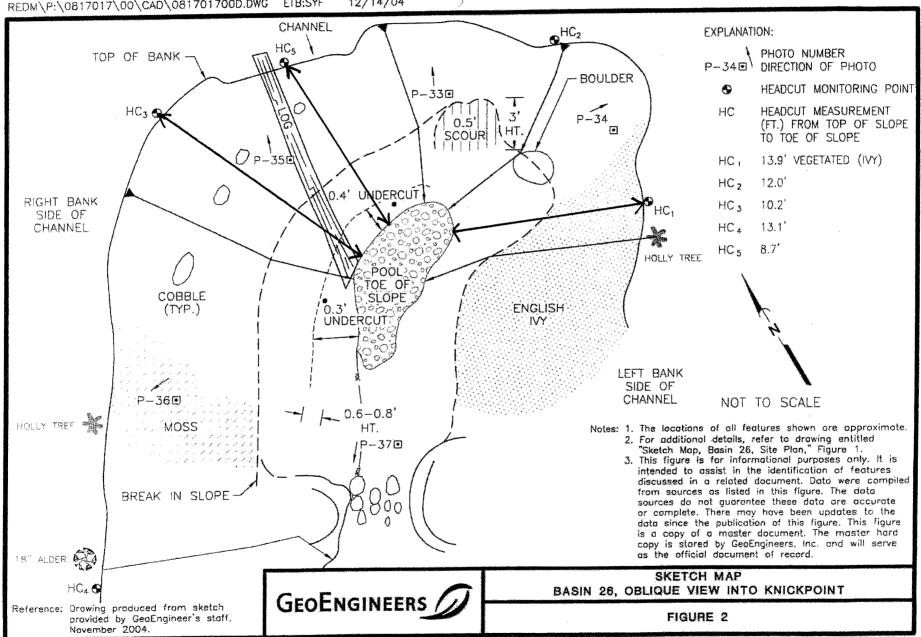
1

| measurement: | | | 1 | 2 | 3 |
|-------------------------------|------------|--------------|---------------------|------------------------|-------------------------|
| by: | | | GeoEngineers | Beck/City | Beck |
| date: | | | 11/18/2004 | 1/5/2006 | 10/20/2006 |
| | | | | very fast water and | |
| Conditions: | | | | rainy. | Dry |
| | | | | | |
| distar | distance | | | | |
| (see F | igure 1 in | 12/15/04 Mor | nitoring report) | | |
| fro | om point | to point | taped distance (ft) | taped distance (ft) | taped distance (ft) |
| | nail 1 | HC5 | 12.3 | 11.6 | 10.4 |
| | nail 2 | HC5 | 12.8 | 13.7 | 13.3 |
| | nail 1 | HC3 | 13.6 | not measured | 13.5 |
| | nail 2 | HC3 | 10.70 | 9.1? | 10.7 |
| | | | | | |
| | | | | | |
| heigh | t | | | | |
| (see Figure 2 in 12/15/04 Mon | | | itoring report) | | |
| | | | | | |
| fro | om point | to | distance (ft) | distance (ft) | distance (ft) |
| | HC1 | toe slope | 13.9 | | 12.8 |
| | HC3 | toe slope | | not measured | 8 |
| | HC5 | toe slope | 8.7 | 8.5 | 8.6 |
| | | | | | |
| | | | | Headcut has retreated | Headcut has retreated |
| | | | | about 1' since Nov | nearly another foot |
| Conclusion | | | | 2004 but stream invert | |
| | | | | about the same. | has filled in with sand |
| | | | | | and gravel. Side banks |
| | | | | | unchanged since 2004 |
| | | | | | - |
| | | | | | |

1.1

12/01/04 REDM\P:\0817017\00\CAD\081701700C.DWG ETB:SYF





REDM\P:\0817017\00\CAD\081701700D.DWG ETB:SYF

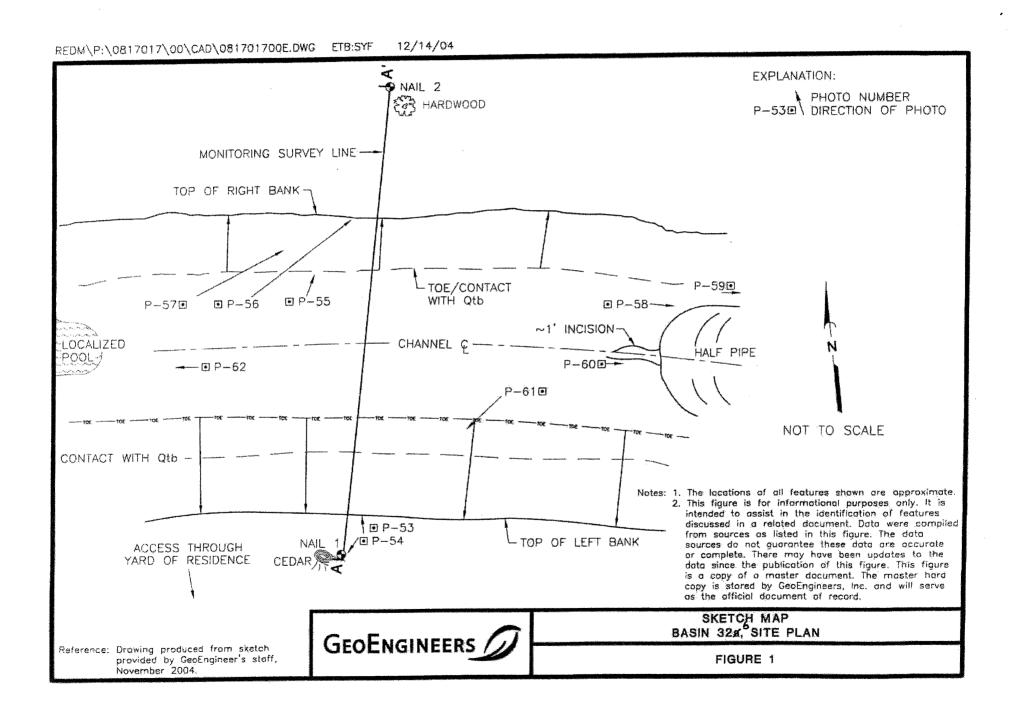
12/14/04

Water Course Monitoring Data Cross section in subbasin 32b

1 k

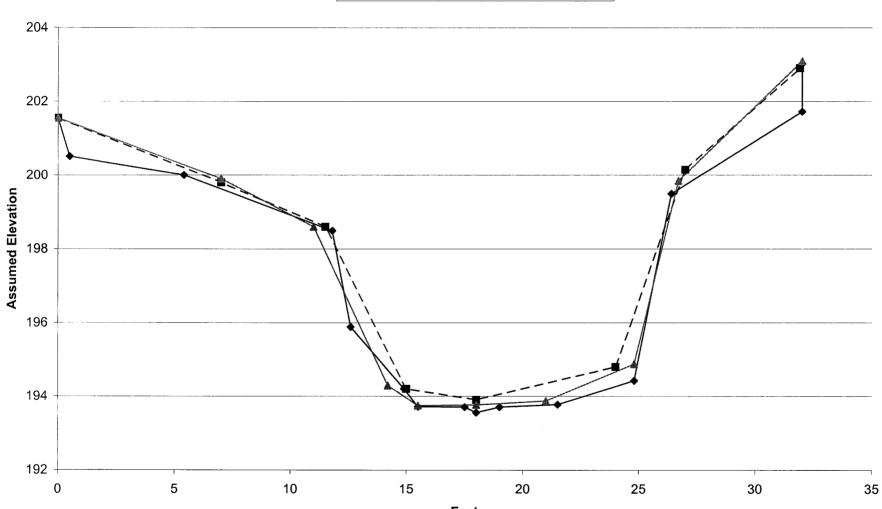
.

| measurement: | 1 | | 2 | | 3 | |
|--------------------------------------|---------------|----------------|----------------------------------|----------------|-------------------------------|----------------|
| by: | GeoEngineers | | Beck/City | | Beck | |
| date: | 11/24/2004 | | 1/5/2006 | | 10/20/2006 | |
| Conditions: | | | very fast water and rainy. | | Dry | |
| Streambed Material Smooth dense silt | | | Smooth dense silt | | Smooth dense silt | |
| Instrument: | optical level | | laser level | | transit | |
| quality of | | | | | | |
| measurement | very good | | poor | | fair | |
| | station | Elevation | station Elevation | | station Elevation | |
| | 0 | 201.55 Nail #1 | 0 | 201.55 Nail #1 | 0 | 201.55 Nail #1 |
| | 0.5 | 200.51 | 7 | 199.8 | 7 | 199.9 |
| | 5.4 | 200.00 | 11.5 | 198.6 | 11 | 198.6 |
| | 11.8 | 198.49 | 15 | 194.2 | 14.2 | 194.29 |
| | 12.6 | 195.88 | 18 | 193.90 | 15.5 | 193.74 |
| | 14.9 | 194.2 | 24 | 194.8 | 18 | 193.76 |
| | 15.5 | 193.71 | 27 | 200.15 | 21 | 193.87 |
| | 17.5 | 193.7 | 31.9 | 202.9 Nail #2 | 24.8 | 194.87 |
| | 18 | 193.55 | | | 26.7 | 199.84 |
| | 19 | 193.7 | | | 32 | 203.09 Nail #2 |
| | 21.5 | 193.77 | | | | |
| | 24.8 | 194.42 | | | | |
| | 26.4 | 199.49 | | | | |
| | 32 | 201.72 | | | 1 | |
| | 32 | 203.02 Nail #2 | | | | |
| Conclusion | | | No change since November 2004 | | No change since November 2004 | |



Monitoring Section Subbasin 32b

- Nov-04 - - - Jan-06 - ____ Oct-06

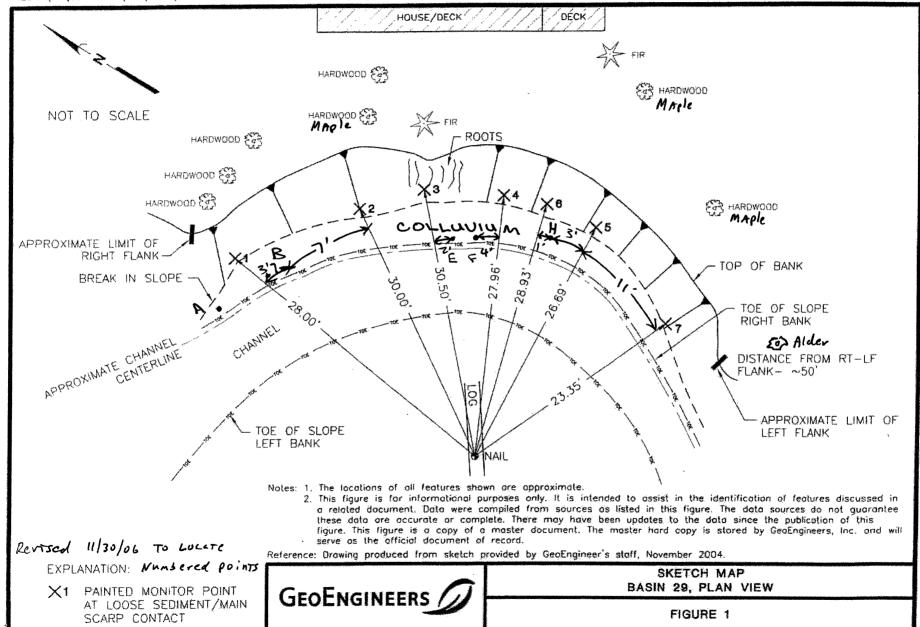


Feet

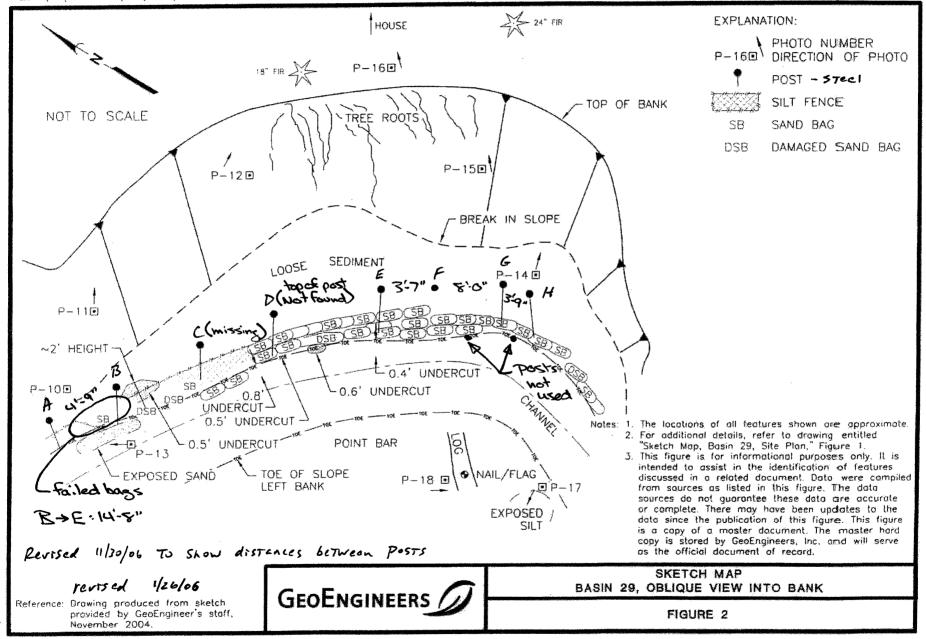
Water Course Monitoring Data subbasin 29

| measurement: | 1 | 2 | 3 |
|---------------|-------------------------------|---------------------------------------|--------------------------|
| by: | GeoEngineers | Beck/City | Beck |
| date: | 11/18/2004 | 1/5/2006 | 10/20/2006 |
| Conditions: | | very fast water and rainy. | Dry |
| | | | |
| Radial dis | stance | | |
| (see Figure | I in 12/15/04 Monitoring repo | ▪ ort) | |
| | oint distance (ft) | | distance (ft) |
| | 1 28 | | |
| | 2 30 | 30 | 30.4 |
| | 3 30.50 | 30 | 30 |
| | 4 27.96 | 26.6 | 27 |
| | 5 28.93 | not measured | 26.60 |
| | 6 26.69 | 26.9 | 27.1 |
| | 7 23.35 | not measured | 23.00 |
| | | | |
| Undercut | ting | | |
| (see Figure 2 | 2 in 12/15/04 Monitoring repo | rt but letters not shown. Post F also | added to drawing) |
| steel fe | ence | | |
| post | No. distance (ft) | distance (ft) | distance (ft) |
| (downstr | eam | | |
| to upstre | am) | | |
| | A 0 | 0 | 0.1 |
| | B 0.5 | 0.4 | 0.7 |
| | C 0.8 | 0.75 | 0.5 |
| | D 0.5 | | post is gone |
| | E 0.4 F 0 | 0 | 0.4 |
| | | | 0.2 |
| | G 0 | | 0.25 |
| | н о | 0 | 0.1 |
| | | | No significant change |
| | | | since Jan 2004. No |
| | | | significant sand bag |
| _ | | No significant change since | losses. |
| Conclusio | า | Nov 2004 | For posts A-G: creek |
| | | | thalweg below sand bags. |
| | | | For posts |
| | | | G-H: creek thalweg at |
| | | | sand bags |

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REDM\P:\0817017\00\CAD\081701700B.DWG ETB:SYF 12/01/04



Appendix D **DIGITAL APPENDIX**

- Report i
- Cost Estimates ii
- iii **Prioritization Model**
- iv
- CIP Project Location Map and Project Summaries Templates for Field Evaluation Form and Project Sheet ٧



Appendix E FIELD INVESTIGATION FORMS FOR EROSION PROBLEMS



Subbasin Problem No. 4. / By: J. Bjork 9/2-1/05 Site Conditions Geology: Qtb Qva Qvr Colluvium fill Undetermined 50-100 gpm Flow Today: Approx. Channel Gradient 0-1% 2-5% 5-10%>10% Varier cfs **Bank Vegetation type:** Native Invasive Landscaped Bank Vegetation quality: Excellent Good Fair Poor **Aquatic Habitat:** Excellent Good Fair Poor **Proximity to Drainage Outfalls:** 125 ft. up/downstream 12 CMP RCP PVC CPEP **Erosion of:** bed left bank right bank headcut Apparent rate of Erosion: stable Slow change Moderate change Rapid change Risks (Check Applicable) None **Private Public Creates Unsafe Condition Bank Stability** \checkmark Upper Slope Stability Landslide Sediment source Habitat destruction Threatens home Threatens other structure Threatens private road/driveway Threatens infrastructure Threatens public road

Address **Apparent Hazard** Low Med High

Low Med High

Significant

300

slide

| | yes |
|----------------------|-----|
| Construction Access: | |

Risk to Homes:

No risk

Conventional Equipment to site

Native

Б

No

30

Conventional Equipment down ravine 1 Conventional Equipment to top of ravine -

| | Conventional Equipment to top of ravine |
|--|---|
| | Crane (less than 200') |
| and the second s | |

Moderate

LF

LF

LF

LF

LF

Landscaped

Cable Way (straight line)

Horiz (ft)

Small equipment

Chute/skid Potential Reduction in O&M costs None Small

Vert (ft)

Solutions

No

Restoration of construction access: Concept: **Outfall protection Bypass Pipe**

Check dams

Channel restoration

Stream restoration

Other

Section MADS Incorrect oho705 Are

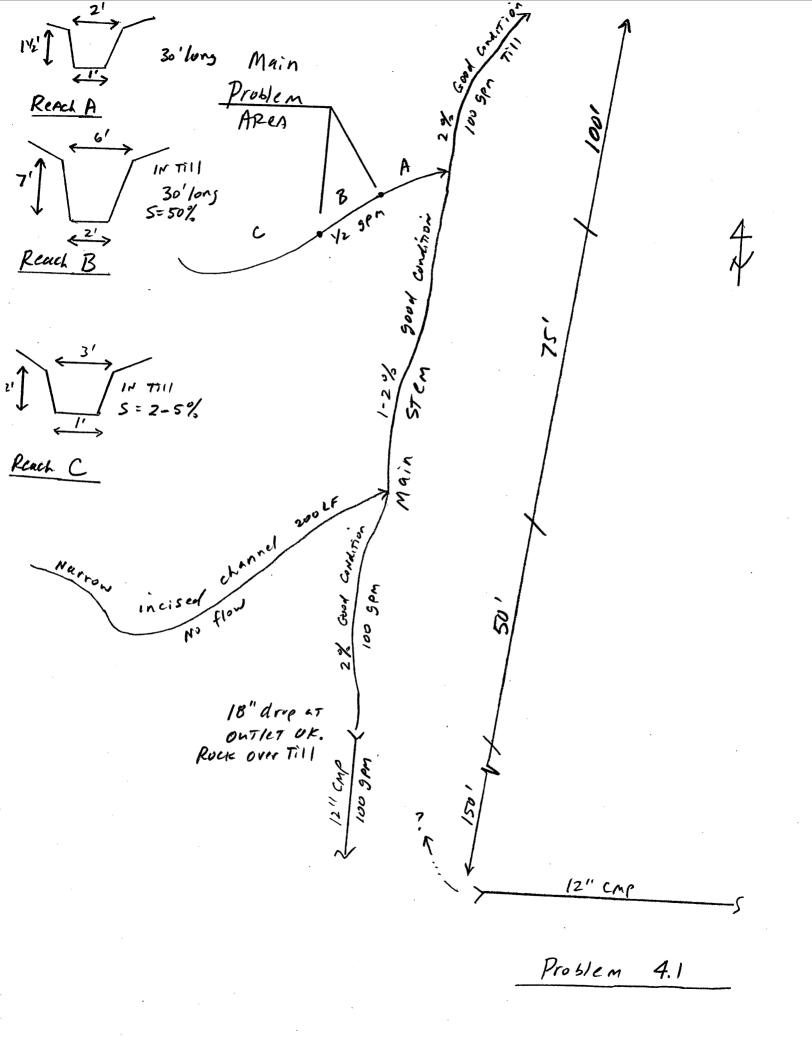
Potential Monitoring Site:

Yes

reach

Area 2 30 Acres

LF



Subbasin 4

Problem No. <u>4. 2</u> By: J. Bjork <u>9 / 24 /05</u>

| Geology: Qtb | Qva | Qvt | Qvr | Colluvium fill | Undetermined slide d f |
|------------------------------|---------------|--------------|--------------------------------|------------------------|---|
| Flow Today: | <u>10 gpm</u> | ncfs | | | Undetermined <u>slide</u> <i># / ient</i> 0-1% 2-5% 5- <u>10</u> %>10% |
| Bank Vegetation type: | | Native | lovasive | Landscaped | lent 0-1% 2-5% 5- <u>10</u> %>10% |
| Bank Vegetation quali | ity: | Excellen | | Fair | Poor |
| Aquatic Habitat: | - | Excellen | | Fair | Poor |
| Proximity to Drainage | Outfalls: | | /downstream | See skeret | Poor |
| Erosion of: | bed | left bank | right bank | headcut | CMP RCP PVC CPEP |
| Apparent rate of Erosi | on: | stable | Slow change | | |
| | | <u>Risks</u> | (Check Appl | | e Rapid change |
| | | None | Private | Public | Crastice Uncerte Occultur |
| Bank Stability | | ······ | V | | Creates Unsafe Condition |
| Upper Slope Stability | | | K | | |
| Landslide Sediment source | | | K | | |
| Habitat destruction | | · · · · | V | V | |
| Threatens home | | · | - | | |
| Threatens other structure | e | ····· | | | |
| Threatens private road/d | | | | V long T | |
| Threatens infrastructure | • | | ······ | <u>v</u> | |
| Threatens public road | | | | | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | | Address | Apparent Hazard |
| No risk | 100' | | 3908 | 90th Ave SE | Low Med High |
| | | | | | Low Med High |
| | 5 | Solutions | <u>}</u> | | |
| Construction | yes | No | | | |
| Construction Access: | <u>/</u> | | Conventional | Equipment to site | |
| | | | Conventional | Equipment down ravi | ne |
| | | | Conventional | Equipment to top of ra | avine |
| | | | Crane (less th Cable Way (s | | |
| | | | Small equipm | | |
| | | | Chute/skid | GIR | |
| Potential Reduction in C | D&M costs N | None | Small | Moderate | Significant |
| Restoration of construc | | : | Native | Landscaped | |
| Concept: Outfall pr | | - | | LF | |
| OPTION Bypass F | • | - | 200 | LF | |
| Check da | | | | LF | |
| Option 2 Channel | restoration | _ | 200 | LF | |
| • | estoration | - | | LF | |
| Other _ | | | | | |
| | -1.1 | SACST. | | 1 in a la la | E pipe System |
| Presence of s fur 3 04T | lide su | SACST. | S DUTT | tused HOP | Ad L'SO Acres |

IE 10'Above "RCP CR. Quarry OBServed SPALLS Spm [([(| xux Partiz Buried and MAPPed 12"mere Slide Top bank 4:1 20'-30' above Creek 12" TOPE IE 7' Above REP Ovarry CR Ð spalls 1 Po Buriel Gallager Hill Road ò 12" HTPPE 2:1 Underent and 1 Quarry Spalls eroding I ١ 40' Wood FENCe Ø LISCK Arector rot or L'à Solution Problem 4.2

4 10'Above CR. ΙE Quarry 12" RLP OBServed 1 gpm 5. nk 11 1) 1 and MAPPed Slide Top bank 4:1 -20'-30' above ruding creek IET'Above CR. Quarry 15" RCP 50 3PM Ð . Spalls 00, Gallager Hill Road -γ 2;1 Undercut and croding l Quarry Spalls I ١ 40' 4 Wood Fence 00 40 LF × ¥ × Not ton rus surg A.T.

Problem 4.2

6 <u>Subbasin</u>

Problem No. 6. 2 By: J. Bjork 9/28/05

| Geology: Qtb | Qva | Qvt | Qvr | Colluvium | fill L | Indetermined | , alida |
|--|--------------|-------------|---------------------------------------|---------------------------------------|-----------|--|----------------|
| Flow Today: | | ncfs | | prox. Channel Gr | _ | | slide |
| Bank Vegetation type | | Native | Invasive | Landscape | | -1% <u>2-5%</u> 5-10% | a≥ <u>10</u> % |
| Bank Vegetation qual | ty: | Excellen | | Fair | | | |
| Aquatic Habitat: | • | Excellen | | Fair | | Poor | |
| Proximity to Drainage | Outfalls: | | /downstream | None | | oor None | No sign of |
| Erosion of: | bed | left bank | right bank | headcut | C | MP RCP PVC CPEF | flowing wate |
| Apparent rate of Erosi | | stable | Slow change | | _ | | |
| | ••••• | Risks | (Check Appl | | inge R | apid change | |
| | | None | | Public | • | | |
| Bank Stability | | | THAC | FUDIC | C | reates Unsafe Co | Indition |
| Upper Slope Stability | · | ~ | | | | | |
| Landslide | | ~ | | | | ************************************** | |
| Sediment source | | | | | | | |
| Habitat destruction | | | | | | | |
| Threatens home Threatens other structur | | | | | | | |
| Threatens private road/c | | | | | | | |
| Threatens infrastructure | inveway | | | · · · · · · · · · · · · · · · · · · · | | | |
| Threatens public road | | ****** | | | | | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | | Address | | | , |
| No risk | (14) | 1011 (11) | | Address | - | parent Hazard | |
| · · · · · · · · · · · · · · · · · · · | | | ······ | | | w Med High | |
| · · · | | Solution | 2 | | Lo | w Med High | |
| | yes | No | 2 | | | | |
| Construction Access: | | | Conventional | Equipment to site | | | |
| | | | Conventional | Equipment down r | avine | | |
| | | | Conventional | Equipment to top of | of ravine | | |
| | | | Crane (less th | nan 200') | | | |
| | | | Cable Way (s | traight line) | | | |
| | | | Small equipm | ent | | | |
| Potential Reduction in | D&M conto | | Chute/skid | | | | |
| Restoration of construct | | | Small | Moderate | Sig | nificant | |
| · · · · · | rotection | • | Native | Landscaped LF | | LF | |
| Bypass | | • | | - | | | |
| Check d | - | - | | LF | | | |
| | restoration | - | · · · · · · · · · · · · · · · · · · · | LF | | | |
| | | - | | LF | | | |
| · · | restoration | | | LF | | 5 | |
| Other_ | | OT A | Surface | WATEr ero | sion | problem | |
| Disturbance Ca | nsed by | bikes | . No run | off or sign | n of | flowing 1 | WATCY |
| Problem Location area. Subbasin | <u>is at</u> | SCAr | e of or | ld Slide | Spri | iss in L | ower |
| area. Jubbasin | bound | | eed to be | Adjusted. | | | |
| Potential Monitoring Sit | e: ץ | | No | | | | |
| | | | | An | < 30 | Acres | |

Sediment or Manual as shown on section mp. No Sign of flowing wares. INCONELT. SEE Prodice 6.1 NU Sorter of duff. no erosian 20 - 30 5 PM Loose Sandy Slide Loyasiide Scarp Materi ni. Abandoned WATCT CISTECN 501/25 1001 18" CPEP nge (introle (Lendelly é O stder € Swele 5+10 くれい MAir nont weltan in developent ARAN 6.2

Problem

Subbasin 10

Problem No. 10. 1 By: J. Bjork 9 128/05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined slide |
|------------------------------------|-----------|-------------|--------------|------------------------------|------------------|-----------|-----------------------------------|
| Flow Today: | | gpn | ncfs | Ap | prox. Channel | Gradier | nt 0-1% 2-5% 5-10% <u>>10%</u> |
| Bank Vegetat | ion type: | | Native | Invasive | Landsca | | |
| Bank Vegetat | ion quali | ty: | Excellent | Good | Fair | | Poor |
| Aquatic Habit | | | Excellent | Good | Fair | | Poor None |
| Proximity to D | Drainage | Outfalls: | ft. up/ | downstream | Rout Lens | des | " CMP RCP PVC CPEP |
| Erosion of: | | bed | left bank | right bank | headcut | | NON1. |
| Apparent rate | of Erosi | on: | stable | Slow change | e Moderate d | hange | Rapid change |
| | | | <u>Risks</u> | (Check Appl | | ÷ | |
| Deals Otability | | | None | Private | Publi | c | Creates Unsafe Condition |
| Bank Stability Upper Slope St | bility | | | | | | |
| Landslide | ability | | | | | - | ***** |
| Sediment source | e | | ~ | | <u> </u> | - | |
| Habitat destruc | tion | | / | | | - | |
| Threatens hom | - | | _ | | | - | |
| Threatens othe | | | | | | - | |
| Threatens priva Threatens infra | | | | | | | |
| Threatens publ | | | | | • | - | |
| Risk to Homes | | Horiz (ft) | Vert (ft) | | Address | - | |
| No risk 🗸 | - | Near | 7411 | | Autress | | Apparent Hazard |
| | | | <u> </u> | | | | Low Med High |
| | • | | Solutions | S | | | Low Med High |
| | | ves | No | 2 | | | |
| Construction | Access: | M | A | Conventional | Equipment to s | ite | |
| | | <u> </u> | | Conventional | Equipment dov | vn ravine | 9 |
| | | | | | Equipment to the | op of rav | /ine |
| | | | | Crane (less th | | | |
| | | <u></u> | | Cable Way (s Small equipm | | | |
| | | ····· | | Chute/skid | | | |
| Potential Redu | | | None | Small | Moderate | | Significant |
| Restoration of | | | 5: | Native | Landscaped | | O LF |
| Concept: | - | rotection | | NA | LF | | |
| | Bypass I | • | | | _LF | | |
| | Check d | ams | | | _LF | | |
| | Channel | restoration | - | | _LF | | |
| | Stream I | restoration | - | | LF | | |
| | Other _ | | | | - | | |
| TOPOGRAPH | ic SI | NALL DE | serve | d but a | Little Ho | NINS | WATER NO |
| <u>Schimm</u> | T SOI | There : | Ar Co | 1100 | A. | 3 | |
| | | | | 11CA ISN | MRLA | 105- J | NOT A Drallon |
| Potential Monit | | - | | 111413~ | MRes_ | | MIT A Proslem |

Subbasin /0

Problem No. 10. 2 By: J. Bjork 9 / 28/05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill Undetermined slide | |
|-------------------------------------|-------------------|----------------|---|----------------|----------------------------------|--|-------|
| Flow Today: | | | gpmcfs | Ар | | radient 0-1% 2-5% 5-10%>10% | 2,2 4 |
| Bank Vegetati | | | Native | Invasive | Landscap | | 3 6 |
| Bank Vegetati | on quali | ity: | Excellen | t <u>Good</u> | Fair | Poor | |
| Aquatic Habita | it: | | Excellen | | Fair | Poor NONE | |
| Proximity to D | rainage | Outfalls | : ft. up | /downstream | Nonc | CMP RCP PVC CPEP | |
| Erosion of: | | bed | left bank | right bank | headcut | | |
| Apparent rate | of Erosi | on: | <u>stable</u> | Slow change | | ······································ | - |
| | | | Risks | (Check Appl | | "igo i taplu change | |
| | | | None | Private | Public | Creates Unsafe Condition | 1 |
| Bank Stability | | | | | | | |
| Upper Slope Sta Landslide | ability | | <u> </u> | | | | |
| Sediment source | _ | | <u> </u> | | ····· | | |
| Habitat destruct | | | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | | | |
| Threatens home | | | | | | | |
| Threatens other | | | | | | | |
| Threatens privat | e road/d | lriveway | ~ | | | | |
| Threatens infras | | | | | | | |
| Threatens public Risk to Homes: | | 11 | | | | | |
| No risk V | | Horiz (| | • | Address | Apparent Hazard | |
| | | / | Ver 3 | 620 | | Low Med High | |
| | | | O a la d | | | Low Med High | |
| | | | <u>Solution</u> | <u>5</u> | | | |
| Construction A | ccess. | yes | No | | F | | |
| | | | | Conventional | Equipment to site Equipment down | | |
| | | | | Conventional | Equipment to top | ravine of ravino | |
| | | | | Crane (less th | nan 200') | | |
| | | | | Cable Way (s | | | |
| | | | | Small equipm | | | |
| Potential Podua | tion in (| 2011 | | Chute/skid | | | |
| Potential Reduc Restoration of c | uon in u | Jam cos | sts <u>None</u> | Small | Moderate | Significant | |
| | | rotection | | Native | Landscaped | LF | |
| - | Bypass I | | | | LF | | |
| | Check d | • | | | LF | | |
| | | restorati | | | LF | | |
| | | | | | LF | | |
| • | Stream r Other | estoratio | ·· - | | LF | | |
| tunnami | | | | | | | |
| 1000graph | | Wale | | | | lowing watty. Sme | 11 |
| COTILET DA | 1 av | ch Ah | 1 none fr | on m | rect. No | TA proslem | |
| Potential Monito | ring Site | 9 : | Yes | No | | v | |

Subbasin 10

Problem No. 10.3 By: J. Bjork 9 / 28/05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undeterm | ined s ⁱ | lide |
|----------------------------------|------------|-------------|--|----------------------------|---------------------------------------|-----------|-------------|---------------------|----------|
| Flow Today: | | Norcopm | cfs | Ap | prox. Channel | | | | |
| Bank Vegetati | on type: | | Native | Invasive | Landsca | | | | |
| Bank Vegetati | on quali | ty: | Excellen | t Good | Fair | • | Poor | | |
| Aquatic Habita | at: | | Excellent | t Good | Fair | | - | sme | |
| Proximity to D | rainage | Outfalls: | ft. up. | /downstream | 6' | , i | CMP RCP P | | |
| Erosion of: | | bed | left bank | right bank | headcut | | | | |
| Apparent rate | of Erosi | on: | stable | Slow change | | hange | Rapid cha | | <u> </u> |
| | | | <u>Risks</u> | (Check Appli | | | | 190 | |
| | | | None | Private | Public | c | Creates U | isafe Cond | dition |
| Bank Stability | | | | | | _ | - | | |
| Upper Slope St Landslide | ability | | | | | - | - | | |
| Sediment source | e | | | | | - | - | | |
| Habitat destruc | | | | | | - | - | | |
| Threatens hom | е | | <pre>\</pre> | ······ | | - | - | | |
| Threatens other | | | _ | | | - | - | | |
| Threatens priva | | riveway | | | | - | _ | | |
| Threatens infra | | | <u> </u> | | | - | _ | | |
| Threatens publi Risk to Homes | | Hariz (ff) | | | <u> </u> | <u> </u> | - | | |
| No risk | | Horiz (ft) | Vert (ft) | | Address | | Apparent | | |
| | | | | | | | Low Med | - | |
| | | C | Solution | ······ | | | Low Med | High | |
| | | ves | No | 5 | | | | | |
| Construction A | Access: | NA | | Conventional | Equipment to s | ito | | | |
| | | | | | Equipment dow | | | | |
| | | | | Conventional | Equipment to to | op of rav | ine | | |
| | | | | Crane (less th | • | | | | |
| | | • <u> </u> | | Cable Way (s | - / | | | | |
| | | | | Small equipm Chute/skid | ent | | | | |
| Potential Redu | ction in (| O&M costs I | None | Small | Moderate | | Significant | | |
| Restoration of | | | | Native | Landscaped | | D | LF | |
| Concept: | Outfall p | rotection | | | LF | | | | |
| | Bypass I | Pipe | | | _ LF | | | | |
| | Check d | ams | | | - LF | | | | |
| | Channel | restoration | | | LF | | | | |
| | Stream r | restoration | · | | LF | | | | |
| | Other | | | | - | | | | |
| Very lim | ited - | Collectio | n arca | . Section | Mp Sis | rem | Curree | F. No | • |
| SOTTING | on | bed ma | revial | down st | ran | NoT. | - A D | rublan | |
| Potential Monit | oring Sit | | | No | · · · · · · · · · · · · · · · · · · · | | | | <u></u> |

<u>Subbasin</u> 10

Problem No<u>. /0. 4</u> By: J. Bjork <u>9 / 24 /05</u>

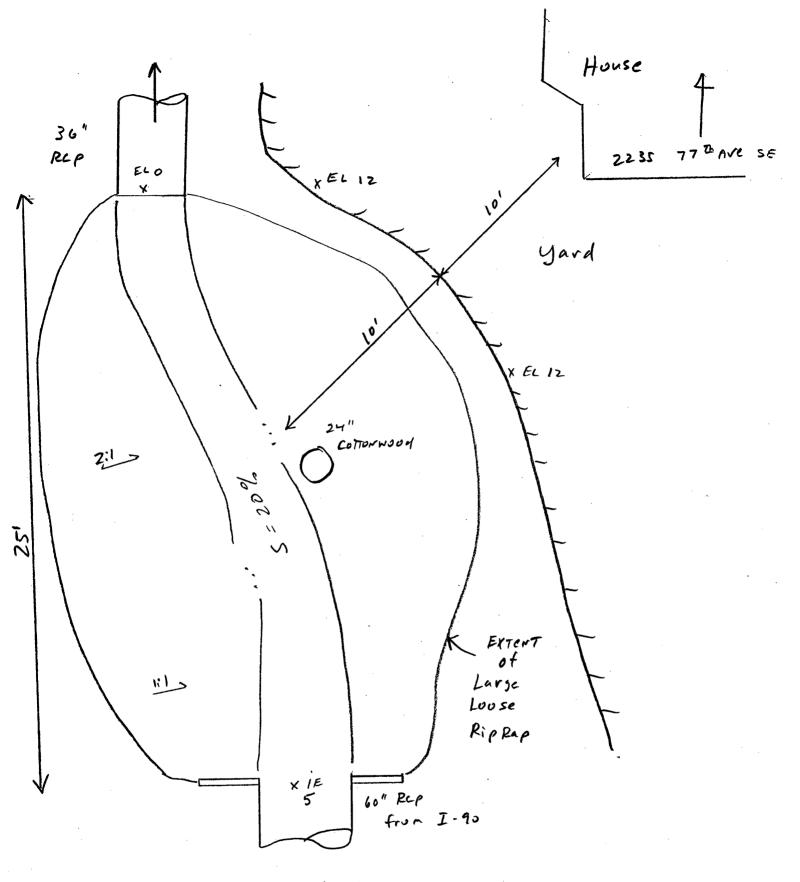
Site Conditions

| Geology: Qtb | Qva | Qvt | Qvr | Colluvium | fill Unde | etermined | slide Louse |
|--|-------------|-----------------------|----------------|--|--------------|-----------------|------------------|
| Flow Today: | 30 gpm | cfs | | prox. Channel G | | | |
| Bank Vegetation type: | | Native | Invasive | Landscap | | | 0 <u>>10%</u> |
| Bank Vegetation quali | ty: | Excellent | | Fair | Poor | | |
| Aquatic Habitat: | • | Excellent | | Fair | | | |
| Proximity to Drainage | Outfalls: | | downstream | | Poor | | |
| Erosion of: | bed | left bank | right bank | headcut | | | , |
| Apparent rate of Erosi | | stable | Slow change | | | lone | i |
| •• | | Risks | (Check Appli | | ange Rapk | l change | |
| | | None | Private | | Crock | an Umanfa O. | |
| Bank Stability | | | ~ | | Creat | es Unsafe Co | Indition |
| Upper Slope Stability | | | - | | | | |
| Landslide | | K | | | | | |
| Sediment source | | V | | | | | |
| Habitat destruction | | | | | | | |
| Threatens home | | | | | | | |
| Threatens other structure | | | | | | | <i>.</i> |
| Threatens private road/d Threatens infrastructure | riveway | x x x x x x | | | | | •. |
| Threatens public road | | <u> </u> | ······ | | | | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | | Address | • | | |
| No risk | | Verency | 2235 | | Appa | rent Hazard | |
| | | | 22 33 | 77 B Avenne | | | |
| - | \$ | Solutions | | ······································ | Low | Med High | |
| | yes | No | 2 | | | | |
| Construction Access: | ,000 | | Conventional | Equipment to site | <u>_</u> | | |
| | | V | Conventional | Equipment down | e Vravino | | |
| | | ~ | Conventional | Equipment to top | of ravine | | |
| | | V | Crane (less th | an 200') | | | |
| • | | | Cable Way (st | | | | |
| | | <u> </u> | Small equipm | | | | |
| Defended De dur (f | <u>_</u> | - | Chute/skid | | | | |
| Potential Reduction in (| | | Small | Moderate | Signific | cant | |
| Restoration of construc | | : | Native | Landscaped | 120 | LF | |
| Concept: Outfall p | | - | | LF | | | |
| Bypass F | • | - | ···· | LF | | | |
| Check da | | | | LF | | | |
| | restoration | - | | LF | | | |
| | estoration | , <u> </u> | | LF | | | |
| Other _ | add 18' | - 27 9 4 | LXCK AT | 68 Outlet (5 | cy) or S | <i>hoscrete</i> | 2 |
| Other No crusion evident | but rol | K lini | ng NOT V | ery good. | Risk de | pends O | in |
| expected flow | Haditi | onal Ar | nalysis M | lavrente | d | | |
| | | | | | | | |

Potential Monitoring Site:

No

Yes



Elevation estimated by Eye. No datum.

Problem 10.4

Subbasin 26

Problem No. 26.1 By: J. Bjork 215106

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill Undetermined slide |
|--|---|---|--|--|--|------------------------------------|
| Flow Today: | | qpi | n <u>Z</u> cfs | | | Sille Sille |
| Bank Vegetatio | on type | : | Native | In <u>vasi</u> ve | piux. Channel Gr | adient 0-1% 2-5% <u>5-10</u> %>10% |
| Bank Vegetatio | | | Excellen | | Landscape | • |
| Aquatic Habitat | | | Excellent | | Fair | Poor |
| Proximity to Dr | | Outfaller | | - | Fair | Poor |
| Erosion of: | annage | bed | | /downstream | none | CMP RCP PVC CPEP |
| Apparent rate o | fEroci | | left bank | right bank | h <u>eadcut</u> | |
| · ppuloiti late o | LIUS | | stable | Slow change | | nge_ Rapid change |
| | | | <u>Risks</u> | (Check Appl | icable) | |
| Bank Stability | | | None | Private | Public | Creates Unsafe Condition |
| Upper Slope Stal | bilitv | | | | | |
| Landslide | | | | | | |
| Sediment source | | | | | | |
| Habitat destruction | on | | | | | |
| Threatens home | | | ~ | | | |
| Threatens other s | | | ~ | ************************************** | | |
| Threatens private | e road/d | Iriveway | 1 2 1 1 | | | |
| Threatens infrast | ructure | | ~ | | | |
| Threatens public | road | | ~ | | | |
| Risk to Homes: | | Horiz (ft) | Vert (ft) | | Address | Apparent Hazard |
| No risk | | | | | | |
| | | | ************************************** | | | Low Med High |
| | - | | Solutions | | | Low Med High |
| | | yes - | No | 2 | | |
| Construction Acc | | • | | | | |
| | cess: | | | Conventional | Equipment to site | |
| | Cess: | | | Conventional | Equipment to site | Di lino |
| | 6622. | | | Conventional | Equipment down ra | avine f ravino |
| | 6622. | | | Conventional Conventional | Equipment down ra Equipment to top o | avine f ravine |
| | 6622: | | | Conventional Conventional Crane (less th | Equipment down ra Equipment to top o an 200') | avine f ravine |
| | cess: | | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme | Equipment down ra Equipment to top o an 200') raight line) | avine f ravine |
| Potential Deduct | | | | Conventional Conventional I Crane (less th Cable Way (st | Equipment down ra Equipment to top o an 200') raight line) | avine f ravine |
| Potential Reducti | on in (| D&M costs | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid | Equipment down ra Equipment to top o an 200') raight line) | f ravine |
| Restoration of co | on in (| D&M costs tion access | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small | Equipment down ra Equipment to top o an 200') raight line) ent | f ravine Significant |
| Restoration of co Concept: 0 | on in (nstruc utfall pi | D&M costs tion access | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e | f ravine |
| Restoration of co Concept: O By | on in (nstruc utfall pi ypass F | D&M costs tion access rotection Pipe | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped | f ravine Significant |
| Restoration of co Concept: O By Cl | on in C nstruc utfall pr ypass F heck da | D&M costs tion access rotection Pipe ams | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped LF | f ravine Significant |
| Restoration of co Concept: O By Cl | on in (nstruc utfall pi ypass F heck da hannel | D&M costs tion access rotection Pipe ams restoration | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped LF LF | f ravine Significant |
| Restoration of co Concept: O By Cl Cl St | on in C nstruc utfall pr ypass F heck da hannel ream re | D&M costs tion access rotection Pipe ams | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped LF LF | f ravine Significant |
| Restoration of co Concept: O By Cl Cl St St | on in C nstruc utfall pi ypass F heck da hannel ream re ther | D&M costs tion access rotection Pipe ams restoration estoration | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped LF LF LF | f ravine Significant |
| Restoration of co Concept: O By Cl Cl St | on in C nstruc utfall pi ypass F heck da hannel ream re ther | D&M costs tion access rotection Pipe ams restoration | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped LF LF LF LF | f ravine Significant 252LF |
| Restoration of co Concept: O By Cl Cl St St | on in C nstruc utfall pi ypass F heck da hannel ream re ther | D&M costs tion access rotection Pipe ams restoration estoration | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped LF LF LF LF | f ravine Significant 252LF |
| Restoration of co Concept: O By Cl Cl St St | on in C nstruc utfall pi ypass F heck da hannel ream re ther | D&M costs tion access rotection Pipe ams restoration estoration | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped LF LF LF LF | f ravine Significant 252LF |
| Restoration of co Concept: 0 By Cl Cl St Of 9' VerTrent | on in C nstruc utfall pr ypass F heck da hannel ream ro ther | D&M costs tion access rotection Pipe ams restoration estoration | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down ra Equipment to top o an 200') raight line) ent Moderate Landscaped LF LF LF LF | f ravine Significant LF |
| Restoration of co Concept: O By Cl Cl St St | on in C nstruc utfall pr ypass F heck da hannel ream ro ther | D&M costs tion access rotection Pipe ams restoration estoration | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down ra Equipment to top o an 200') raight line) ent <u>Moderat</u> e Landscaped LF LF LF LF | f ravine Significant LF |

| Subbasin 27a | — | Problem N | 0. 279. 1 | By: J. Bjork | 9 128 10 | <u>5</u> | | |
|--|----------|---------------|------------------------------|----------------------------|------------------|-----------|-----------------|-----------|
| | | | | Site Cond | itions | | | |
| | | | | | | | | |
| Geology: | | Qva | Qvt | Qvr | Colluvium | fill | undetermined | slide |
| Flow Today: | | <u>10 gpm</u> | | | | | 0-1% 2-5% 5-1 | |
| Bank Vegetation | tvne: | <u></u> 9pm | <u>Nativ</u> e | Invasive | Landscaped | oraulent | 0-170 2-070 0-1 | 0/0-10/0 |
| Bank Vegetation | •• | | Excellent | Good | Fair | | Poor | |
| Aquatic Habitat: | quant | у. | Excellent | Good | Fair | *. | | |
| Proximity to Drai | nago (| Jutfaller | | downstream | | 5 " | Poor | |
| Erosion of: | - | | | | k | 2 | CMP RCP PVC CF | ΈP |
| Apparent rate of | | bed | l <u>eft ban</u> k stable | right bank | h <u>eadcu</u> t | | | |
| Apparentiate of | E10510 | /11. | Risks | Slow change | | d change | | |
| | | | None | (Check Appli Private | cable) Publi | ~ | Creates Unaste | Condition |
| Bank Stability | | | None | | Fubi | 6 | Creates Unsafe | Condition |
| Upper Slope Stabi | ility | | | | | - | <u> </u> | - |
| Landslide | 2 | | | ~ | ••••• | - | | - |
| Sediment source | | | | V | | - | | - |
| Habitat destruction | ו | | | ~ | | _ | | _ |
| Threatens home | | | <u> </u> | | | - | ······ | - |
| Threatens other st | | | | | | - | | - |
| Threatens private Threatens infrastru | | nveway | | · | | - | | - |
| Threatens public r | | | 225 | | | - | | - |
| Risk to Homes: | ouu | Horiz (ft) | Vert (ft) | | Address | - | Apparent Haza | - Ird |
| No risk | | 100' | 30' | 56 | | Cer WEH | Low Med Hig | |
| | - | · | | | | J | Low Med Hig | |
| | - | | Solutions | 5 | <u></u> | | | , |
| | | yes | No | - | | | | |
| Construction Acc | cess: | <u> </u> | | Conventional | Equipment to s | site | | |
| | | <u>/</u> | | Conventional | Equipment dov | vn ravine | • | |
| | | | <u> </u> | | Equipment to t | op of rav | ine | |
| | | | <u>~</u> | Crane (less t | | | | |
| | | | | Cable Way (s | | | | |
| | | | | Small equipm Chute/skid | lent | | | |
| Potential Reducti | on in (| D&M costs | None | Small | Moderate | | Significant | |
| Restoration of co | nstruc | tion acces | s: | Native | Landscaped | | | _F |
| Concept: O | utfall p | rotection | | <u> </u> | LF | | | |
| B | ypass I | Pipe | | | LF | | | |
| С | heck d | ams | | ······ | LF | | | |
| С | hannel | restoration | | 30 | LF | | | |
| | | restoration | | | LF | | | |
| Small S | | | pid c | rosion | in soft | MATE | rin | |
| | | | | | | | | |
| | | | | | Ap = | 30-80 | Acres | |
| Potential Monitor | ing Sit | e: | Yes | <u>No</u> | | | | |

Subbasin 279

Problem No. 279. Z By: J. Bjork 9 / 28 /05

Site Conditions

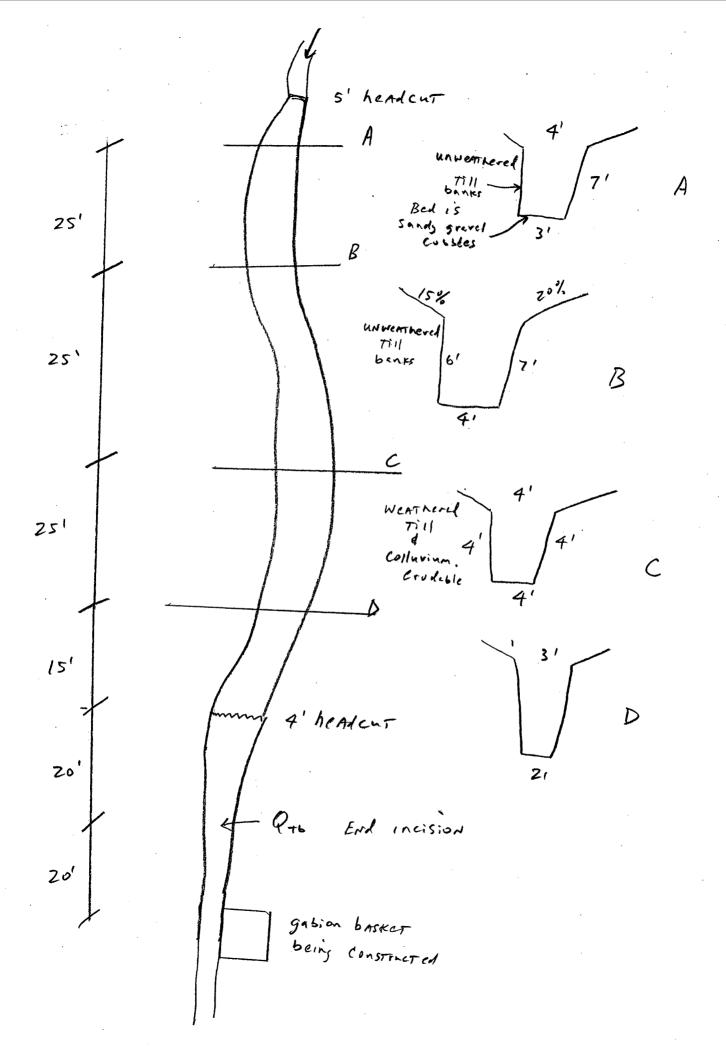
| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined s | lide |
|-------------------------------------|------------|-------------|---|-----------------------------|-----------------|---------------|--|--------------|
| Flow Today: | | gpi | ncfs | Арр | | | t 0-1% 2-5% 5-10%> | |
| Bank Vegetati | on type: | | Native | Invasive | Landsca | | | 10 /0 |
| Bank Vegetati | on quali | ty: | Excellent | | Fair | ped | Poor | |
| Aquatic Habita | at: | | Excellent | | Fair | | Poor | |
| Proximity to D | rainage | Outfalls: | | downstream | | 15 | " CMP RCP PVC CPEP | |
| Erosion of: | | bed | left bank | right bank | headcut | | None | |
| Apparent rate | of Erosi | on: | stable | Slow change | | hande | Rapid change | · |
| | | | Risks | (Check Applie | | lange | Naplu change | |
| | | | None | Private | Public | | Creates Unsafe Con | dition |
| Bank Stability | | | | . · | | - | | union |
| Upper Slope St | ability | | | | | | | |
| Landslide | | | | | · | - | | |
| Sediment source Habitat destruct | | | ~ | | | | | |
| Threatens home | | | | | · | | | |
| Threatens other | - | A | 4 1 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 | | - <u></u> | | | |
| Threatens priva | | | | | | | | |
| Threatens infras | | line | ~ | | | | ······ | |
| Threatens public | c road | | ~ | | | | | |
| Risk to Homes | : | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard | |
| No risk_ | | | | | | | Low Med High | |
| | • | | | | | | Low Med High | |
| | • | | Solutions | S | | | Low med riigh | |
| | | yes | No | - | | | | |
| Construction A | ccess: | / | 1 <u>A</u> | Conventional | Equipment to si | te | | |
| | | | | Conventional I | Equipment dow | n ravine | ана стана стана В стана с | |
| | | | <u> </u> | | Equipment to to | p of rav | ine | |
| | | | ····· | Crane (less th | | | | |
| | | | | Cable Way (st | | | | |
| | | | | Small equipme Chute/skid | ent | | | |
| Potential Reduc | ction in (| 0&M costs | None | | Moderate | | Cimplement | • |
| Restoration of | construc | tion acces | | • • · · · | Landscaped | | Significant | |
| | | rotection | | | LF | | LF | |
| | Bypass I | Pipe | • | 1 | LF | | | |
| | Check d | ams | • | | LF | | | • |
| | Channel | restoration | - | | LF | | | |
| | Stream r | estoration | - | | LF | | | |
| | Other | | - | | | | | |
| No erosion | _ | West 1 | nercer | blan C. | LVENT ON | | Also No cross | ` 0.0 |
| UPSTREAM | of W. | M.W. M | lew hours | AT TATE | WMW due | <u> 1 C T</u> | - Affect Main | *** |
| | | <u>+</u> _/ | 110-36 | | y new use | 5 1107 | ATTEET MAIN | STEM |

Potential Monitoring Site:

Yes

Subbasin 27 a Problem No. 2743 By: J. Bjork 9 / 28 /05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined | slide |
|------------------------------------|-----------|---------------|-----------------|---|--------------------|---------|------------------------|-----------|
| Flow Today: | | 20 gpm | cfs | Арр | rox. Channel G | radient | 0-1% <u>2-5%</u> 5-10% | >10% |
| Bank Vegetatio | on type: | | Native | Invasive | Landscap | bed | | |
| Bank Vegetatio | on qualit | y: | Excellent | Good | Fair | | Poor | |
| Aquatic Habita | t: | | Excellent | Good | Fair | | Poor | |
| Proximity to Dr | rainage | Outfalls: | ft. up/ | downstream | None | | CMP RCP PVC CPEP | |
| Erosion of: | | <u>bed</u> | left bank | right bank | h <u>eadcu</u> t s | S'AT | 45 cond; 4' a | T DS end |
| Apparent rate of | of Erosic | on: | stable | Slow change | | - | Rapid change | |
| | | | <u>Risks</u> | (Check Applie | cable) | | | |
| | | | None | Private | Public | : | Creates Unsafe Co | ndition |
| Bank Stability | | | | <u> </u> | | | | |
| Upper Slope Sta Landslide | ability | | <u> </u> | | | | | |
| Sediment source | ۵ | | <u> </u> | | | | | |
| Habitat destruct | | | <u> </u> | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | | | |
| Threatens home | | | ~ | | · · · · · · | | ************ | |
| Threatens other | structur | e | × × × × | | | | · · · · · | |
| Threatens privat | | riveway | | | | | | |
| Threatens infras | | | <u> </u> | | | | | |
| Threatens public Risk to Homes: | | Uprin (ff) | | | A .Jl | | | |
| | | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard | |
| No risk | • | | | | | | Low Med High | |
| | | | Solution | | | l | Low Med High | |
| | | | Solution: No | 5 | | | , | |
| Construction A | ccess: | yes | INO | Conventional | Equipment to sit | to | | |
| | | | ~ | | Equipment down | | | |
| | | ~ | | | Equipment to to | | ne . | |
| | | | <u> </u> | Crane (less th | • | | | |
| | | | | Cable Way (s | | | | |
| | | <u>v</u> | | Small equipm | lent | | | |
| Potential Redu | ction in | 0&M costs | None | Chute/skid Small | Moderate | | Significant | |
| Restoration of | | | | Native | Landscaped | ``` | Significant | |
| Concept: | | protection | | | LF | - | <u> </u> | |
| • | Bypass | | | | LF | | | |
| | Check c | • | | | LF | | | |
| | Channe | I restoration | , I | | LF | | | |
| | | restoration | | 110 | _LF | | | |
| | Other | | | | | | | |
| deed in | cisco | (Chan | nel | | | | | |
| | | <u> </u> | | | Ao | 230 | Acres | |
| | | `` | | | (]0 | | | . <u></u> |
| Potential Monit | oring Si | te: | (res) | No | | | | |



<u>Subbasin 27 q</u>

Problem No. 274. 7 By: J. Bjork 9 / 28 /05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill Undeterr | nined | slide |
|------------------------------------|------------|--|--|----------------|--|----------------------|--------------|----------|
| Flow Today: | | _O_gpm | ncfs | Apr | prox. Channel Gra | | | |
| Bank Vegetation | on type: | | Native | Invasive | Landscape | | //0 J=10 % | ~10% / |
| Bank Vegetatio | on qualit | y: | Excellent | | Fair | Poor | | |
| Aquatic Habita | it: | | Excellent | | Fair | _ | | |
| Proximity to D | rainage (| Outfalls: | ft. up/ | downstream | /2 | " CMP RCP | NONC | |
| Erosion of: | | bed | left bank | right bank | headcut | | PVC CPEP | |
| Apparent rate | of Erosia | on: | stable | Slow change | | ge Rapid ch | | <u> </u> |
| | | | <u>Risks</u> | (Check Applie | | ige napiu un | ange | |
| | | | None | Private | Public | Creates I | Jnsafe Cor | ndition |
| Bank Stability | | | _ | | | | | indición |
| Upper Slope Sta Landslide | ability | | | | | | | |
| Sediment source | _ | | <u> </u> | | | | | |
| Habitat destructi | | | | | | | <u> </u> | |
| Threatens home | | | ~ | <u>-</u> | | | | |
| Threatens other | | | _ | | | | | |
| Threatens privat | | iveway | _ | | + | | | |
| Threatens infras | | | | | | | | |
| Threatens public Risk to Homes: | | | | | | | | |
| No risk | | Horiz (ft) | Vert (ft) | | Address | Apparent | Hazard | |
| NO TISK | - | •••••••••••••••••••••••••••••••••••••• | | | | Low Med | l High | |
| | - | | | | | Low Med | l High | |
| | | | <u>Solutions</u> | | | | | |
| Construction A | ccess' | yes N | A No | Conventional | | | | |
| | | | | Conventional | Equipment to site Equipment down ra | n vin o | | |
| | | ······································ | | Conventional I | Equipment to top o | f ravine | | |
| | | | | Crane (less th | an 200') | T LANIE | | |
| | | | | Cable Way (st | raight line) | | | |
| | | | | Small equipme | ent | | | |
| Potential Reduc | tion in O | 8 M acata | | Chute/skid | | | | |
| Restoration of c | onstruct | tion access | Contraction of the local division of the loc | | Moderate | Significant | | |
| | Outfall pr | | | • | Landscaped LF | 0 | LF | |
| - | Bypass P | | - | | LF | | | |
| | Check da | • | - | | LF | | | |
| | | restoration | | | LF | | | |
| | | estoration | - | | | | | |
| | Other | | - | | LF | | | |
| | | Misher | AT CA. | | | 7 / | 1 | |
| | • • • | | | | my STATED 7 | here has alvert e | been r | 10 |
| prosten to | | years | SINCE | road re | brilt & C | nerest e | 2Tenn | les . |
| Potential Monito | ring Site |): | es N | 10 | NO pr | oslem | | |

<u>Subbasin 279</u>

Problem No<u>. 279</u>.5 By: J. Bjork <u>9 / 28/05</u>

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium fi | |
|------------------------------------|------------|-------------|--------------|---------------------|---|--|
| Flow Today: | | gr | mcfs | | | ll Un <u>determined</u> slide lient 0-1% 2-5% 5-10% <u>>10%</u> |
| Bank Vegetati | on type: | | Native | Invasive | Landscaped | alent 0-1% 2-5% 5-10% 210% |
| Bank Vegetati | on quali | ty: | Excellen | | Fair | Poor |
| Aquatic Habita | at: | | Excellen | | Fair | |
| Proximity to D | rainage | Outfalls: | | /downstream | i dii | Poor |
| Erosion of: | | bed | left bank | right bank | headcut | CMP RCP PVC CPEP |
| Apparent rate | of Erosic | on: | stable | Slow change | | Donid change |
| | | | Risks | (Check Appli | | e Rapid change |
| <u> </u> | | | None | Private | Public | Creates Unsafe Condition |
| Bank Stability | | | | | | Greates Unsale Condition |
| Upper Slope Sta Landslide | ability | | | | | |
| Sediment sourc | • | | | | | |
| Habitat destruct | | | | | | |
| Threatens home | | | ~ | | | |
| Threatens other | | | ~ | | · | · · · · · · · · · · · · · · · · · · · |
| Threatens privat | te road/di | riveway | | | | |
| Threatens infras | | | | | | |
| Threatens public Risk to Homes: | c road | | | | | |
| No risk | | Horiz (ft) | Vert (ft) | | Address | Apparent Hazard |
| | - | | | | | Low Med High |
| | - | | Salution | | | Low Med High |
| | | yes | Solutions | 5 | | |
| Construction A | ccess: | yc3 | */ * | Conventional | | |
| | | | | Conventional I | Equipment to site Equipment down rav | ino |
| | | | | Conventional I | Equipment to top of | ravine |
| | | | ····· | Crane (less the | an 200') | |
| | | | | Cable Way (st | | |
| | | | | Small equipme | ent | |
| Potential Reduc | tion in C | &M costs | | Chute/skid Small | Madaust | |
| Restoration of c | onstruct | tion acces | | | Moderate Landscaped | Significant |
| | Outfall pr | | | - | LE LE | _ <u>_</u> LF |
| | Bypass P | | - | | LF | |
| | Check da | ims | - | ***** | LF | |
| · (| Channel I | restoration | - | | LF | |
| | | estoration | - | | LF | |
| • | Other | | - | | -F | |
| 1 | nap | Corre | oth S | hows Th | 45 This | Telation Comment |
| IS pi | oed . | ND | Crosion | | | WATEr Couvse |
| | | | | | 7 | |
| Potential Monito | ring Site | : | Yes <u>N</u> | 10 | | · · · · · · |

<u>Subbasin 279</u>

Problem No.274.6 By: J. Bjork 9/28/05

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined | slide |
|--------------------------------------|------------|-------------|--------------|---------------------------------------|-------------------|-------------|--------------------------------|----------------|
| Flow Today: | | gpn | ncfs | Арр | orox. Channel G | | t 0-1% <u>2-5%</u> 5-10% | |
| Bank Vegetatio | •• | | Native | Invasive | Landscap | | | |
| Bank Vegetatio | on qualit | y: ` | Excellent | Good | Fair | | Poor | |
| Aquatic Habita | t: | | Excellent | Good | Fair | | Poor | |
| Proximity to Dr | ainage (| Outfalls: | ft. up/ | downstream | none | | CMP RCP PVC CPEP | |
| Erosion of: | | bed | left bank | right bank | headcut | | - ^ | iling |
| Apparent rate of | of Erosic | n: | stable | Slow change | Moderate cha | ange | Rapid change | |
| | | | <u>Risks</u> | (Check Applie | | U | index of a light | |
| Deals Of 1 W | | | None | Private | Public | | Creates Unsafe Co | ndition |
| Bank Stability Upper Slope Sta | 5114. | | | | | | | |
| Landslide | ionity | | <u> </u> | | | | | |
| Sediment source | , | | | | ······ | | | |
| Habitat destructi | | | | | | | | |
| Threatens home | | | ~ | | <u> </u> | | | |
| Threatens other | | | 111 | | | | · | |
| Threatens private | | iveway | | | | - (1 | | |
| Threatens infras Threatens public | | | | | | 8 5 | ewer main Crus | ses down stren |
| Risk to Homes: | | Horiz (ft) | Vert (ft) | | | | | |
| No risk | • | | Vert (it) | | Address | | Apparent Hazard | |
| | - | | | | | | Low Med High | |
| | - | | Solutions | | | | Low Med High | |
| | | yes | No | 2 | | | | |
| Construction A | cess: | | | Conventional | Equipment to site | ē | | |
| | | | | Conventional | Equipment down | , ravine | 2 | |
| | | | r | Conventional | Equipment to top | of rav | ine | |
| | | | <u> </u> | Crane (less th | an 200') | | | |
| | | | _ <u> </u> | Cable Way (st | - / | | | |
| | | | | Small equipme Chute/skid | ent | | | |
| Potential Reduc | tion in C | 0&M costs | None | Small | Moderate | | Significant | |
| Restoration of c | | | | Native | Landscaped | | 250 LF | |
| Concept: | Outfall pr | otection | _ | | LF | | LI | |
| 1 | Bypass F | Pipe | • | | LF | | | |
| (| Check da | ams | • | · · · · · · · · · · · · · · · · · · · | LF | | | |
| (| Channel | restoration | • | <u></u> | LF | | - | |
| | Stream r | estoration | • | · · · · | LF | | | |
| (| Other | 4 | ULF | | rscade | | | |
| 4 high tin | nber (| · · · · | nm is | Failing | | IM | MINCOT IN | a |
| CrEATE 2 | 20-5 | O Ch | 1 | Sediment | - Sanitari | Spurs | Minent. We as down STREAM 1 | MIN AND I |
| | | | | | J. | | | |
| Potential Monito | ring Site |): | Yes | No | | | | |

Subbasin 29

Problem No. 29. | By: J. Bjork 115106

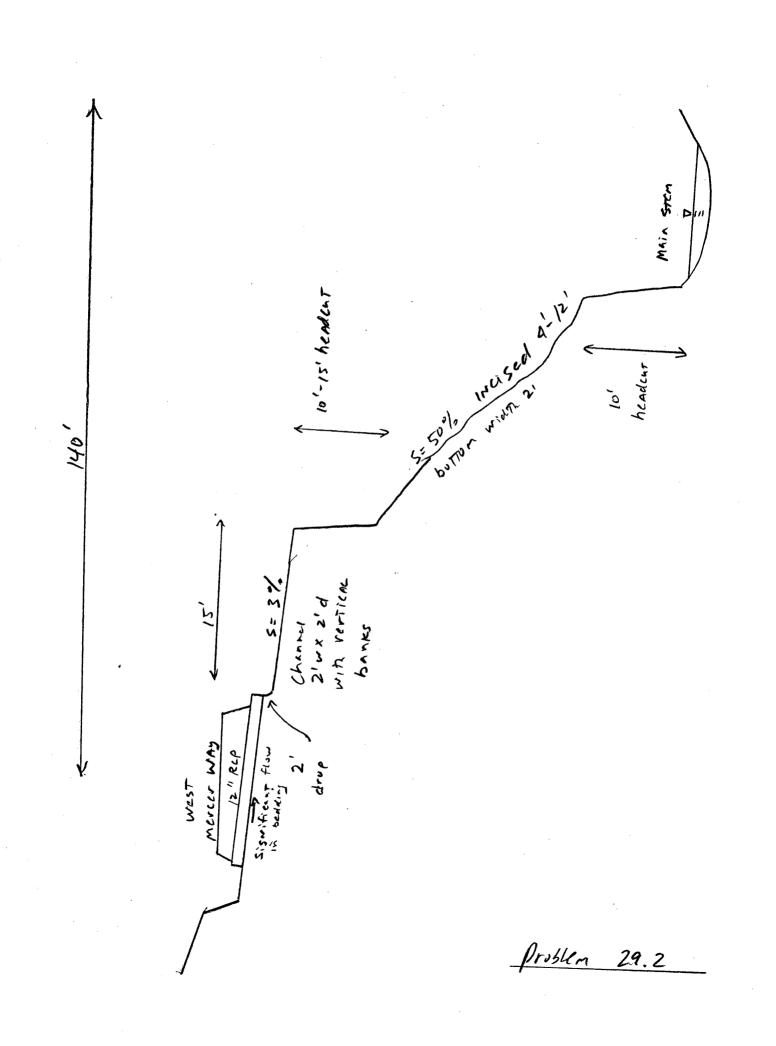
| | Qtb | Qva | Qvt . | Qvr | Colluvium | fill Undetermined | |
|--|---|---|----------------------|---|---|---|--------|
| Flow Today: | | gpr | $n \leq cfs$ | | | | slide |
| Bank Vegetation | n type: | | Native | مہ Invasive ف | prox. Channel (| Fradient 0-1% 2-5% 5-10% | >10% |
| Bank Vegetation | | | Excelle | | Landsca | | |
| Aquatic Habitat | | | Excelle | | Fair | Poor | |
| Proximity to Dra | | Outfalle | | | Fair | Poor | |
| Erosion of: | unugo | bed | | p/downstream | 27 | CMP RCP PVC CPEP | |
| Apparent rate of | Froeid | | left bank | | headcut | | |
| | LIVOI | | stable | Slow change | | ange R <u>apid chang</u> e | |
| • | • | | <u>Risks</u> None | | • | | • |
| Bank Stability | | | none | Private | Public | Creates Unsafe Cor | dition |
| Upper Slope Stab | oility | | | | | | |
| Landslide | • | | <u></u> | ~ | | ······································ | |
| Sediment source | | | | | | | |
| Habitat destruction | n | | | <u> </u> | | | |
| Threatens home | | | ~ | | | | |
| Threatens other st | tructure |) Deuk | | ~ | | | |
| Threatens private Threatens infrastru | road/dr | riveway | | | | | |
| Threatens public r | ucture | | | | | | |
| Risk to Homes: | oad | Hanim (EL) | <u> </u> | | | | |
| No risk | | Horiz (ft) | Vert (ft) | | Address | Apparent Hazard | |
| | - | | | 6165 We | st Mercer 6 | AN LOW Med High | |
| • | · | | | 6205 Wes | 5 Mercer 1 | ver Low Med High | |
| | | | Solution | <u>s</u> | · · · · | | |
| Construction Acc | | yes | No | | | | |
| | | | | | | | |
| | ess: | | <u> </u> | Conventional | Equipment to site |) | |
| | ess: | | | Conventional | Equipment down | ravine | |
| | ess: | <u> </u> | | Conventional Conventional | Equipment down Equipment to top | ravine | |
| | ess: | | | Conventional Conventional Crane (less th | Equipment down Equipment to top an 200') | ravine | |
| | ess: | | | Conventional Conventional Crane (less th Cable Way (st | Equipment down Equipment to top an 200') raight line) | ravine | |
| | | | ¥ | Conventional Conventional Crane (less th Cable Way (st Small equipme | Equipment down Equipment to top an 200') raight line) | ravine | |
| Potential Reduction | on in O | | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid | Equipment down Equipment to top an 200') raight line) ent | ravine of ravine | |
| Potential Reduction Restoration of cor | on in O Istruct | &M costs N ion access | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small | Equipment down Equipment to top an 200') raight line) ent Moderate | ravine of ravine <u>Significant</u> | |
| Potential Reduction Restoration of cor | on in O Istruct | | | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent | ravine of ravine | |
| Potential Reduction Restoration of cor Concept: Ou By | on in O Istruct Itfall pro | &M costs N ion access ptection ipe | | Conventional Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped | ravine of ravine <u>Significant</u> | |
| Potential Reduction Restoration of cor Concept: Ou By | on in O Istruct | &M costs N ion access ptection ipe | | Conventional I Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF | ravine of ravine <u>Significant</u> | |
| Potential Reduction Restoration of cor Concept: Ou By Ch | on in O Istruct Itfall pro pass Pi eck dat | &M costs N ion access ptection ipe | | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF | ravine of ravine <u>Significant</u> | |
| Potential Reduction Restoration of cor Concept: Ou By Ch Ch | on in O Istruct Itfall pro pass Pi eck dai annel r | &M costs N ion access otection ipe ms estoration | | Conventional Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF LF | ravine of ravine <u>Significant</u> | |
| Potential Reduction Restoration of cor Concept: Ou By Ch Ch | on in O Istruct Itfall pro pass Pi eck dar annel re eam re | &M costs N ion access otection ipe ms | | Conventional Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF | ravine of ravine <u>Significant</u> | |
| Potential Reduction Restoration of cor Concept: Ou By Ch Ch Stru | on in O Istruct Itfall pro pass Pi eck dai annel re eam re ner | &M costs N ion access otection ipe ms estoration storation | | Conventional Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF LF LF | ravine of ravine <u>Significant</u> LF | |
| Potential Reduction Restoration of cor Concept: Ou By Ch Ch Ch Stro Oth | on in O Istruct Itfall pro pass Pi eck dar annel re eam re her | AM costs N ion access otection ipe ms estoration storation | None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF LF _F _F | ravine of ravine Significant LF | |
| Potential Reduction Restoration of cor Concept: Ou By Ch Ch Str Ott drup at banks L | on in O Istruct Itfall pro pass Pi eck dai annel re eam re ner | AM costs N ion access otection ipe ms estoration storation | None | Conventional Conventional I Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF LF LF | ravine of ravine Significant LF | |
| Potential Reduction Restoration of cor Concept: Ou By Ch Ch Ch Stro Oth | on in O Istruct Itfall pro pass Pi eck dar annel re eam re her | AM costs N ion access otection ipe ms estoration storation | None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF LF _F _F | ravine of ravine Significant LF | · |
| Potential Reduction Restoration of cor Concept: Ou By Ch Ch Str Ott drup at banks L | on in O istruct itfall pro- pass Pi eck dan eck dan annel re eam re her Ch C | M costs N ion access otection ipe ms estoration storation V(rT 0 h 6c/n | None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent Moderate Landscaped LF LF LF LF _F _F _F F F | ravine of ravine Significant LF | |

Subbasin 29

Problem No. 29. 2 By: J. Bjork <u>12 / 14 /05</u>

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined slide |
|-----------------------------|-------------|-------------|--|---------------------------------|--|--------|---------------------------------|
| Flow Today: | | 80 gpm | ıcfs | | | | t 0-1% 2-5% 5-10%>10% |
| Bank Vegetati | on type: | | Native | Invasive | Landscap | | |
| Bank Vegetati | on qualit | ty: | Excellen | t Good | Fair | -(| Poor |
| Aquatic Habita | at: | | Excellen | | Fair | | Poor |
| Proximity to D | rainage | Outfalls: | <u>/5</u> ft. up | /downstream | 12 | | CMP RCP PVC CPEP |
| Erosion of: | | bed | left bank | right bank | headcut 2 | | |
| Apparent rate | of Erosic | on: | stable | Slow change | the second design of the secon | ande | Rapid change |
| | | | <u>Risks</u> | (Check Applie | | ango | |
| | | | None | Private | Public | | Creates Unsafe Condition |
| Bank Stability | | | | <u> </u> | | | |
| Upper Slope St Landslide | ability | | | × × × × | | | |
| Sediment source | 0 | | | <u></u> | · | | |
| Habitat destruct | | | | | | | |
| Threatens hom | | | | | | | |
| Threatens other | r structure | 9 | × × × | | | | |
| Threatens priva | te road/d | riveway | ~ | | | | |
| Threatens infra | | Ţ | <u></u> | | | | |
| Threatens publi | | | | - | | | |
| Risk to Homes | | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard |
| No risk_ | . | | | | | | Low Med High |
| | - | | | | | | Low Med High |
| | | | Solution | <u>s</u> | | | |
| 0 | | yes | No | | | • | |
| Construction A | CCess: | | | Conventional | Equipment to site | ; | |
| | | | | | Equipment down | | |
| | | <u> </u> | | Conventional | Equipment to top | of rav | ine |
| | | | ************************************** | Crane (less th Cable Way (st | | | |
| | | V | | Small equipme | | | |
| | | V | | Chute/skid | | | |
| Potential Redu | | | | Small | Moderate | | Significant |
| Restoration of | | | 5: | <u>Nativ</u> e | Landscaped | | 25 LF |
| Concept: | Outfall p | | | | LF | | |
| | •• | Pipe Hopi | - | 140 | LF | | |
| | Check da | | | | LF | | |
| | Channel | restoration | | | LF | | |
| | Stream r | estoration | | | LF | | |
| | Other _ | | | | | | |
| · | | | | | | | |
| | | | | | | | |
| | | | | | · · ·································· | | |
| Potential Monite | oring Site | e: | (es | No | | | |

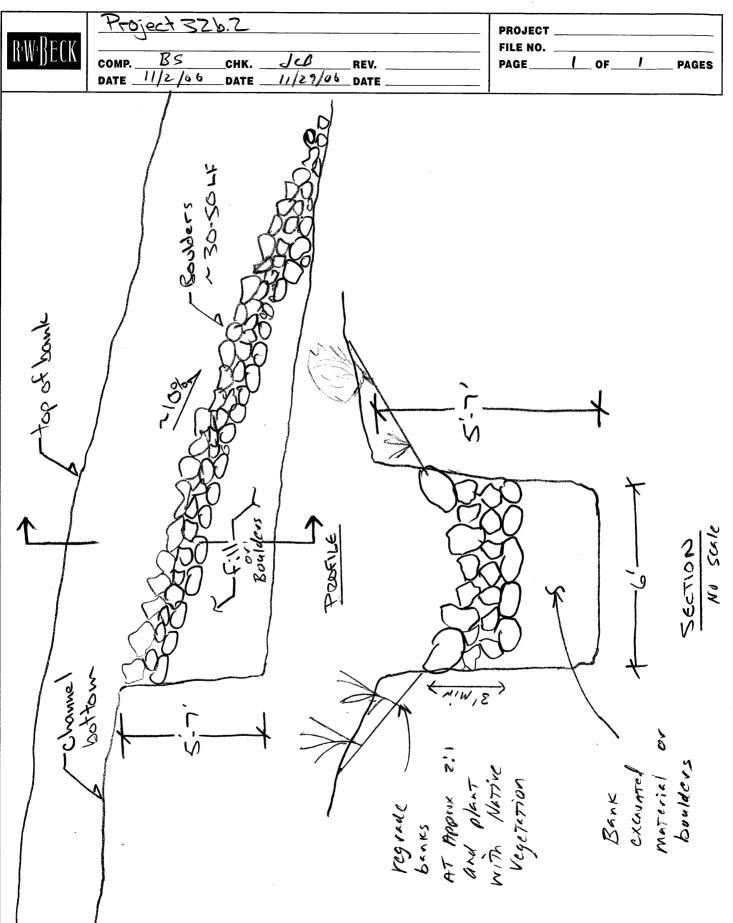


<u>SubbasinS2b</u>

Problem No.328-2 By: J. Bjork 10/20/06

| lower | v. | -pper- | | | |
|--|--------------|--|---|---|---|
| Geology: Qtb | Qva | Qvt | Qvr | Colluvium fill | Undetermined slide |
| Flow Today: | <u>S</u> gpn | n <u> </u> | App | | nt 0-1% 2-5% 5-10%>10% |
| Bank Vegetation type | : | Native | <u>Invasive</u> | Landscaped | |
| Bank Vegetation qual | ity: | Excellent | | Fair | <u>Poor</u> |
| Aquatic Habitat: | | Excellent | | Fair | Poor |
| Proximity to Drainage | Outfalls: 3 | SAOft. up | | 78 | |
| Erosion of: | bed | left bank | right bank | headcut | CMP RCP PVC CPEP |
| Apparent rate of Erosi | ion: | stable | Slow change | Moderate change | Popid change |
| | | Risks | (Check Applic | | Rapid change |
| D | | None | Private | Public | Creates Unsafe Condition |
| Bank Stability | | | V | | orcates onsale condition |
| Upper Slope Stability Landslide | | <u>V</u> | | | |
| Sediment source | | V | | | |
| Habitat destruction | | | <u>×</u> | ·= · · · · · · · · · · · · · · · · · · | |
| Threatens home | | 1 | | | |
| Threatens other structur | | ブ | | ************************************** | · · · · · · · · · · · · · · · · · · · |
| Threatens private road/o | driveway | V | | | |
| Threatens infrastructure | | V | | | |
| Threatens public road Risk to Homes: | | | | | |
| | Horiz (ft) | Vert (ft) | | Address | Apparent Hazard |
| No risk | | | | | _Low Med High |
| | | | | | Low Mod Likely |
| | | | | | Low Med High |
| | | Solutions | 5 | ······································ | _Low Med High |
| Construction Access | yes | No | - | ······· | _Low Mea High |
| Construction Access: | | No | Conventional E | Equipment to site | |
| Construction Access: | | No | Conventional E Conventional E | Equipment down ravin | e . |
| Construction Access: | | No | Conventional E Conventional E Conventional E | Equipment down raving Equipment to top of rav | e . |
| Construction Access: | | No V | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str | Equipment down ravin Equipment to top of ra an 200') raight line) | e vine |
| Construction Access: | | No V | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str | Equipment down ravin Equipment to top of ra an 200') raight line) ent UNA & CCCSS 1 | e vine |
| | | No VV | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid | Equipment down ravin Equipment to top of rav an 200') raight line) Int النام مدروجي م جنگو ملا تمين | e . |
| Potential Reduction in | yes | No V None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small | Equipment down ravin Equipment to top of ra- an 200') aight line) nt UNA ACCESS of Side SE FAUS Moderate | e vine |
| Potential Reduction in Restoration of construct | yes | No V None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small | Equipment down ravin Equipment to top of ra- an 200') raight line) ent UIA & CCCSS Side CE FOUI Moderate Landscaped | e vine road parellel te north ne (Meadow Lane) |
| Potential Reduction in Restoration of construc Concept: Outfall p | yes | No V None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of rav an 200') raight line) nt النم محدوجة م ينكو مح تمرين Moderate Landscaped | e vine road parellel te north ne (Meadow Lane) Significant |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass | yes | No V None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of ra- an 200') raight line) ent UIA & CCCSS State State Moderate Landscaped LF | e vine road parellel te north ne (Meadow Lane) Significant |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass Check d | yes | No V None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of ravin raight line) Int النام محدود الم Side color Moderate Landscaped LF LF | e vine road parellel te north ne (Meadow Lane) Significant |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass Check d Channel | yes | No V None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of rav an 200') raight line) ent النام محدوجة م الموالية Moderate Landscaped LF LF LF | e vine road parellel te north ne (Meadow Lane) Significant |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass Check d Channel Stream | yes | No None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of ra- an 200') raight line) ont UNA & CCCSS Moderate Landscaped LF LF LF LF LF | e vine road parellel te north ne (Meadow Lane) Significant |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass Check d Channel Stream Other | yes | | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of ra- an 200') raight line) ont UNA & CCCSS Moderate Landscaped LF LF LF LF LF | e vine road parellel te north ne (Meadow Lane) Significant |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass Check d Channel Stream Other | yes | No None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of ravin Faight line) and UNA ACCESS of Side SE rowin Moderate Landscaped LF LF LF LF LF LF LF LF LF LF LF LF LF | e vine Toad parellel te north ne (Meadow Lane) Significant Significant LF north bank |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass Check d Channel Stream Other | yes | No None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of ravin Faight line) and UNA ACCESS of Side SE rowin Moderate Landscaped LF LF LF LF LF LF LF LF LF LF LF LF LF | e vine Toad parellel te north ne (Meadow Lane) Significant Significant LF north bank |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass Check d Channel Stream Other Approximate | yes | No None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of raving an 200') raight line) ent UNA & CCESS M Side CE FONT Moderate Landscaped LF LF LF LF LF LF | e vine Toad parellel te north ne (Meadow Lane) Significant Significant LF north bank |
| Potential Reduction in Restoration of construct Concept: Outfall p Bypass Check d Channel Stream Other | yes | No None Si er Cors phead with | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down ravin Equipment to top of ravin Faight line) and UNA ACCESS of Side SE rowin Moderate Landscaped LF LF LF LF LF LF LF LF LF LF LF LF LF | e vine Toad parellel te north ne (Meadow Lane) Significant Significant LF north bank |

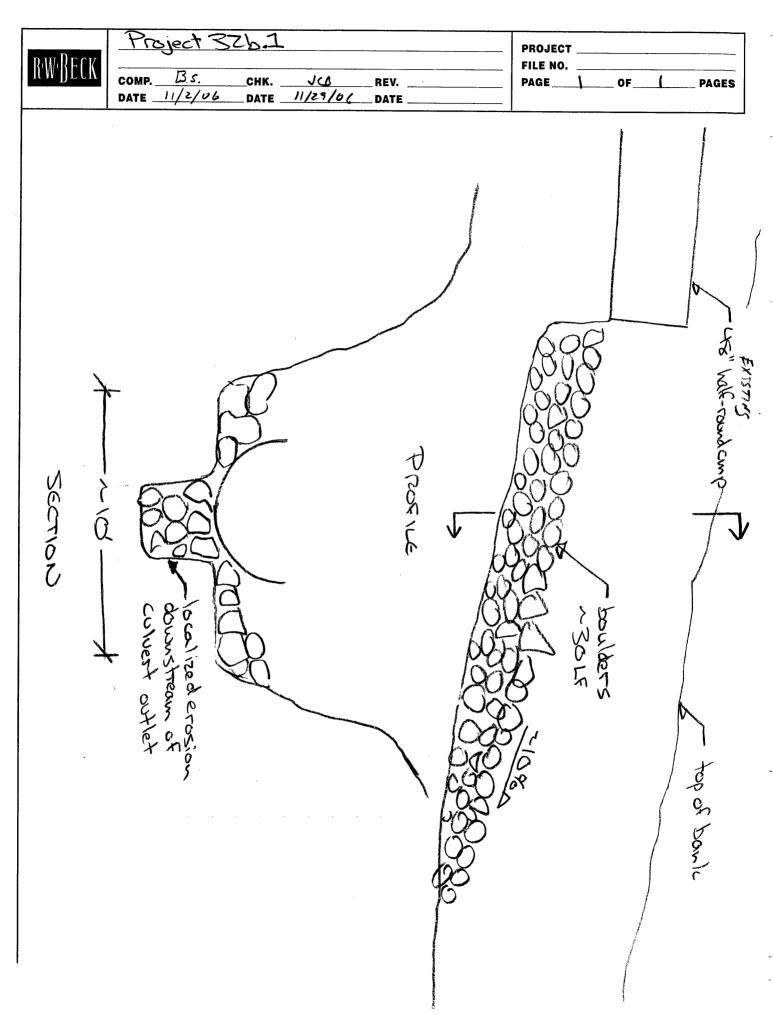




Subbasin 32B

Problem No 3281 By: J. Bjork 10 / 20 / 06

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill Undetermined | slide |
|--|--|--------------|----------------------|---|---|--|------------------------|
| Flow Today: | | <u>5</u> gpn | ncfs | Арр | • | radient 0-1% 2-5% 5-10% | |
| Bank Vegetati | on type: | | Native | Invasive | Landscap | | 10 76 |
| Bank Vegetation | on qualit | y: | Excellent | | Fair | Poor | |
| Aquatic Habita | - | • | Excellent | | Fair | | |
| Proximity to D | rainage (| Outfalls: 🕇 | | | a second s | Poor Poor | 1 |
| Erosion of: | | bed | left bank | right bank | headcut | 8 CMP RCP PVC CPEP | HDBE |
| Apparent rate | | | stable | Slow change | | Devid at | |
| | | | Risks | (Check Applic | Moderate cha | ange Rapid change | |
| . • | | | None | Private | Public | Creates Unsafe Con | dition |
| Bank Stability | | | ······ | \checkmark | | oreates unsale con | aition |
| Upper Slope Sta | ability | | \checkmark | | | | |
| Landslide | _ | | \checkmark | | | | |
| Sediment sourc Habitat destruct | | | · | ×, | | | |
| Threatens home | | | | \checkmark | | | |
| Threatens other | - | ` | × | | | | |
| Threatens privat | | | <u>v</u> | | | | |
| Threatens infras | | woway | × | | | | |
| Threatens public | | | VVVV | | | | |
| Risk to Homes : | | Horiz (ft) | Vert (ft) | | Address | | |
| No risk | | - () | | | Aug 233 | Apparent Hazard | |
| | - | | | | | Low Med High | |
| | | | | | | | |
| | | | Solutions | | | Low Med High | • |
| | | | Solutions | i | = 1 <u>4-0</u> | LOW Med High | |
| Construction A | ccess: | yes | No | | Equipment to site | | · |
| Construction A | ccess: | | No | Conventional I | Equipment to site | , | · |
| Construction A | ccess: | | No | Conventional I Conventional I | Equipment down | ravine | · |
| Construction A | ccess: | | No | Conventional I Conventional I Conventional I | Equipment down Equipment to top | ravine | |
| Construction A | ccess: | | No V | Conventional I Conventional I Conventional I Crane (less that | Equipment down Equipment to top an 200') | ravine | |
| Construction A | ccess: | | No V V | Conventional I Conventional I Conventional I Crane (less tha Cable Way (str | Equipment down Equipment to top an 200') raight line) ent νίω ωςcces | ravine of ravine | north |
| | | | | Conventional I Conventional I Conventional I Crane (less that Cable Way (str Small equipme Chute/skid | Equipment down Equipment to top an 200') raight line) ent νίω ωςcces | ravine | north ane |
| Potential Reduc | tion in C | yes | No V V None | Conventional I Conventional I Conventional I Crane (less tha Cable Way (str Small equipme Chute/skid Small | Equipment down Equipment to top an 200') raight line) ent via occes Side of c Moderate | ravine of ravine | onorth one) |
| Potential Reduc Restoration of c | ction in C | yes | No V V None | Conventional I Conventional I Conventional I Crane (less that Cable Way (str Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent مريد مرجوح Side مج Moderate Landscaped | ravine of ravine of ravine contended by the Significant | north one) north |
| Potential Reduc Restoration of c Concept: | ction in C construct | yes | No V V None | Conventional I Conventional I Conventional I Crane (less that Cable Way (str Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent via a cces Side of c Moderate Landscaped LF | ravine of ravine of ravine contended by the Significant | one) |
| Potential Reduc Restoration of c Concept: | c tion in C construct Outfall pr Bypass F | yes | No V V None | Conventional I Conventional I Conventional I Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent via a cces Side of c Moderate Landscaped LF LF | ravine of ravine of ravine contended by the Significant | one) |
| Potential Reduc Restoration of c Concept: | ction in C construct Outfall pr Bypass F Check da | yes | No V V None | Conventional I Conventional I Conventional I Crane (less that Cable Way (str Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent via a cces Side of c Moderate Landscaped LF LF | ravine of ravine of ravine contended by the Significant | one) |
| Potential Reduc Restoration of c Concept: | ction in C construct Outfall pr Bypass F Check da Channel | yes | No V V None | Conventional I Conventional I Conventional I Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent vie o cces Side of c Moderate Landscaped LF LF LF | ravine of ravine of ravine contended by the Significant | one) |
| Potential Reduc Restoration of c Concept: | ction in C construct Outfall pr Bypass F Check da Channel Stream re | yes | No V | Conventional I Conventional I Conventional I Crane (less tha Cable Way (str Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent via a cces Side of c Moderate Landscaped LF LF LF LF | ravine of ravine of ravine contended by the Significant | one) |
| Potential Reduc Restoration of c Concept: | ction in C construct Outfall pr Bypass F Check da Channel Stream re Other | yes | No None s: | Conventional I Conventional I Conventional I Crane (less that Cable Way (str Small equipme Chute/skid Small Native | Equipment down Equipment to top an 200') raight line) ent via a cces Side of c Moderate Landscaped LF LF LF LF | ravine of ravine os road parallel te avime (Meadow L Significant <u>~50</u> LF- | one) |
| Potential Reduc Restoration of c Concept: | ction in C construct Outfall pr Bypass F Check da Channel Stream re Other | yes | No None s: | Conventional I Conventional I Conventional I Crane (less tha Cable Way (st Small equipme Chute/skid Small Native 30 | Equipment down Equipment to top an 200') raight line) ent via a cces Side of c Moderate Landscaped LF LF LF LF | ravine of ravine os road parallel te avime (Meadow L Significant <u>~50</u> LF- | one) |
| Potential Reduc Restoration of c Concept: | ction in C construct Outfall pr Bypass F Check da Channel Stream re Other | yes | No None s: | Conventional I Conventional I Conventional I Crane (less tha Cable Way (str Small equipme Chute/skid Small Native 30 | Equipment down Equipment to top an 200') raight line) ent via a cces Side of r Moderate Landscaped LF LF LF LF LF | ravine of ravine s rood porcillel to significant <u>Significant</u> <u>LF-round CMP</u> . | one) |
| Potential Reduc Restoration of c Concept: Problem | ction in C construct Outfall pr Bypass F Check da Channel Stream re Other | yes | No None s: | Conventional I Conventional I Conventional I Crane (less tha Cable Way (sti Small equipme Chute/skid Small Native Solution Soluti | Equipment down Equipment to top an 200') raight line) ent via a cces Side of r Moderate Landscaped LF LF LF LF LF LF LF LF LF LF LF LF | ravine of ravine s rood porcillel to significant <u>Significant</u> <u>LF-round CMP</u> . | one) |
| Potential Reduc Restoration of c Concept: Problem | ction in C construct Outfall pr Bypass F Check da Channel Stream re Other | yes | No None s: | Conventional I Conventional I Conventional I Crane (less tha Cable Way (str Small equipme Chute/skid Small Native 30 | Equipment down Equipment to top an 200') raight line) ent via a cces Side of r Moderate Landscaped LF LF LF LF LF LF LF LF LF LF LF LF | ravine of ravine s rood porcillel to significant <u>Significant</u> <u>LF-round CMP</u> . | one) |



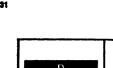
<u>Subbasin</u> 376

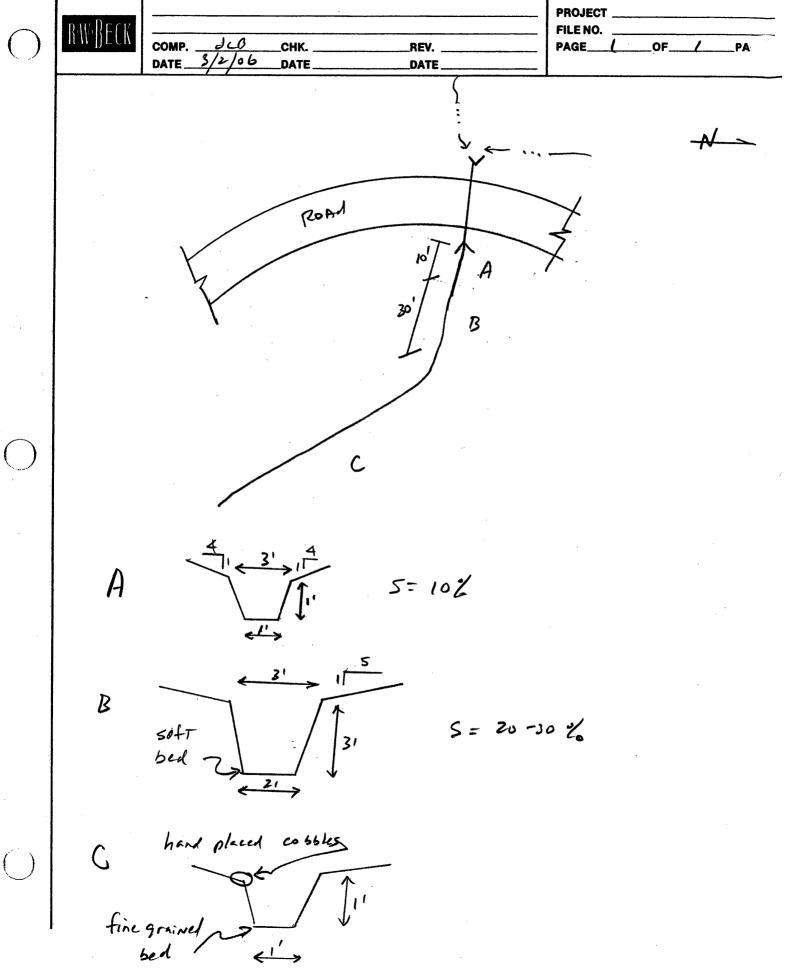
Problem No.3761 By: J. Bjork 3/3/06

| | Geology: Qtb | Qva | Qvt | Qvr | Colluvium | fill Undeter | | |
|---|--|---------------|--|--------------------------------|---|------------------|--|-----------------------|
| | Flow Today: | 50gpi | | | | | mined <u>slid</u> | de Maper |
| | Bank Vegetation typ | e: | Native | مہت I <u>nvasive</u> | | Fradient 0-1% 2- | 5% <u>5-10</u> %>10 | 3% |
| | Bank Vegetation qua | | Excellent | | Landscar | • | | |
| | Aquatic Habitat: | 2 | Excellent | | <u>Fair</u> | Poor | | |
| | Proximity to Drainag | e Outfalls: | | downstream | Fair | Poor. | | |
| | Erosion of: | bed | left bank | right bank | 12-18 boodard | CMP_RCP | | |
| | Apparent rate of Eros | | stable | Slow change | headcut | <u> </u> | drug at 0 | MATTER |
| | • • | | <u>Risks</u> | (Check Appl | | ange Rapid ch | ange | |
| | · · | | None | Private | | • • | | |
| | Bank Stability | | | _ <u>V</u> | | Creates | Unsafe Condit | llon |
| ? | Upper Slope Stability | | | K | | | | |
| | Landslide | | · · · | ? | | | ······································ | |
| | Sediment source Habitat destruction | | | ~ | | | | |
| | Threatens home | | | KKK | | | | |
| | Threatens other structu | ire | | | | | | |
| | Threatens private road | | X | | 101-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1 | | <u> </u> | |
| | Threatens infrastructur | e | | | | | (| |
| | Threatens public road | | | | | | | |
| | Risk to Homes: | Horiz (ft) | Vert (ft) | <u>-</u> | Address | Apparent | Hazard | |
| | No risk | ** | | BOZO EAS | | | | se lile- |
| | | | | | | Low Med | 1 Migh 702 | sc file- upported. |
| | | | Solutions | | ····· | | • | |
| | Complexed | yes | No | - | | • | | |
| | Construction Access: | | | Conventional | Equipment to site | • | | |
| | | | | Conventional | Equipment down | ravine | | |
| | | <u>v</u> | | Conventional | Equipment to top | of ravine | | |
| | • | <u> </u> | \ \ | Crane (less th | an 200') | | | |
| | | ~ | | Cable Way (st Small equipme | and no line) | | | |
| | | | (| Chute/skid | 5111 | | | |
| | Potential Reduction in | O&M costs | None S | Small | Moderate | Significant | | |
| | Restoration of constru | | 5: N | <u>Vative</u> | Landscaped | /00 | LF | |
| | | protection | | 10 | LF (CITY pl | caner Sugge | | |
| | Bypass | • | | | LF | | | |
| | Check | | - | | LF | | | |
| | | l restoration | | | LF | | | |
| | | restoration | | | LF · | | | |
| | Other | Type 2 A | trup CB | & new ou | Ter (option | Array 1 | | |
| - | | rring LT | the second s | | | | ^ | |
| _ | by STreet rune | | | | | | | <u>e</u> st |
| ٤ | AST Mercer WAY | OK Prop | cri due | es have | Pilkington | 5'd x 10'L | Ulstream | 1 Sidié |
| 6 | georechnical angi | nces ore | | Chan Laura | FILKIngton | 15 having | Julian Li | in, |
| 1 | Potential Monitoring Si | te: Y | es N | | | | | - |
| | | | | - | | | | |

Subbasin 39 9 Problem No. 3991 By: J. Bjork 9 / 28 /05

| Geology: Qtb | Qva | Qvt | Qvr | Colluvium fill | I | undetermined slide |
|---|---------------------------------------|----------------------------|-------------------------------|---------------------|------|---------------------------------|
| Flow Today: | <u>l0 g</u> pm | cfs | Арр | rox. Channel Grad | ient | 0-1% 2-5% 5-10% >10% |
| Bank Vegetation type: | | Native | Invasive | Landscaped | | |
| Bank Vegetation qualit | ty: | Excellent | Good | Fair | | Poor |
| Aquatic Habitat: | | Excellent | Good | Eair | | Poor |
| Proximity to Drainage | Outfalls: | <u>Α</u> τ ft. <u>up</u> / | downstream | 12 | " | CMP RCP PVC CPEP |
| Erosion of: | <u>bed</u> | left bank | right bank | headcut | | • |
| Apparent rate of Erosic | on: | stable | Slow change | Moderate chang | e | Rapid change |
| | | <u>Risks</u> | (Check Applic | | • | |
| | | None | Private | Public | | Creates Unsafe Condition |
| Bank Stability | | | | | | |
| Upper Slope Stability Landslide | | | | <u></u> | | v |
| Sediment source | | | ~ | | | |
| Habitat destruction | | | | | | |
| Threatens home | | ~ | | | | |
| Threatens other structure | | | | | | |
| Threatens private road/d | lriveway | 1111 | | | | |
| Threatens infrastructure Threatens public road | | | · · · · | | | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard |
| No risk 🗸 | | | | Address | | Low Med High |
| · · · · · · · · · · · · · · · · · · · | | | | | | Low Med High |
| | | Solution | s | <u>-</u> - | | Low mou riight |
| | yes - | No | - | | | |
| Construction Access: | <u> </u> | | Conventional | Equipment to site | | |
| | | <u>~</u> | | Equipment down ra | | |
| | <u> </u> | <u> </u> | | Equipment to top of | ravi | ine |
| | <u> </u> | | Crane (less the Cable Way (st | , | | |
| | | | Small equipm | - <i>i</i> | | |
| | | / | Chute/skid | ont | | |
| Potential Reduction in | | | Small | Moderate | | Significant |
| Restoration of construct | | S: | Native | Landscaped | | <u>30</u> LF |
| - · · | protection | | | LF | | |
| Bypass | • | | | LF | | |
| Check of | | | | LF | | |
| | l restoration | | <u> </u> | LF | | |
| | restoration | | • | LF | | |
| Other | Bouller | CASCAde | 40 6 | -F | | |
| | · · · · · · · · · · · · · · · · · · · | | ····· | | | |
| | | | | Drainage | Ar | en 2 30 Acres |
| Potential Monitoring Si | te: | Yes | No | | | |





RWB SD 31

Subbasin 42

Problem No. <u>42</u> | By: J. Bjork <u>3/3/06</u>

Į

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Indotomained | |
|-------------------------------------|---|---|------------------------------------|-------------------|--|----------------|---|-------------------------|
| Flow Today: | | 100 - 200 pm | cfs | | | | Undetermined § 0-1% 2-5% 5-10%> | lide |
| Bank Vegetat | ion type: | | Native | l <u>nvasi</u> ve | Landsca | | 0-1% 2-5% 5-10%> | 10% |
| Bank Vegetat | ion quali | ity: | Excellen | | Fair | | Deer | |
| Aquatic Habit | at: | - | Excellen | | Fair | | Poor | |
| Proximity to D | Drainage | Outfalls: | | /downstream | none | | Poor | |
| Erosion of: | - | bed | left bank | right bank | headcut | | CMP RCP PVC CPEP | |
| Apparent rate | of Erosi | | stable | Slow change | | | Dentified | |
| • | • | | Risks | (Check Applie | | lange | Rapid change | |
| | • | | None | Private | Public | | Crootee Uneste Osia | |
| Bank Stability | | | | | | | Creates Unsafe Cond | ition |
| Upper Slope St Landslide | ability | | | | | | | |
| Sediment source | | | ~ | | | | · · · · · · | |
| Habitat destruc | | | | ~ | | | | |
| Threatens hom | | | | | | | | |
| Threatens other | | a | <u> </u> | | | | | |
| Threatens priva | | | | | | | | |
| Threatens infra | structure | | | | | | | |
| Threatens publi | c road | | 1 | | | | | |
| Risk to Homes | | Horiz (ft) | Vert (ft) | | Address | | nnaront Herend | |
| No risk | | | ••• | | | | Apparent Hazard | |
| | - | | | | | | ow Med High | |
| | - | S | olutions | | | L | ow Med High | |
| | | yes — | No | - | | | | |
| Construction A | ccess: | | | Conventional E | Equipment to site | e | | |
| | | | | Conventional E | Equipment down | ravine | | |
| • | | | <u> </u> | Conventional E | Equipment to top | of ravine | Э | |
| · | | ······································ | | Crane (less that | an 200') | | | |
| | | <u> </u> | | Cable Way (str | aight line) | | | |
| | | <u> </u> | | Small equipme | nt | | | |
| Potential Reduc | | | | Chute/skid | | | | |
| - | ction in C |)&M costs N | one | Small | Vadarata | ~ | | |
| Restoration of a | ction in C construc | D&M costs N tion access: | | | Moderate | S | gnificant | |
| Restoration of c Concept: | ction in C construc Outfall pr | tion access: | | Native | Landscaped | S | gnificant <u>200</u> LF | |
| Concept: | construc | tion access: rotection | | Native | Landscaped LF | | The second se | |
| Concept: | construc Outfall pr | tion access: rotection Pipe | | Native | Landscaped LF _F | <u>Si</u> — | The second se | |
| Concept: | construc Outfall pr Bypass F Check da | tion access: rotection Pipe | | Native | Landscaped LF _F | <u>Si</u> | The second se | |
| Concept: | construc Outfall pr Bypass F Check da Channel | tion access: otection Pipe ams restoration | | Native | Landscaped LF _F _F | | The second se | |
| Concept: | Construc Outfall pr Bypass F Check da Channel i Stream re | tion access: otection Pipe ams | | Native | Landscaped LF _F | | The second se | |
| Concept: | construc Outfall pr Bypass F Check da Channel Stream re Other | tion access: otection Pipe ams restoration estoration | - | Native | Landscaped LF _F F _F _F | - | <u>200</u> LF | |
| Concept: | Construc Outfall pr Bypass F Check da Channel i Stream re | tion access: otection Pipe ams restoration estoration xilc che | | Native | Landscaped LF LF LF LF LF | have | ZOO LF done a gog | L |
| Sand bag & | Construc Outfall pr Bypass F Check da Check da Check da Stream re Other | tion access: otection Pipe ams restoration estoration <u>xilc che</u> downce | | Native | Landscaped LF LF LF LF LF LF LT Fences Some L | have Ink f | done a gog atlure The ch | <u>в</u> <u>се</u> к |
| Sand bag & Jub of Si dams are | Construc Outfall pr Bypass F Check da Channel Stream re Other <u>9corc</u> <u>bcpin</u> | tion access: otection Pipe ams restoration estoration <u>xile che</u> <u>downe</u> | cic dar atting. Ail. R | Native | Landscaped LF _F _F _F IT fences Some br | have Ink f | done a gog silure The ch unse of lar | d se |
| Sand bag & Jub of Si dams are | Construc Outfall pr Bypass F Check da Channel Stream re Other <u>9 corce</u> <u>b c gini</u> STore | tion access: otection Pipe ams restoration estoration <u>xile che</u> <u>downe</u> <u>ring to f</u> | cic das atting. Ail R Bed | Native | Landscaped LF LF LF LF LF LF LF Some boome boo | have Ink f | done a gog atlure The ch | d cen se |

Subbasin 42

Problem No. 42.1A By: J. Bjork 313 106

| Geology: Qtb | <u>Qva</u> | Qvt | Qvr | Colluvium fill | |
|--|--|--|--|---|---|
| Flow Today: | | n <u>1/2</u> cfs | | | |
| Bank Vegetation type | | Native | App Invasive | rox. Channel Gradi | ent 0-1% 2-5% 5-10%>10% |
| Bank Vegetation qual | | Excellent | | Landscaped | |
| Aquatic Habitat: | | Excellent | | Fair | Poor |
| Proximity to Drainage | Outfalle | | | Fair | Poor |
| Erosion of: | bed | | downstream | none | CMP RCP PVC CPEP |
| Apparent rate of Eros | | left bank | right bank | headcut | |
| | юп. | stable | Slow change | Moderate change | Rapid change |
| · · · · | | <u>Risks</u> None | (Check Applic | | |
| Bank Stability | | None | Private | Public | Creates Unsafe Condition |
| Upper Slope Stability | | ~ | _ Look | | |
| Landslide | | | | | terrestation and the second |
| Sediment source | | | ~ | | |
| Habitat destruction | | | ~ | | |
| Threatens home | | | | | - |
| Threatens other structur | | ~ | | | |
| Threatens private road/c Threatens infrastructure | Iriveway | | ····· | | |
| Threatens public road | | | | | |
| Risk to Homes: | Horiz (ft) | | | | |
| No risk | 10112 (11) | Vert (ft) | | Address | Apparent Hazard |
| | | | | | _Low Med High |
| | | | | | Low Med High |
| | | | | | |
| | | Solutions | , | | |
| Construction Access | yes | No | | | |
| Construction Access: | | No - | Conventional E | quipment to site | _ |
| Construction Access: | yes | No | Conventional E Conventional E | quipment down ravin | e |
| Construction Access: | yes | No | Conventional E Conventional E Conventional E | quipment down ravin quipment to top of ra | e |
| Construction Access: | yes | No 1 1 1 1 1 1 1 1 1 | Conventional E Conventional E Conventional E Crane (less tha | quipment down ravin quipment to top of ra n 200') | e |
| Construction Access: | yes | No | Conventional E Conventional E Conventional E Crane (less tha Cable Way (stra | quipment down ravin quipment to top of ra n 200') aight line) | e |
| • | yes | No | Conventional E Conventional E Conventional E Crane (less tha Cable Way (stra Small equipmer | quipment down ravin quipment to top of ra n 200') aight line) | e |
| Potential Reduction in (| yes | | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid | quipment down ravin quipment to top of ra n 200') aight line) nt | e vine |
| Potential Reduction in 0 Restoration of construc | yes | No V V V V None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (stra Small equipmen Chute/skid | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e | e vine Significant |
| Potential Reduction in C Restoration of construc Concept: Outfall pr | yes | No V V V V None | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small <u>M</u> | quipment down ravin quipment to top of ra n 200') aight line) nt | e vine Significant |
| Potential Reduction in C Restoration of construc Concept: Outfall pl Bypass F | yes | No V V V V None | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Cable Way (stra Small equipmer Chute/skid Small L L | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e andscaped F F | e vine Significant |
| Potential Reduction in C Restoration of construc Concept: Outfall p Bypass F Check da | yes | No V V V V None | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small L Lative L | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e andscaped F F | e vine Significant |
| Potential Reduction in C Restoration of construc Concept: Outfall pl Bypass F Check da Channel | yes | No V V V V None | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small L L L 2 EA L | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e andscaped F F | e vine Significant |
| Potential Reduction in C Restoration of construc Concept: Outfall po Bypass F Check da Channel Stream red | yes | No V V V V None | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small L L L L 2 En L | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e andscaped F F F | e vine Significant |
| Potential Reduction in C Restoration of construc Concept: Outfall pl Bypass F Check da Channel Stream re Other | yes | No | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Cable Way (stra | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e andscaped F F F | e vine Significant |
| Potential Reduction in C Restoration of construc Concept: Outfall pu Bypass F Check da Channel Stream re Other Sand bas bank | yes | No | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small L L L 2 EA L | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Moderat</u> e andscaped F F F F F | e vine Significant |
| Potential Reduction in C Restoration of construc Concept: Outfall pl Bypass F Check da Channel Stream re Other Sand bas bank | yes V V V V V V V V V V V V V | No | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small M Lative L 2 FA M L 60 L | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e andscaped F F F F F F | Significant 200 LF |
| Potential Reduction in C Restoration of construc Concept: Outfall pl Bypass F Check da Channel Stream re Other Sand bas bank | yes | No | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small <u>L</u> L <u>2 FA</u> L <u>60 LI</u> | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aderat</u> e andscaped F F F F F F | Significant 200 LF |
| Potential Reduction in C Restoration of construc Concept: Outfall pu Bypass F Check da Channel Stream ru Other Sand bas bank has some ar bas check | yes <u>V</u> <u>V</u> <u>V</u> D&M costs I tion access rotection Pipe ams restoration estoration <u>Pro TecTi</u> <u>Cas</u> <u>uf</u> | No | Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small M Lative L 2 FA L 60 Li | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e andscaped F F F F F F | Significant 200 LF |
| Potential Reduction in C Restoration of construc Concept: Outfall pl Bypass F Check da Channel Stream re Other Sand bas bank | yes <u>V</u> <u>V</u> <u>V</u> D&M costs I tion access rotection Dipe ams restoration estoration $\int rv TecT I$ Cas of <i>dam</i> | No | Conventional E Conventional E Conventional E Conventional E Crane (less that Cable Way (stra Small equipmer Chute/skid Small M Lative L 2 FA M Li 60 Li 60 Li | quipment down ravin quipment to top of ra n 200') aight line) nt <u>Aoderat</u> e andscaped F F F F F F | Significant 200 LF |

Subbasin 42

Problem No. <u>42.2</u> By: J. Bjork <u>3 / 03 /06</u>

1

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined | slide |
|---------------------------------------|------------|---------------------|---------------------------------------|------------------------|----------------------------------|-----------|----------------------------|----------|
| Flow Today: | | gpm | 1 Yzcfs | Арр | rox. Channel | | t 0-1% 2- <u>5% 5</u> -10% | |
| Bank Vegetati | on type: | | <u>Nativ</u> e | Invasive | Landsca | | | |
| Bank Vegetati | on qualit | ty: | Excellent | Good. | Fair | | Poor | |
| Aquatic Habita | at: | | Excellent | Good | Fair | | Poor | |
| Proximity to D | rainage | Outfalls: | ft. up/o | downstream | Norre | , | CMP RCP PVC CPE | Þ |
| Erosion of: | | bed | left bank | right bank | headcut | | | |
| Apparent rate | of Erosic | on: | stable | Slow change | Moderate c | hange | Rapid change | |
| | | | <u>Risks</u> | (Check Applie | | | | |
| Donk Otability | | | None | Private | Publi | c | Creates Unsafe C | ondition |
| Bank Stability Upper Slope Sta | ability | | | | | - | | |
| Landslide | abinty | | | | | - | | |
| Sediment sourc | e | | | | <u></u> | - | | |
| Habitat destruct | | | · · · · · · · · · · · · · · · · · · · | | 1 1 1 | - | | |
| Threatens home | - | | <u> </u> | · | | - | | |
| Threatens other Threatens priva | | - | | | | - | | |
| Threatens infras | structure | пистау | ~ | ss on rig | AT bANK | Arster | Ted by RICIL | |
| Threatens public | | | < < < < < < < < < < < < < < < < < < < | | | | - j <u>Mac</u> | |
| Risk to Homes | : | Horiz (ft) | Vert (ft) | | Address | - | Apparent Hazard | |
| No risk | - | | | | | | Low Med High | |
| | - | | | | | | Low Med High | |
| | | 2 | Solutions | <u>i</u> | | | · · · · | |
| Construction A | | yes | No | | _ | | | |
| Construction A | | | | | Equipment to s | | | |
| | | | | | Equipment dow Equipment to to | | | |
| · | | | | Crane (less th | | p or ravi | | |
| | | | <u> </u> | Cable Way (st | raight line) | | | |
| | | | | Small equipme | ent | | | |
| Potential Reduc | ction in (| NeM costs | | Chute/skid | | | . | |
| Restoration of a | | | | Small <u>Native</u> | Moderate Landscaped | | Significant | |
| - | Outfall p | | | | LF | | LF | |
| | Bypass F | ^{>} ipe | - | | LF | | | |
| | Check da | ams | | 3 - | lf ea te | pair | | |
| | Channel | restoration | | | LF | • | · · | |
| | Stream r | estoration | - | * | LF | | | |
| | Other | | | | | | | |
| TWO | | check | = dam | ns ok. | STRAM | ress | oration of | - |
| Sou | m b | anic a | ibont | 1/3 of | TOTAL | lengt | | |
| · · · · · · · · · · · · · · · · · · · | | | | | <u>_</u> | | | |
| | | | | | | | | |

Potential Monitoring Site: Yes

Subbasin 42

Problem No. 42. 3 By: J. Bjork 3/3/06

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined sl | ida |
|--|--|------------|---------------------|--|--|---|--|----------------|
| Flow Today: | | gpm | $\frac{1/2}{2}$ cfs | Ap | | | 0-1% 2- <u>5% 5-</u> 10%> | ide |
| Bank Vegeta | tion type: | | Native | Invasive | Landsca | | 0-170 2-070 0-10% | 10% |
| Bank Vegeta | tion quali | ty: | Excellent | | Fair | · . | Poor | |
| Aquatic Habi | - | • | Excellent | | Fair | | | |
| Proximity to I | Drainage | Outfalls: | | downstream | none | " | Poor | |
| Erosion of: | • | bed | left bank | right bank | headcut | - | CMP RCP PVC CPEP | |
| Apparent rate | of Erosi | on: | stable | Slow change | | | Devide | · |
| | • | | <u>Risks</u> | (Check Appli | · · · · · · · · · · · · · · · · · · · | lange | Rapid change | |
| | • | | None | Private | Public | • | Creates Unsafe Cond | 141 |
| Bank Stability | | | | K | 1 00110 | | Creates Unsale Cond | ition |
| Upper Slope S | tability | | | | | | ······· | |
| Landslide Sediment sour | | | | | | | · · · · · | |
| Habitat destruc | | | | <u> </u> | | | | |
| Threatens hor | | | | <u> </u> | <u> </u> | | | |
| Threatens othe | | e | 1/1/2 | | | | | |
| Threatens priva | | | ~ | | | | | |
| Threatens infra | structure | | ~ 5 | s is ok | ************************************** | | 1 | |
| Threatens publ | | | | | | | | |
| Risk to Homes | | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard | |
| No risk | <u> </u> | | | | | | ow Med High | |
| | | | | | | | - | |
| | - | | | | | L | -ow wea Hian | |
| | - | 5 | Bolutions | | · · · · · · · · · · · · · · · · · · · | L | ₋ow Med High | |
| | - | yes | No | - | | | | |
| Construction / | Access: | | No | Conventional | Equipment to sit | e alor | | |
| Construction / | - Access: | yes | No | Conventional Conventional | Equipment down | e alor Travine | y part | |
| Construction / | - Access: | yes | No | Conventional Conventional Conventional | Equipment down | e alor Travine | y part | |
| Construction / | - Access: | yes | No 1111 | Conventional Conventional Conventional Crane (less th | Equipment down Equipment to top an 200') | e alor Travine | y part | |
| Construction / | - Access: | yes | No 1 1 1 1 | Conventional Conventional Conventional Crane (less th Cable Way (st | Equipment down Equipment to top an 200') traight line) | e alor ravine o of ravin | y part | |
| | | yes | No 1 2 2 2 | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipme | Equipment down Equipment to top an 200') traight line) ent in Cre | e a lo r a ravine o of ravin | y part | |
| Potential Redu | iction in (| yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipme | Equipment down Equipment to top an 200') traight line) | e alor ravine o of ravin erc S | ng park e | |
| Potential Redu Restoration of | iction in (construc | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipmo Chute/skid | Equipment down Equipment to top an 200') traight line) ent in Cre for bounder | e alor ravine o of ravin erc S | יך איזע e ignificant | |
| Potential Redu | i ction in (construc Outfall pi | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipmo Chute/skld Small | Equipment down Equipment to top an 200') traight line) ent in Cre for bounder Moderate | e alor ravine o of ravin erc S | ignificant | |
| Potential Redu Restoration of | iction in C construc Outfall pi Bypass F | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipmo Chute/skld Small | Equipment down Equipment to top an 200') traight line) ent in Cre for boulder <u>Moderate</u> Landscaped | e alor ravine o of ravin erc S | יך איזע e ignificant | |
| Potential Redu Restoration of | iction in C construc Outfall pi Bypass F Check da | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipmo Chute/skld Small | Equipment down Equipment to top an 200') traight line) ent in Cre for 6 on loler Moderate Landscaped LF | e alor ravine o of ravin erc S | יך איזע e ignificant | |
| Potential Redu Restoration of | iction in C construc Outfall p Bypass F Check da Channel | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipmo Chute/skid Small <u>Native</u> | Equipment down Equipment to top an 200') traight line) ent in Cre for boulder Moderate Landscaped LF LF | e alor ravine o of ravin erc S | יך איזע e ignificant | |
| Potential Redu Restoration of | iction in C construc Outfall pi Bypass F Check da Channel Stream r | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipmo Chute/skid Small <u>Native</u> | Equipment down Equipment to top an 200') traight line) ent in Cre for Gonider Moderate Landscaped LF LF | e alor ravine o of ravin erc S | יך איזע e ignificant | |
| Potential Redu Restoration of Concept: | iction in C construc Outfall p Bypass F Check da Channel | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skld Small <u>Vative</u> | Equipment down Equipment to top an 200') traight line) ent in Cre for boulder Moderate Landscaped LF LF LF | e alor ravine o of ravin erc S | יך איזע e ignificant | |
| Potential Redu Restoration of Concept: | Channel Stream ro Other | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> | Equipment down Equipment to top an 200') traight line) ent in Cre for 6 on loler Moderate Landscaped LF LF LF LF | e a lo a navine o of ravin e (c S | יש איז e ignificant ווסט_LF | |
| Potential Redu Restoration of Concept: South b And S | Channel Stream ro Other | yes | No | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small <u>Native</u> 90 | Equipment down Equipment to top an 200') traight line) ent in Cre for boulder Moderate Landscaped LF LF LF LF | e alor navine o of ravin erc S S | ignificant 100 LF | |
| Potential Redu Restoration of Concept: | iction in C construc Outfall pr Bypass F Check da Channel Stream r Other | yes | No Vone | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skld Small <u>Native</u> 90 | Equipment down Equipment to top an 200') traight line) ent in Cre for 6 on Ider Moderate Landscaped LF LF LF LF LF LF | e a lo a navine o of ravin e (c S | e ignificant 100 LF Slope Failu | ures |
| Potential Redu Restoration of Concept: South b And S | Channel Stream re Other | yes | No Vone | Conventional Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skld Small <u>Native</u> 90 | Equipment down Equipment to top an 200') traight line) ent in Cre for boulder Moderate Landscaped LF LF LF LF | e alor navine o of ravin erc S S | ignificant 100 LF | ۰ <u>۲</u> ۰۲۶ |

<u>Subbasin</u> 42

Problem No.<u>424</u> By: J. Bjork <u>313106</u>

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | C 11 | | |
|---|-----------|-------------|------------------|---------------------|-------------------------------|------------------------|--------------------|-----------------|
| Flow Today: | | qr | m <u>1/z_cfs</u> | | | fill | Undetermin | ed <u>slide</u> |
| Bank Vegetatio | n type | e: | Native | Invasivo | pprox. Channe | Gradien | t 0-1% <u>2-5%</u> | 5-10%>10% |
| Bank Vegetatio | | | Exceller | | | • • | • | |
| Aquatic Habitat | | • | Exceller | | Fai | | Poor | |
| Proximity to Dra | ainage | Outfalls: | | o/downstream | Fai | | Poor | |
| Erosion of: | • | bed | left bank | | | f | CMP RCP PVC | CPEP |
| Apparent rate of | f Eros | | stable | Slow chang | headcut | | | |
| • • | | | Risks | (Check Ap | | change | Rapid change | e |
| | | | None | Private | | lia | • • • | |
| Bank Stability | | | | - | rupi | IC | Creates Unsa | ife Condition |
| Upper Slope Stab Landslide | ollity | | | x x x | | - | | |
| Sediment source | | | | | | | | ' |
| Habitat destruction | n | | | | | _ | | |
| Threatens home | | | | | | | | |
| Threatens other s | tructur | e | | ······ | | | | Philippe . |
| Threatens private | road/d | lriveway | ~ | | | _ | | |
| Threatens infrastru Threatens public r | ucture | | ·. | | | - sewer | min | |
| Risk to Homes: | oad | Llonia (ft) | <u> </u> | | | - | | |
| No risk | | Horiz (ft) | Vert (ft) | | Address | | Apparent Haz | ard |
| | - | | | | | l | ow Med Hi | gh |
| | • | | Solution | | | L | .ow Med Hi | gh |
| | | yes | Solutions No | Ž | | | | |
| Construction Acc | ess: | , v | NO | Conventione | l Equipment (| | | |
| | | ~ | | Conventional | I Equipment to s | ite a lor | 's path | |
| | | | | Conventional | Equipment to to | n avine on of ravin | 0 | |
| | | | | Crane (less t | han 200') | | | |
| | | | | Cable Way (s | straight line) | | | |
| | | | <u> </u> | Small equipm | nent | | | |
| Potential Reductio | on in C | 0&M costs | Nono | Chute/skid Small | Moderate | | | |
| Restoration of con | istruc | tion access | | Native | <u>Moderate</u> Landscaped | S | ignificant | _ |
| Concept: Ou | itfall pr | otection | | | LF | · | 100 1 | LF |
| | pass F | • | - | | LF | | | |
| | eck da | | | | LF | | | |
| Ch | annel | restoration | | | LF | | | |
| | | estoration | | 130 | LF | | | |
| A Oth | ner | | | | | | | |
| Mighly Cro | sirc | - ban | KS. K | ANK : | slongh ing | 410 / | Sarit | |
| _ Sapping Vi | isibl | e on | SUNT | | | | Spring | |
| | one. | bnt | additio | | | | restoraj | Tun |
| | MH. | Which 1 | • | | Tected 5 | <u>q</u> . (| reck ru | ns |
| PotentialMonitorin | g Site | | es N | | | 7 90 | range spe | 115. |
| | | | | Lary | er Mater | ial m | my se n. | ceded |

Subbasin 42

Problem No. 42.5 By: J. Bjork 3/ 3/06

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill Undetermined | Slide Mappen |
|---|--|---|--|---|--|---|----------------|
| Flow Today: | | <u>Ø</u> gpm | cfs | Apr | | adient 0-1% 2-5% 5- | |
| Bank Vegetatio | on type: | | Native | I <u>nvasiv</u> e | Landscape | | |
| Bank Vegetatio | | | Excellent | | Fair | Poor | |
| Aquatic Habita | • | | Excellent | No. of Concession, name | Fair | | |
| Proximity to D | | Outfalls [.] | | downstream | None | Poor None | |
| Erosion of: | annago | bed | left bank | right bank | | | |
| Apparent rate of | of Frasi | | stable | - | headcut | None | |
| Apparentiates | | 011. | Risks | Slow change | | nge Rapid change | |
| | | | None | (Check Appli Private | Public | Oursets II - C | A 1 1 1 |
| Bank Stability | | | None | Filvale | Public | Creates Unsaf | e Condition |
| Upper Slope Sta | ability | | ~ | | H | | · |
| Landslide | • | | | | ····· | | |
| Sediment source | | | | | | | |
| Habitat destruct | | | !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!</td <td></td> <td></td> <td></td> <td></td> | | | | |
| Threatens home | | | | | | ······ | |
| Threatens other | | | | | | | |
| Threatens privat | | | | | | | |
| Threatens infras | | | | | | | |
| Threatens public Risk to Homes: | | | | | | | |
| | - | Horiz (ft) | Vert (ft) | | Address | Apparent Haz | |
| No risk | | | | | | Low Med Hi | - |
| | | | | | ······ | Low Med Hig | gh |
| | | | Solution | <u>5</u> | | | |
| | | | | | | | |
| Construction A | | yes N | ANO | 0 | | | |
| Construction A | ccess: | N | A No | | Equipment to site | | |
| Construction A | ccess: | yes ∕ | A No | Conventional | Equipment down I | avine | |
| Construction A | ccess: | N | A | Conventional Conventional | Equipment down I Equipment to top | avine of ravine | |
| Construction A | ccess: | N | A | Conventional Conventional Crane (less th | Equipment down r Equipment to top an 200') | avine of ravine | |
| Construction A | ccess: | | A | Conventional Conventional Crane (less th Cable Way (s | Equipment down i Equipment to top aan 200') traight line) | avine of ravine | |
| Construction A | ccess: | | A | Conventional Conventional Crane (less th | Equipment down i Equipment to top aan 200') traight line) | avine of ravine | |
| Potential Reduc | ction in | | A | Conventional Conventional Crane (less th Cable Way (s Small equipm | Equipment down i Equipment to top aan 200') traight line) | of ravine | |
| Potential Reduc Restoration of c | ction in construct | O&M costs | A | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid | Equipment down i Equipment to top an 200') traight line) ent | of ravine Significant | LF |
| Potential Reduc Restoration of c | ction in construct | | A | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small | Equipment down i Equipment to top an 200') traight line) ent Moderate | of ravine Significant | LF |
| Potential Reduc Restoration of c Concept: | ction in construct | O&M costs ction access | A | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small | Equipment down i Equipment to top an 200') traight line) ent Moderate Landscaped | of ravine Significant | LF |
| Potential Reduc Restoration of c Concept: | ction in construct | O&M costs ction access protection Pipe | A | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small | Equipment down i Equipment to top an 200') traight line) ent Moderate Landscaped LF | of ravine Significant | LF |
| Potential Reduc Restoration of c Concept: | ction in construc Outfall p Bypass Check d | O&M costs ction access protection Pipe | A | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small | Equipment down i Equipment to top an 200') traight line) ent Moderate Landscaped LF LF | of ravine Significant | LF |
| Potential Reduc Restoration of c Concept: | c tion in construct Outfall p Bypass Check d Channe | O&M costs ction access protection Pipe lams I restoration | A | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small | Equipment down i Equipment to top an 200') traight line) ent Moderate Landscaped LF LF LF LF | of ravine Significant | LF |
| Potential Reduc Restoration of c Concept: | ction in construct Outfall p Bypass Check d Channe Stream | O&M costs ction access protection Pipe lams | A | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small | Equipment down i Equipment to top an 200') traight line) ent Moderate Landscaped LF LF | of ravine Significant | LF |
| Potential Reduc Restoration of c Concept: | ction in construct Outfall p Bypass Check d Channe Stream Other | O&M costs ction access protection Pipe lams I restoration restoration | A | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small Native | Equipment down i Equipment to top an 200') traight line) ent Moderate Landscaped LF LF LF LF LF | of ravine Significant | , , |
| Potential Reduc Restoration of o Concept: | ction in construct Outfall p Bypass Check d Channe Stream Other | O&M costs ction access protection Pipe lams I restoration restoration | A None s: | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small Native | Equipment down in Equipment to top in an 200') traight line) ent Moderate Landscaped LF LF LF LF LF | of ravine Significant | LF |
| Potential Reduc Restoration of a Concept: This a <u>precip</u> | Channe Stream Other Stream | O&M costs ction access protection Pipe lams I restoration restoration | А None s: 2 ipc On | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small Native | Equipment down in Equipment to top in an 200') traight line) ent Moderate Landscaped LF LF LF LF LF LF LF LF | Significant <u>Ma</u> except d s Asplact | , , |
| Potential Reduc Restoration of a Concept: This a <u>precip</u> on bu | Channe Stream Other Stream Other | O&M costs ction access protection Pipe lams I restoration restoration | Α | Conventional Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small Native | Equipment down in Equipment to top in an 200') traight line) ent Moderate Landscaped LF LF LF LF LF LF | Significant <u>Ma</u> except d s Asplact | , , |
| Potential Reduc Restoration of a Concept: This a <u>precip</u> | ction in construct Outfall p Bypass Check o Channe Stream Other <u>stream</u> Other <u>stream</u> Other | O&M costs ction access protection Pipe lams I restoration restoration | A None s: Dipc On Nh.'II | Conventional Crane (less th Cable Way (s Small equipm Chute/skid Small Native | Equipment down in Equipment to top in an 200') traight line) ent Moderate Landscaped LF LF LF LF LF LF LF LF | Significant <u>Ma</u> except d s Asplact | , , |

Subbasin 42

Problem No. 42.6 By: J. Bjork 3/3/06

Site Conditions

| Geology: Qtb | Qva | Qvt | Qvr | | 0 11 ()) | 5 |
|---|--|--|--|------------------|---------------------------------------|---------------------------------------|
| Flow Today: | <u>/ð</u> gpn | | | Colluvium | fill Undetern | nined <u>slide</u> |
| Bank Vegetation type | | <u>Nativ</u> e | Al Invasive | oprox. Channel | Gradient 0-1% 2-5 | % 5-10%>10% 5 |
| Bank Vegetation qua | | Excellen | | | • . | 20% |
| Aquatic Habitat: | | Excellen | - Aller State Stat | Fair | Poor | |
| Proximity to Drainage | Outfaller | | | Fair | Poor | |
| Erosion of: | bed | | / <u>downstrea</u> m | | 2 " CMP RCP F | VC CPEP |
| Apparent rate of Eros | the second s | left bank | right bank | headcut | · · · · · · · · · · · · · · · · · · · | |
| Apparent late of LIOS | 1011: | stable | Slow chang | | hange Rapid cha | inge |
| | | <u>Risks</u> None | (Check App | • | | |
| Bank Stability | N. | None | Private | Public | c Creates U | nsafe Condition |
| Upper Slope Stability | | | | May | - , | |
| Landslide | | `\ | | ritu | | |
| Sediment source | | <u>\</u> | | property | | |
| Habitat destruction | | ~ | | [[| · . | |
| Threatens home Threatens other structure | | <u> </u> | | | - | |
| Threatens private road/ | | $ \langle \langle \langle \langle \rangle \rangle $ | | | | · · · · · · · · · · · · · · · · · · · |
| Threatens infrastructure | unveway | | | | · - | |
| Threatens public road | • | | | | · · · - | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | | Address | - | |
| No risk 🗸 | () | | | Audress | Apparent | |
| | · | | · · · · · · · · · · · · · · · · · · · | | Low Med | • |
| | | Solutions | ······ | ····· | Low Med | High |
| | yes | No | 2 | | | |
| Construction Access: | | | Conventional | Equipment to si | to | |
| | | | Conventional | Equipment down | le Il ravino | |
| | | | Conventional | Equipment to to | D of ravine | |
| | <u> </u> | | Crane (less t | han 200') | | |
| | | <u> </u> | Cable Way (s | straight line) | | |
| | | | Small equipm | nent | | |
| Potential Reduction in | | | Chute/skid | | | |
| Restoration of construc | ction access | vone | Small Notive | Moderate | Significant | |
| Concept: Outfall r | protection | • | Native | Landscaped LF | /0 | LF |
| Bypass | | - | | | | |
| Check d | • | - | · · · · · | | | |
| | restoration | - | | LF | | |
| | | - | 60 | LF | | |
| | restoration | - | | LF | | |
| Other | | | | | · · · | |
| Tech Eroding 0 | <u>thannel</u> | 11 | Soft Y | naterial | | |
| | | | | | | |
| | | | | | | |

Potential Monitoring Site:

Subbasin 42

Problem No. 42.7 By: J. Bjork 313106

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined | alida | very |
|----------------------------------|---------------|--|------------------|-----------------------------|--|-----------|------------------------|--------------|-----------|
| Flow Today: | | O gpr | ncfs | Арр | | | it 0-1% 2-5% 5-1(| <u>slide</u> | Satt |
| Bank Vegeta | tion type | : | Native | Invasive | Landsca | onad | | /%>10% | Silt |
| Bank Vegeta | tion qual | ity: | Excellent | | Fair | ,pou | Poor | | |
| Aquatic Habi | itat: | | Excellent | | Fair | | _ | | |
| Proximity to | Drainage | Outfalls: | ft. up/ | downstream | none | | | | |
| Erosion of: | | bed | left bank | right bank | headcut | | CMP RCP PVC CPI | EP | |
| Apparent rate | e of Erosi | on: | stable | Slow change | Moderate ch | hongo | none | | • · |
| | • | | Risks | (Check Applic | able) | lange | Rapid change | | |
| | | | None | Private | Public | - | Creates Unsafe (| Sala Jat | |
| Bank Stability | | | | | 1 40110 | | Creates Unsale (| onation | |
| Upper Slope S Landslide | stability | | | | | - | 00 | | |
| Sediment sour | rce | | **************** | | ······ | | | | |
| Habitat destru | | | | | <u></u> | | | | |
| Threatens hon | | | | | | | | | |
| Threatens other | | | | | | | | | |
| Threatens prive | ate road/d | lriveway | | | | | | | |
| Threatens infra Threatens pub | | | <u></u> | | | | | | |
| Risk to Home | nc 1080 St | Horiz (ft) | Vart (ft) | | | | | | |
| No risk_ | | 110112 (11) | Vert (ft) | | Address | , , | Apparent Hazard | | |
| fromera | | | | 6520 E | ASS Merce | ~ Way | Low Med High | from | landslide |
| , | • | ···· | Solutions | ······ | ······································ | | Low Med High | | |
| | | yes | No | | | | | | |
| Construction | Access: | N | A | Conventional E | auipment to sit | Þ | | | |
| | | | | Conventional E | quipment dowr | n ravine | | | |
| | | | | Conventional E | quipment to top | p of ravi | ne | | |
| | | | | Crane (less tha | n 200') | | • • | | |
| | | | | Cable Way (stra | aight line) | | | | |
| • · | | ************************************** | (| Small equipme Chute/skid | n | | | | |
| Potential Redu | iction in C | D&M costs | None s | | Aoderate | | Significant | | |
| Restoration of | | | : 1 | | andscaped | | | | |
| Concept: | Outfall p | | | | .F | - | LI | | |
| | Bypass F | • | | L | .F | | | | |
| | Check da | | - | L | F | | | | |
| | | restoration | | L | F · | | | | |
| | | estoration | | L | F | | | | |
| 1 | Other _ | | | N | | ۰. | | | |
| LITTle | eria | | | lowing | WATEN. | SM | all Colle | Tion | |
| arca | 15 | unde | 1 elune. | NOT | GA E | erosi | on prost | | |
| | | | | | | | 103/ | | |
| 1 | | | | | | | | | |
| Potential Monit | oring Site | e: Υ | es N | 0 | | | | | · |

P

Subbasin 42

Problem No. 42.8 By: J. Bjork 3, 3,06

| Geology: (| Qva Qva | Qvt | Qvr | Collensier | |
|---------------------------------------|----------------------------|-----------------------------|---------------------------------------|------------------------|---------------------------------|
| Flow Today: | | ncfs | | Colluvium fil | |
| Bank Vegetation | | <u>Nativ</u> e | مم Invasive | prox. Channel Grad | lient 0-1% 2-5% 5-10%>10% 40 |
| Bank Vegetation | | Excellent | | ====== | |
| Aquatic Habitat: | | Excellent | | Fair | · · Poor |
| Proximity to Drai | nage Outfalls [.] | | | Fair | Poor |
| Erosion of: | bed | | downstream | | CMP RCP PVC CPEP |
| Apparent rate of | | l <u>eft bank</u> stable | rig <u>ht bank</u> | headcut | |
| | | <u>Risks</u> | Slow change | | e Rapid change |
| | • | None | (Check Appl Private | • | |
| Bank Stability | | NOILE | rnvate | Public | Creates Unsafe Condition |
| Upper Slope Stabil | ity | | | | |
| Landslide | | | | <u> </u> | |
| Sediment source | | | | | |
| Habitat destruction | | - | | ~ | |
| Threatens home Threatens other str | | 1111 | | | - |
| Threatens private re | | | | | |
| Threatens infrastruc | Dau/onveway | _ | | | |
| Threatens public ro | ad | \leq | | - | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | | | |
| No risk | | vert (it) | | Address | Apparent Hazard |
| | | | | | Low Med High |
| | | 2-1-41 | | ····· | Low Med High |
| | • | Solutions | | | |
| Construction Acce | yes | No | • <i>• •</i> • | | |
| | | | Conventional | Equipment to site | |
| | · | | Conventional | Equipment down ravi | ne |
| | | | Crane (less th | Equipment to top of ra | avine |
| | | | Cable Way (st | raight line) | |
| | ~ | | Small equipme | and and miley | |
| | · · · · | | Chute/skid | | |
| Potential Reduction | n in O&M costs N | Vone S | | Moderate | Significant |
| Restoration of cons | | : N | | Landscaped | • |
| | fall protection | | | LF | LF |
| •• | ass Pipe | _ | | LF | |
| | ck dams | | | LF | |
| Cha | nnel restoration | | · · · · · · · · · · · · · · · · · · · | LF | |
| Strea | am restoration | | | LF | · |
| Othe | r 150 LF 1 | villant | 1. h a 1 1 c C | - | |
| All SMAL | Collect, | | | | tolerate plant |
| erosive | Soil and | | rea is | Underclop | ed. Itishly |
| 10 | Ar Moring | bed | | MATERIAL BO | ed Sorting ar |
| | THE TY DE ING | . FAIL | nre mo | my be relat | |
| SAMA. C | | | | ry be relat | eg More To |
| Spring S rotential Monitoring | 1 pping 7 | | Surface | erusion, | ed More To |

Subbasin 42

Problem No. 42.8A By: J. Bjork 313106

| Geology: Qtb | Qva | Qvt | Qvr | Colluvium fi | |
|--|---|------------------|------------------------------|--|---------------------------------------|
| Flow Today: | gp | m <u>1/2</u> cfs | | | |
| Bank Vegetation type | : | Native | r Invasive _ | piox. Channel Grad | lient 0-1% 2-5% 5-10%>10% |
| Bank Vegetation qual | | Exceller | - | | · _ · |
| Aquatic Habitat: | | Excellen | | Fair . | Poor |
| Proximity to Drainage | Outfalls: | | /downstream | H'W XJ'H | Poor |
| Erosion of: | bed | left bank | | the second s | CMP RCP PVC CPEP 60x |
| Apparent rate of Eros | | stable | right bank | headcut | |
| | | <u>Risks</u> | Slow chang (Check App | | e Rapid change |
| Poply Clability | | None | Private | Public | Creates Unsafe Condition |
| Bank Stability Upper Slope Stability | | | | <u> </u> | |
| Landslide | | <u> </u> | | | |
| Sediment source | | | | | · · · · · · · · · · · · · · · · · · · |
| Habitat destruction | | | | | |
| Threatens home | | | | | |
| Threatens other structur | | | | | |
| Threatens private road/c | lriveway | | | | |
| Threatens infrastructure | | _ <u>_</u> | SS OK | <u></u> | |
| Threatens public road Risk to Homes: | | -× | | | |
| | Horiz (ft) | Vert (ft) | | Address | Apparent Hazard |
| No risk | | | - | | Low Med High |
| | | | | | Low Med High |
| | | Solutions | <u>s</u> ' | | |
| Construction Access: | yes | No | | | |
| Construction Access; | | | Conventional | Equipment to site | from path |
| | ~ | | Conventional | Equipment down ravi | ine |
| | | | Conventional | Equipment to top of r | avine |
| | | | Crane (less th | ian 200') troight line à | · . |
| | V | | Cable Way (s Small equipm | traignt line) | |
| | V . | | Chute/skid | en | |
| Potential Reduction in (| D&M costs | None | Small | Moderate | Pignifianut |
| Restoration of construc | | | Native | Landscaped | Significant |
| Concept: Outfall p | rotection | _ | | LF | <u>50</u> LF |
| Bypass F | Dino | - | | LF | |
| | ihe | | | LF | |
| Check da | • | - | | | |
| • | • | - | | LF | · . |
| Channel | ams | | 30 | LF | x and |
| Channel | ams restoration | - | 30 | LF | K only |
| Channel Stream r Other | ams restoration estoration | | | LF LF LF right ban | - |
| Channel Stream r Other Left bank is | ams restoration estoration | | Large r | LF LF LF right ban DCIC TO Proto | ect Sewer Main. |
| Channel Stream r Other Left bank is c No crossion is c | ams restoration estoration <u>Compose</u> vidence | , Large | Large rock C | LF LF LF right ban <u>DCIC TO Proto</u> Leck dams | also olc. |
| Channel Stream r Other Left bank is | ams restoration estoration <u>Compose</u> vidence | , Large | Large r | LF LF LF right ban DCIC TO Proto | ect Sewer Main. |

Subbasin 42

Problem No. 42.9 By: J. Bjork 313106

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | C 11 | | |
|--|---|---|--|--|---|--|---|----------|
| Flow Today: | | 50 gpi | | | | fill | <u>Undetermine</u> d | slide |
| Bank Vegetat | ion type |): | Native | h have the | brox. Channel (| Fradient | 0-1% 2-5% 5-10 |)%>10% |
| Bank Vegetat | | | Excellent | I <u>nvasiv</u> e | Landsca | · · · · · | | |
| Aquatic Habit | | | Excellent | | Fair | | Poor | ан А. |
| Proximity to D | | Outfaller | | | <u>Fai</u> r | | Poor | |
| Erosion of: | runaye | | | downstream | | 11 | CMP_RCP PVC CPE | EP . |
| Apparent rate | of Eroo | bed | left bank | right bank | headcut | | | |
| - ppulont late | ULIUS | ion: | stable | Slow change | | ange 1 | Rapid change | |
| | • | | <u>Risks</u> | (Check Appli | cable) | | | |
| Bank Stability | | | None | Private | Public | | Creates Unsafe C | ondition |
| Upper Slope St | ability | | | | | | | |
| Landslide | • | | | | | | · · | |
| Sediment sourc | | | | 1111 | | | | |
| Habitat destruct | | | | ~ | · | | | |
| Threatens home | | | < < < < | | | | · | |
| Threatens other | | | <u> </u> | | *** <u>**********************************</u> | | | |
| Threatens privated Threatens infrast | te road/c | Iriveway | | | | | (| |
| Threatens public | road | | ~ | | | | | |
| Risk to Homes: | Juau | Horiz (ft) | | | | | | |
| No risk | | 110112 (11) | Vert (ft) | | Address | Α | pparent Hazard | |
| | | | | | | | ow Med High | |
| | | | | | | | Ý. | |
| | • | | N-1-41 | | | Lo | ow Med High | |
| | · | | Solutions | | | Lo | ow Med High | |
| Construction A | CCASS' | yes | No | | | | ow Med High | |
| Construction A | CCess: | | No | Conventional E | quipment to site |) | ow Med High | |
| Construction A | CCess: | yes | No (| Conventional E Conventional E | quipment down | e ravine | - | |
| Construction A | CCess: | yes | No | Conventional E Conventional E Conventional E | quipment down | e ravine | - | |
| Construction A | CCess: | yes | No | Conventional E Conventional E Conventional E Crane (less tha | quipment down quipment to top In 200') | e ravine | - | |
| Construction A | CCess: | yes | No 0 0 0 0 | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str | quipment down quipment to top in 200') aight line) | e ravine | - | |
| • | | yes | No | Conventional E Conventional E Conventional E Crane (less tha | quipment down quipment to top in 200') aight line) | e ravine | - | |
| Potential Reduct | tion in (| yes | | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid | quipment down quipment to top in 200') aight line) | ravine of ravine |) | |
| Potential Reduct Restoration of c | tion in (onstruc | yes yes yes yes yes yes yes yes | No 000000000000000000000000000000000000 | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small I | quipment down quipment to top in 200') aight line) nt | ravine of ravine | gnificant | wetlerd |
| Potential Reduct Restoration of c Concept: (| tion in (onstruc Dutfall pr | yes | No 000000000000000000000000000000000000 | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Cmall I Iative L | quipment down quipment to top n 200') aight line) nt Moderate | ravine of ravine |) | Wetland |
| Potential Reduct Restoration of c Concept: (| tion in C onstruc Dutfall pr Bypass F | yes yes yes yes yes yes yes yes yes yes | No 000000000000000000000000000000000000 | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Cable May (str Cable | equipment down equipment to top n 200') aight line) nt Moderate andscaped | ravine of ravine | gnificant | wetlend |
| Potential Reduct Restoration of c Concept: (E | tion in C onstruc Dutfall pr Bypass F Check da | yes yes yes yes yes yes yes yes | No 000000000000000000000000000000000000 | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Emall I Iative L | Equipment down Equipment to top aight line) nt Moderate andscaped | ravine of ravine | gnificant | WeTlend |
| Potential Reduct Restoration of c Concept: (E | tion in C onstruc Dutfall pr Bypass F Check da Channel | yes yes yes yes yes yes yes yes yes yes | No 000000000000000000000000000000000000 | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipment Chute/skid Small I Iative L 10 L | quipment down quipment to top n 200') aight line) nt Moderate andscaped F | ravine of ravine | gnificant | Wetlend |
| Potential Reduct Restoration of c Concept: () E () S | tion in C onstruc Dutfall pr Bypass F Check da Channel Stream re | yes yes yes yes yes yes yes yes | No 000000000000000000000000000000000000 | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small I Iative L JOLL | quipment down quipment to top aight line) nt Moderate andscaped .F F F | ravine of ravine | gnificant | wetlend |
| Potential Reduct Restoration of c Concept: () E () C S | tion in C onstruc Dutfall pr Bypass F Check da Channel S Stream re Other | yes yes yes yes yes yes yes yes yes yes | No 000000000000000000000000000000000000 | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small I Iative L 10 L | quipment down quipment to top aight line) nt Moderate andscaped .F F F | ravine of ravine | gnificant | WeTlend |
| Potential Reduct Restoration of c Concept: () E () S | tion in C onstruc Dutfall pr Bypass F Check da Channel S Stream re Other | yes yes yes yes yes yes yes yes yes yes | No Vone S None | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small I Iative L 10 L | quipment down quipment to top in 200') aight line) nt Moderate andscaped F F F F | ravine of ravine Sig | gnificant 103 LF | |
| Potential Reduct Restoration of c Concept: () E () C S | tion in C onstruc Dutfall pr Bypass F Check da Channel Stream re Other 2 | yes yes yes yes yes of costs f tion access rotection Pipe ams restoration estoration | No V V V None None No None No No No No No No No No No No | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small M Iative L 10 L 30 L 30 L | quipment down quipment to top in 200') aight line) nt Moderate andscaped F F F F F | ravine of ravine Sig | gnificant <u>103</u> LF | |
| Potential Reduct Restoration of c Concept: () E There are | tion in C onstruc Dutfall pr Bypass F Check da Channel Stream re Other Cher Cher Cher Cher | yes yes yes yes yes yes yes tion access rotection Pipe ams restoration estoration | No Vone | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small I Iative L 10 L 30 L 30 L 30 L | Equipment down Equipment to top In 200') alight line) nt Moderate andscaped .F F F F F F F F F | ravine of ravine Sig | gnificant <u>105</u> LF <u>op at Cur</u>) Channer | - Key T |
| Potential Reduct Restoration of co Concept: C E C C C C C C C C C C C C C C C C C C | tion in C onstruc Dutfall pr Bypass F Check da Channel Stream re Other Other Creave Charnel | yes yes yes yes yes yes yes otection Pipe ams restoration estoration proble | No No No None None None None None No None No No No No No No No No No No | Conventional E Conventional E Conventional E Crane (less tha Cable Way (str Small equipme Chute/skid Small M Iative L 10 L 30 L 30 L | quipment down quipment to top in 200') aight line) nt Moderate andscaped F F F F F | ravine of ravine Sig 5' dra 30 fee | enificant <u>103</u> LF <u>er at Cur</u>) Channel | -VCPT |

Subbasin 42

Problem No. 42.10 By: J. Bjork 3/3/06

| Geology: | Qtb | Qva | Qvt ? | Qvr | Colluvium | fill U | Indotowa ta sul | |
|------------------------------------|------------|---|---------------|---|-------------------|-----------------|----------------------|---------------|
| Flow Today: | | <u>50 g</u> pm | | | | - | Indetermined | slide |
| Bank Vegetati | on type: | | Native | I <u>nva</u> sive | orox. Channel G | | -1% 2-5% 5-109 | %> <u>10%</u> |
| Bank Vegetati | | | Exceller | | Landscap | • | • | |
| Aquatic Habita | | | Exceller | | Fair | | oor | |
| Proximity to D | | Outfalle | | | Fair | | oor None | |
| Erosion of: | | bed | | o/downstream | along 12 | <u>"</u> CI | MP RCP PVC CPE | - |
| Apparent rate | of Frasi | · · · · · · · · · · · · · · · · · · · | left bank | A STREET | headcut | | | |
| - when our rate | | JU. | stable | Slow change | | <u>an</u> ge Ra | apid change | |
| | | | <u>Risks</u> | | • | | | |
| Bank Stability | | | None | Private | Public | Cı | reates Unsafe Co | ondition |
| Upper Slope St | ability | | | <u></u> | | | | |
| Landslide | | | | | | | | |
| Sediment sourc | | | | × | | | | |
| Habitat destruct | | | | | | | | |
| Threatens home | | | | | | | · | |
| Threatens other | | | | | | | | |
| Threatens privat | te road/di | riveway | ~ | | | | $\overline{\langle}$ | |
| Threatens infras | | | 45/5/5 | | | | | |
| Threatens public Risk to Homes: | | 11 | | · | | | | |
| | | Horiz (ft) | Vert (ft) | | Address | Ар | parent Hazard | |
| No risk | - | ····· | | | · | Lov | w Med High | |
| | - | | | | | Lov | - | |
| | | 5 | olution | <u>s</u> | | | | |
| Construction A | | yes | No | | | | | |
| Construction A | ccess: | | | Conventional E | Equipment to site |) | | |
| | | <u> </u> | ······ | Conventional E | Equipment down | ravine | | |
| | | <u>/</u> _ | | Conventional E | Equipment to top | of ravine | | |
| | | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | Crane (less that | an 200') | | · | |
| | | <u> </u> | | Cable Way (str Small equipme | raight line) | | | |
| | | | | Chute/skid | H1L | | | |
| Potential Reduc | tion in O | &M costs N | lone | — | Moderate | Olar | 16 | |
| Restoration of c | onstruct | tion access: | | | Landscaped | Sigr | nificant | |
| Concept: | Outfall pr | otection | | | LF | | LÈ | |
| I | Bypass P | ipe 🖾 👘 | • | | | +5' -1 | 1 | |
| . (| Check da | ms | • | | | z × 5 | d x BOLF | = 100 Cy Fil |
| (| Channel r | restoration | - | | _F · | | | |
| | | storation | - | ويعويها والمترابية والمتحد والمتحد المتحد المراجع والمتحد المراجع والمتحد والمتحد والمحمد والمحمد والمحمد والم | | | | |
| | Other | 50101011 | - | Ĺ | _F | | | |
| | | | | | | | | |
| The existing | | | <u>mp 1/2</u> | round cr | np and Sul | the C | PEP is V | VORKING |
| WITH Mode | | 1 CAICASC | The s | surface CF | PEP has only | 1 Juin | TON | le S |
| for Thrust, | This | SISTEM | WICKS | but show | 11 be ULT | ; MATE | 14 replace | ed |
| Bir Covere | 7 | | | ······································ | | | | <u>-7</u> |
| Potential Monito | ring Site | : Ye | es l | No | | | | |

Subbasin 446

Problem No. 445.1 By: J. Bjork 12/14/05

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined slide |
|-------------------------------------|------------|-------------|------------------|--|-------------------|----------|--------------------------|
| Flow Today: | | <u> </u> | cfs | Ap | | | t 0-1% 2-5% 5-10%>10% |
| Bank Vegetati | on type: | | Native | Invasive | Landscar | | 0 1/0 2 0/0 0 10/0 10/0 |
| Bank Vegetati | on qualit | ty: | Excellen | t Good | Fair | | Poor |
| Aquatic Habita | at: | | Excellen | | Fair | | Poor |
| Proximity to D | rainage | Outfalls: | ft. up | /d <u>own</u> stream | / 2 | | |
| Erosion of: | | bed | left bank | right bank | headcut | | CMP RCP PVC CPEP |
| Apparent rate | of Erosic | on: | stable | Slow change | | ango | Donid abon as |
| | | | Risks | (Check Appli | | ange | Rapid change |
| | | | None | Private | Public | | Creates Unsafe Condition |
| Bank Stability | | | | | | | oreates unsale condition |
| Upper Slope Sta Landslide | ability | | | | | | |
| Sediment sourc | • | | | | | | |
| Habitat destruct | | | | | | | |
| Threatens home | | | | | | | · |
| Threatens other | | | | | | | |
| Threatens privat | te road/di | riveway | ~ | + <u> </u> | | | |
| Threatens infras | | | +< + + + + + + + | | | | |
| Threatens public | c road | | | | | | |
| Risk to Homes: | 7 | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard |
| No risk | - | | · | | | | Low Med High |
| | - | | | | | | Low Med High |
| | | | olution | <u>6</u> | | | |
| Construction A | | yes NA | No . | • | | | |
| Construction A | ccess: | | | Conventional | Equipment to site | Э. | |
| | | | | Conventional | Equipment down | ravine | |
| | | | | Crane (less th | Equipment to top | of ravi | ne |
| | | | | Cable Way (st | raight line) | | |
| | | | | Small equipme | ent | | |
| Defended De 1 | | | | Chute/skid | | | |
| Potential Reduc Restoration of c | tion in C | D&M costs N | | Small | Moderate | 5 | Significant |
| | Outfall pr | | _ | Native | Landscaped LF | - | LF |
| 1 | Bypass P | Pipe | | NA | LF | | |
| | Check da | ams | • | | LF | | |
| (| Channel i | restoration | - | وستجار بالمحديث بالمراقبة والمحاصلا البالا أما المتناقبة | LF | | |
| | Stream re | estoration | - | | LF | | |
| Ċ | Other | | - | | | | |
| NOT A | pres | len . | Proper | Ty owne | r Horn | <u> </u> | ctalled MARINE |
| Lined | | rascape | d Ch | ADNAL | OK ON W | 114 | de East Mercer Way. |
| | | | | | UN UN W | cst 51 | me CAST Microer Way. |

Potential Monitoring Site:

No

Yes

Subbasin 445

Problem No<u>. 2</u>

By: J. Bjork 12 / 14 /05

Site Conditions

| Geology: Q | ltb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined | slide | | |
|---------------------------------------|--------|------------|---|--|-----------------|-----------|-----------------|-----------|------|---|
| Flow Today: | | 0 | ipmcfs | App | orox. Channel (| | t 0-1% 2-5% 5-1 | | | |
| Bank Vegetation | type: | | Native | Invasive | Landsca | | 30% AT ONT | riet Then | 70 5 | 2 |
| Bank Vegetation | qualit | ty: | Excellen | | Fair | _ | Poor | | | |
| Aquatic Habitat: | : | - | Excellen | | Fair | | Poor | | | |
| Proximity to Drain | nage (| Outfalls: | | /downstream | 12 | " | CMP RCP PVC CF | DT DT | | |
| Erosion of: | | bed | left bank | right bank | headcut | | LOWERCEPVCCE | | | |
| Apparent rate of E | | | stable | Slow change | | 20000 | | i | | |
| | | | Risks | (Check Appli | | lange | Rapid change | | | |
| | | | None | Private | Public | : | Creates Unsafe | Condition | | |
| Bank Stability | | | | | | • | oreates offsale | condition | | |
| Upper Slope Stabil | ity | | - | | | | | - | | |
| Landslide | | | | <u> </u> | | | | - | | |
| Sediment source | | | < < < < < < < < < < < < < < < < < < < | | | | | - | | |
| Habitat destruction Threatens home | | | | · · · · · | | • , | | - | | |
| Threatens other str | ucture | • | | | | | | - | | |
| Threatens private r | | | | | | | | - | | |
| Threatens infrastrue | | nveway | - <u>-</u> - | | | | | • . | | |
| Threatens public ro | | | ~ | | | | | | | |
| Risk to Homes: | | Horiz (f | | <u> </u> | Address | | Apparent Haza | rd | | |
| No risk | | | , | | | | Low Med High | | | |
| | - | | | ······································ | | | Low Med High | | | |
| | - | ···· | Solution | S | | | Low Med Flig | 1 | | |
| | | yes | No | 2 | | | | | | |
| Construction Acce | ess: | | <u>NA</u> | Conventional | Equipment to si | te | | | | |
| | | | | | Equipment dow | | | | | |
| | | | | Conventional | Equipment to to | p of ravi | ne | | | |
| | | | | Crane (less th | | | | | | |
| | | | | Cable Way (st | | | | | | |
| | | | | Small equipme | ent | | | | | |
| Potential Reductio | n in C | N&M cos | te None | Chute/skid Small | Moderate | | 0: | | | |
| Restoration of con | struc | tion acc | ess: | Native | Landscaped | i | Significant | - | | |
| - | | rotection | | | LF | - | | F | | |
| - | pass F | | | -0 | LF | | | | | |
| | eck da | • | | | LF | | | | | |
| | | restoratio | on | | LF | | | | | |
| | | estoratio | | | LF | | | | | |
| Oth | | 00101010 | | | Ll. | | | | | |
| - | | | 1 1 | | | | | | | |
| | | placed | | noter, R | easonably | Prote | cted . N | 0 | | |
| tlune AT | end | 0 | <u> </u> | I as sh | own on | Sa | Tion MAP | + | | |

Potential Monitoring Site:

Yes

Subbasin 455

Problem No<u>. 45-61</u>

By: J. Bjork <u>12 / 8 /05</u>

Site Conditions

| Geology: Qt | b Qva | Qvt | Qvr | Colluvium | fill Undetermined s | : d a |
|---|--|---------------|--|--|-------------------------|----------|
| Flow Today: | 20-70 gpm | cfs | | No. of Concession, name of | adient 0-1% 2-5% 5-10%> | ide |
| Bank Vegetation t | | Native | Invasive | Landscape | | 10% |
| Bank Vegetation o | uality: | Excellent | | Fair | | |
| Aquatic Habitat: | • | Excellent | | Fair | Poor | |
| Proximity to Drain | age Outfalls: | | downstream | | Poor / | |
| Erosion of: | bed | left bank | right bank | headcut | <u> </u> | |
| Apparent rate of E | | stable | Slow change | | | i |
| •• | | <u>Risks</u> | (Check Applic | Moderate char | nge Rapid change | |
| | | None | Private | Public | Orrestan II | |
| Bank Stability | | | | | Creates Unsafe Conc | ition |
| Upper Slope Stabilit | у | | ~ | | | |
| Landslide | | | ~ MA | iped v | | |
| Sediment source Habitat destruction | | | | | | |
| Threatens home | | <u></u> | | | | |
| Threatens other stru | icture | <u> </u> | | | | |
| Threatens private ro | | | | | ······ | |
| Threatens infrastruc | ture | <u> </u> | | Low r | Cle. | |
| Threatens public roa | | | | LOW R | | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | · | Address | Apparent Hazard | |
| No risk | | | | AST Mercer h | | |
| • | | | ······································ | | Low Med High | |
| | | Solutions | ······································ | | | |
| | yes | No | • | | | |
| Construction Acces | ss: | <u> </u> | Conventional E | Equipment to site | | |
| | <u> </u> | | Conventional E | Equipment down ra | avine | |
| | · / | | Conventional E | Equipment to top o | of ravine | |
| | | | Crane (less the | an 200') | | |
| | ~ | | | | | |
| | ~ | | Cable Way (str | | | |
| | | \$ | Small equipme | | | |
| Potential Reduction | 5 | | Small equipme Chute/skid | nt | Significant | |
| Restoration of cons | in O&M costs | None | Small equipme Chute/skid Small I | nt M <u>odera</u> te | Significant | |
| Restoration of cons | in O&M costs | None | Small equipme Chute/skid Small I <u>Native</u> I | nt | Significant LF | |
| Restoration of cons Concept: Outf | in O&M costs | None | Small equipme Chute/skid Small I <u>Native</u> I | nt M <u>oderat</u> e Landscaped | - | |
| Restoration of cons Concept: Outf Bypa | in O&M costs I struction access | None | Small equipme Chute/skid Small I <u>Native</u> I | nt M <u>oderat</u> e Landscaped LF _F | LF | |
| Restoration of cons Concept: Outf Bypa Che | in O&M costs in truction access all protection access all protection | None | Small equipme Chute/skid Small I <u>Native</u> I I 300 L | nt M <u>oderat</u> e Landscaped LF _F _F Add 73 d | - | |
| Restoration of cons Concept: Outf Bypa Che Cha | in O&M costs I struction access all protection ass Pipe ck dams | None | Small equipme Chute/skid Small I <u>Native</u> I I I 300 L | nt Moderate Landscaped LF _F _F Add 73 d | LF | |
| Restoration of cons Concept: Outf Bypa Che Cha | in O&M costs in struction access all protection ass Pipe ck dams nnel restoration am restoration | None | Small equipme Chute/skid Small I <u>Native</u> I I I 300 L | nt M <u>oderat</u> e Landscaped LF _F _F Add 73 d | LF | |
| Restoration of cons Concept: Outf Bypa Che Cha Strea Othe | in O&M costs in truction access all protection ass Pipe ck dams nnel restoration am restoration | | Small equipme Chute/skid Small I <u>Native</u> I I JOO I L | nt M <u>oderat</u> e Landscaped LF _F _F Add 73 d _F _F | LF | |
| Restoration of cons Concept: Outf Bypa Chei Chai Strea Othe Existing Guerr | in O&M costs in truction access all protection ass Pipe ck dams nnel restoration am restoration | Vone : : I | Small equipme Chute/skid Small I <u>Native</u> I I JOO I L | nt Moderate Landscaped LF _F _F _F Add 73 _F _F _F | LF | <u>\</u> |

Potential Monitoring Site:

Yes

Subbasin 456

Problem No.4552 By: J. Bjork 12/ 8 / 05

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined slide | |
|----------------------------------|------------|--|-----------------|-----------------|------------------------|----------|---------------------------------------|-------|
| Flow Today: | | Nore gpm | cfs | Аррі | ox. Channel Gi | radient | 0-1% 2-5% 5-10% 2-3 2 | ~~ |
| Bank Vegetatio | on type: | | Native | Invasive | Landscap | ed | | |
| Bank Vegetatio | on qualit | ty: | Excellent | Good | <u>Fair</u> | | Poor | |
| Aquatic Habita | t: | | Excellent | Good | Fair | | Poor NONE | , |
| Proximity to D | rainage | Outfalls: | ft. up/ | downstream | Nore | н | CMP RCP PVC CPEP Portme V | oot |
| Erosion of: | | bed | left bank | right bank | headcut | | NA Le | Aners |
| Apparent rate of | of Erosi | on: | stable | Slow change | Moderate cha | ange | Rapid change | |
| | | | <u>Risks</u> | (Check Applic | able) | | | |
| | | | None | Private | Public | | Creates Unsafe Condition | |
| Bank Stability | -1.426. | | | | <u></u> | | | |
| Upper Slope Sta Landslide | ability | | 1111111 | | | | | |
| Sediment sourc | <u>م</u> | | | | | | | |
| Habitat destruct | | | | | | | | |
| Threatens home | | | <i>.</i> | | | | | |
| Threatens other | - structur | e | | | | | | |
| Threatens priva | | • | | | | | <u> </u> | |
| Threatens infras | | | | | <u></u> | | | |
| Threatens public | | / f 4) | | | | | Annovertillement | |
| Risk to Homes | : | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard | |
| No risk | - | | | | | | Low Med High | |
| | | | O a lesti a m | | · · · · · · · · · · | <u>.</u> | Low Med High | |
| | | | Solution: No | 5 | | | | |
| Construction A | locase. | yes ∧∕ | | Conventional | Equipment to sit | Þ | | |
| | | ······································ | , <u> </u> | | Equipment dowr | | | |
| | | | | | Equipment to to | | | |
| | | | | Crane (less th | an 200') | - | | |
| | | <u> </u> | · | Cable Way (s | ÷ , | | | |
| | | · | | Small equipm | ent | | | |
| Detential Dedu | ation in | 0.914 | | Chute/skid | Madarata | | Cirrificant | |
| Potential Redu Restoration of | | | | Small Native | Moderate Landscaped | | Significant | |
| Concept: | | protection | 3. | | LF | | Ľ | |
| | Bypass | • | | | LF | | | |
| | Check | - | | ······ | LF | | | |
| | | el restoration | | | _= _LF | | | |
| | | restoration | | | LF | | | |
| | Other | 10310120011 | | | | | | |
| NO cride | | at U | | NATER. L | imited C | o//cc7 | 700 area and | |
| | ONTIE | | | | | | miration of | |
| STORA | WAT | | rot AL | | | | al al at | |
| -/-/-/- | ••••• | | | | product product | | · · · · · · · · · · · · · · · · · · · | |

Potential Monitoring Site: No Yes

Subbasin 455 Problem No. 455.3 By: J. Bjork ____

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill Undetermined slide |
|--------------------------------------|---|---|------------------------|---|---|---------------------------------|
| Flow Today: | | gpm | cfs | Арр | orox. Channel Gra | adient 0-1% 2-5% 5-10%>10% |
| Bank Vegetatio | on type: | | Native | Invasive | Landscape | |
| Bank Vegetation | on qualit | y: | Excellent | Good | Fair | Poor |
| Aquatic Habita | it: | | Excellent | Good | Fair | Poor |
| Proximity to D | rainage | Outfalls: | ft. up/ | downstream | /2 | CMP RCP PVC CPEP |
| Erosion of: | | bed | left bank | right bank | headcut | |
| Apparent rate | of Erosic | on: | stable | Slow change | Moderate cha | nge Rapid change |
| | | | <u>Risks</u> | (Check Applie | | |
| | | | None | Private | Public | Creates Unsafe Condition |
| Bank Stability | ability . | | | | | |
| Upper Slope Sta Landslide | ability | | | <u> </u> | | |
| Sediment sourc | e | | | <u> </u> | | |
| Habitat destruct | | | | | | |
| Threatens home | e | | | | | · · · · · |
| Threatens other | | | | | | |
| Threatens privat | | riveway | 115 | | | |
| Threatens infras Threatens public | | | | <u></u> | side Sewer | Leater and V |
| Risk to Homes: | | Horiz (ft) | Vert (ft) | · | Address | |
| No risk | • | (10)12 (11) | ••••• | | Audress | Apparent Hazard Low Med High |
| | • . • | | | | | Low Med High |
| | - | | Solutions | S | | Low med flight |
| | | yes | No | 2 | | |
| Construction A | ccess: | | _ <u></u> | Conventional | Equipment to site | |
| | | | | | Equipment to site | |
| | | ~ | | Conventional | Equipment down i | |
| | | | | Conventional Conventional | Equipment down i Equipment to top | |
| | | | - | Conventional Conventional Crane (less th | Equipment down i Equipment to top an 200') | |
| | | | | Conventional Conventional Crane (less th Cable Way (st | Equipment down i Equipment to top an 200') traight line) | |
| | | | - | Conventional Conventional Crane (less th | Equipment down i Equipment to top an 200') traight line) | |
| Potential Reduc | | D&M costs | I I I None | Conventional Conventional Crane (less th Cable Way (st Small equipme | Equipment down i Equipment to top an 200') traight line) | |
| Restoration of | construc | D&M costs | I I I None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid | Equipment down i Equipment to top an 200') traight line) ent | of ravine |
| Restoration of Concept: | construc Outfall p | D&M costs rotection | I I I None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small | Equipment down a Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF | of ravine Significant |
| Restoration of Concept: | construc Outfall p Bypass I | D&M costs etion access rotection Pipe | I I I None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small | Equipment down i Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF LF | of ravine Significant |
| Restoration of Concept: | construc Outfall p Bypass I Check d | D&M costs ction access rotection pipe ams | I I I None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small | Equipment down a Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF | of ravine Significant |
| Restoration of o Concept: | construc Outfall p Bypass I Check d Channel | D&M costs etion access rotection Pipe ams restoration | I I I None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down i Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF LF LF LF | of ravine Significant |
| Restoration of o Concept: | construc Outfall p Bypass I Check d Channel Stream r | D&M costs stion access rotection Pipe ams restoration restoration | None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small | Equipment down a Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF LF LF | of ravine Significant |
| Restoration of Concept: | Construct Outfall p Bypass I Check d Channel Stream r Other | D&M costs stion access rotection Pipe ams restoration estoration | None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down i Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF LF LF LF | of ravine Significant |
| Restoration of o Concept: | Construct Outfall p Bypass I Check d Channel Stream r Other | D&M costs stion access rotection Pipe ams restoration restoration | None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down i Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF LF LF LF | of ravine Significant |
| Restoration of Concept: | Construct Outfall p Bypass I Check d Channel Stream r Other | D&M costs stion access rotection Pipe ams restoration estoration | None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down i Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF LF LF LF | of ravine Significant |
| Restoration of Concept: | Construct Outfall p Bypass I Check d Channel Stream r Other | D&M costs stion access rotection Pipe ams restoration estoration | None | Conventional Conventional Crane (less th Cable Way (st Small equipme Chute/skid Small Native | Equipment down i Equipment to top an 200') traight line) ent <u>Moderate</u> Landscaped LF LF LF LF | of ravine Significant |

Potential Monitoring Site:

| Subbasin 455 | Problem N | | By: J. Bjork | 121 8 105 | ~ | _ |
|---|-----------------|--------------------------|--------------------|------------------|-------------|----------------------------|
| | | New | Site Cond | itions | | |
| | | | | | | |
| Geology: Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined slide |
| Flow Today: | <u>פדי g</u> pm | cfs | Арр | orox. Channel G | radien | t 0-1% 2-5% 5-10%>10% 50 💈 |
| Bank Vegetation type: | | Native | Invasive | Landscap | | |
| Bank Vegetation qualit | : y: | Excellent | Good | Fair | | Poor |
| Aquatic Habitat: | | Excellent | Good | Fair | | Poor |
| Proximity to Drainage | Outfalls: | <u>ar</u> ft. <u>up/</u> | downstream | /: | 2 " | CMP RCP PVC CPEP |
| Erosion of: | bed | left bank | right bank | headcut | | |
| Apparent rate of Erosic | on: | stable | Slow change | Moderate ch | ange | Rapid change |
| | | <u>Risks</u> | (Check Applic | cable) | | |
| Ponk Stobility | | None | Private | Public | ; | Creates Unsafe Condition |
| Bank Stability Upper Slope Stability | | | | | | |
| Landslide | | | Low | | | |
| Sediment source | | | ~ | | | |
| Habitat destruction | | V | | | | |
| Threatens home | | <u> </u> | · · · | | | |
| Threatens other structure Threatens private road/d | | <u> </u> | | <u></u> | | |
| Threatens infrastructure | IIVEWAY | | V | | Scure | |
| Threatens public road | | ~ | | <u> </u> | | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard |
| No risk_ | | | | | | Low Med High |
| | | | | | | Low Med High |
| | | Solutions | <u>.</u> | | | - U |
| 0 | yes | No | _ | | | |
| Construction Access: | | | | Equipment to sit | | |
| | | | | Equipment down | | |
| | ~ | <u></u> | Crane (less th | | p or ravi | ine |
| | i/ | | Cable Way (st | | | |
| • | <u> </u> | | Small equipme | • • | | |
| Defended Desky desta | | . <u></u> | Chute/skid | | | |
| Potential Reduction in (Restoration of construct | | | Small | Moderate | | Significant |
| _ | rotection | 5. | Native 50 - 100 | Landscaped LF | | LF |
| Bypass | | or | | | if car | J flow |
| Check d | • | | | LF | | 1 1 1 2 |
| | restoration | | | LF | | |
| | restoration | | | LF | | |
| Other | Soloradon | - | | | | |
| MLT-fil M | F Dire | ATC C | hevert | | | alit de |
| his hear | | | LLV eri Claired | on steep | <u> </u> | phisle slope |
| ny seen | 1 | My r | cprired | with C | <i>iuar</i> | ry spalls |
| | ~ | | | | | |

Potential Monitoring Site: Yes

Subbasin 46a Problem No. 469.1 By: J. Bjork 1218.105

| Geology: | Qtb | Qva | | Qvt | Qvr | Colluvium | fill | Undete | rmined | slide | |
|------------------------|-----------|-----------|-------------|-----------|----------------------------|-------------------|---------------|-----------|-----------|-----------|-----|
| Flow Today: | | dry | <u>g</u> pm | cfs | Ap | prox. Channel G | | | | | 30% |
| Bank Vegetatio | n type: | - | | Native | Invasive | Landscap | | | 0/00/10 | /0= 10 /0 | |
| Bank Vegetatio | n qualit | y: | | Excellent | | Fair | pou | Poor | | | |
| Aquatic Habitat | - | • | | Excellent | | Fair | | Poor | | | |
| Proximity to Dr | | Outfall | s: | | downstream | | , • | | NONC | - | |
| Erosion of: | | bed | | left bank | right bank | headcut | | | P PVC CPE | Р | |
| Apparent rate o | | | | stable | Slow change | | | NON | | | - |
| - pparonerato o | | /11. | | Risks | - | | lange | Rapid c | hange | | |
| | | | | None | (Check Appl Private | rcable) Public | | • | | | |
| Bank Stability | | | | None | Filvale | Fublic | | Creates | Unsafe C | ondition | |
| Upper Slope Sta | bility | | | | | | | | Colonia | | |
| Landslide | - | | | | ~ | <u> </u> | | | | | |
| Sediment source | ; | | | ~ | | | | | | | |
| Habitat destruction | on | | | | | | | | | | |
| Threatens home | | | | | | | | | <u> </u> | | |
| Threatens other | | - | | | | | | | | | |
| Threatens private | | riveway | / | ~ | | | | | | | |
| Threatens infrast | | | | 1112 | | | | | | | |
| Threatens public | road | | (| | | ····· | | | | | |
| Risk to Homes: | | Horiz | (ft) | Vert (ft) | | Address | | Apparei | nt Hazaro | I | |
| No risk | - | | | | | | | Low Me | ed High | | |
| | - | | | | | | | Low Me | ed High | | |
| | | | <u>S</u> | olutions | <u>b</u> | | | | | | |
| • • • • • | | yes | | n No | | | | | | | |
| Construction Ac | cess: | | / | <u>+</u> | | Equipment to sit | | | | | |
| | | | <u> </u> | | | Equipment dowr | | | | | |
| | | <u></u> | | <u> </u> | | Equipment to top | p of ravi | ne | | | |
| | | | | | Crane (less th | • | | | | | |
| | | | <u> </u> | | Cable Way (s | | | | | | |
| | | | | | Small equipm Chute/skid | ient | | | | | |
| Potential Reduct | tion in C | 0&M co | osts N | | Small | Moderate | | Ciamifian | | | |
| Restoration of c | | | | - | Native | Landscaped | | Significa | | | |
| - | Dutfall p | | | | | LF | | 0 | LF | | |
| | Bypass F | | | - | | _LF | | | | | |
| | Check da | • | | - | | ' _LF | | | | | |
| | Channel | | tion | - | | '' LF | | | | | |
| | Stream r | | | | | - | | | | | |
| | Other | sioral | | - | | _LF | | | | | |
| | ~ | - () | 1 | | <u> </u> | 1 | · | , . | | | |
| No Cridence | OT | | | WATE | | | nTri | | Arei | | |
| INcluding | 1-2 | A | | | nvine are | | | is fa | TPM 5 | lides | |
| or mass | WAST | <u> </u> | | crosio | | erry dorl | <u>1 h://</u> | ber | ng den | clopen | 1 |
| NOT | An | Cros | - | Pro bl | | ~ | | | / | | • |
| Potential Monito | ring Site |): | Y | es l | No | | | | | | |

Subbasin 46a Problem No. 46a 3 By: J. Bjork 118 104 and 3/3/06

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermi | ned slide | Silty | Sana |
|--------------------------------------|----------|----------------|---------------|------------------------|------------------------|------------|---------------------------------------|--|-------|------|
| Flow Today: | | gpm | cfs | A | oprox. Channel | Gradient | | the second s | • | |
| Bank Vegetatio | on type: | | <u>Native</u> | Invasive | | | | | | |
| Bank Vegetatio | on quali | ty: | Excellent | | Fai | • | Poor | | | |
| Aquatic Habita | t: | - | Excellent | - | Fai | | Poor | | | |
| Proximity to Dr | rainage | Outfalls: | ft. up/ | downstream | - | - | CMP RCP P | C CPEP | | |
| Erosion of: | • | bed | left bank | right bank | headcut | | | | | |
| Apparent rate of | of Erosi | on: | stable | Slow chang | | change | Rapid char | Ine | - | |
| | | | Risks | (Check App | • | | | 190 | | |
| | | | None | Private | Publ | lic | Creates Un | safe Condition | | |
| Bank Stability | | | | K | | | | | | |
| Upper Slope Sta | | | | | city | _ | | | | |
| Landslide Ma | ••• | | | | projecty 7- | | · · · · · · · · · · · · · · · · · · · | | | |
| Sediment source | | | | | [][[][]]] | | _ | | | |
| Habitat destructi Threatens home | | | | | | _ | | | | |
| Threatens other | | | | | <u> </u> | | _ | | | |
| Threatens privat | | | | | | | | | | |
| Threatens infras | | | <u> </u> | | | | | | | |
| Threatens public | | , | 122 | | · | | | - <u></u> | | |
| Risk to Homes: | | Horiz (ft) | Vert (ft) | | Address | _ | Apparent I | lazard | | |
| No risk 🗸 🗸 | | | | | | | Low Med | | | |
| | | | | | | | Low Med | - | | |
| | | | Solutions | 5 | ···· | | - Low Micu | riigii | | |
| | | yes | No | | | | | | | |
| Construction A | ccess: | | | Conventiona | al Equipment to | site | | | | |
| | | | ~ | Conventiona | al Equipment do | wn ravine | ! | | | |
| | | | <u> </u> | | al Equipment to | top of rav | ine | | | |
| | | - | <u> </u> | Crane (less | | | | | | |
| • | | | | | (straight line) | | | | | |
| | | | · | Small equip | ment | | | | | |
| Potential Reduc | ction in | O&M costs | Nono | Chute/skid Small | Madavata | | 01 | | | |
| Restoration of a | | | | Native | Moderate Landscaped | | Significant 20 3 | | | |
| | | protection | | Idave | LF | | | LF | | |
| - | Bypass | | | 250 | LF Ορπία~ | a | | | | |
| | Check of | | | | | • | | | | |
| | | el restoration | | | LF | | | | | |
| | | restoration | • | 250 | | | | | | |
| | Other | , coloration | | | LI | | | | | |
| | | | 1 | | 1.1. 61 | | | A. set | • | |
| | reach | | jor Sla | | chility SI | ide tro | n norn | | 5 | |
| Creek in | Sor | | Tions. | Consid | | and in | STream | | | |
| Adjacent Will rean | | road way | | | Morenen | | tion of | Solution | | |
| Will regn Potential Monito | | nrther 1 | | <u>a Ti on .</u> No | and Moni | Toring | ot Mo | rement. | | |
| | oning OI | | 100 | | | | | | | |

Subbasin 46 a

Problem No. 464. 4 By: J. Bjork 313106

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined | slide |
|--|------------|-------------|--------------|--|-----------------|---|--------------------|---------|
| Flow Today: | | 10-20gpm | cfs | Ap | | and the second se | t 0-1% 2-5% 5-10% | |
| Bank Vegetatio | on type: | | Native | I <u>nvasiv</u> e | Landsca | | | -10% |
| Bank Vegetatio | on qualit | y: | Excellent | | Fair | | Poor | |
| Aquatic Habita | t: | | Excellent | | Fair | | Poor | |
| Proximity to Dr | ainage (| Outfalls: | AT ft. up/ | downs <u>tream</u> | | 24 | CMP RCP PVC CPEP | |
| Erosion of: | | bed | left bank | right bank | headcut | | | |
| Apparent rate of | of Erosio | on: | stable | Slow change | | hange | Rapid change | |
| | | | <u>Risks</u> | (Check Appl | | go | rapid change | |
| | · | | None | Private | Publi | с | Creates Unsafe Cor | ndition |
| Bank Stability Upper Slope Sta | bilite . | | ······ | <u> </u> | | | | |
| Landslide | Dinty | | | | City | - | | |
| Sediment source |) | | | | Drugerty ?- | - | | |
| Habitat destruction | | | | | <u> </u> | - | | |
| Threatens home | | | ~ | · · · · · · · · · · · · · · · · · · · | | - | | |
| Threatens other | | | | | | - | | |
| Threatens private Threatens infrast | e road/dr | iveway | 12/2/2 | | | - | | |
| Threatens public | | | | | | - | | |
| Risk to Homes: | iuau | Horiz (ft) | Vert (ft) | | | - | | |
| No risk | v | | Vort (ity | | Address | | Apparent Hazard | |
| | _ | | | | | | Low Med High | |
| ·• | | S | olutions | •••••••••••••••••••••••••••••••••••••• | <u></u> | | Low Med High | |
| | | yes | No | - | | | | |
| Construction Ac | cess: | <u> </u> | | Conventional | Equipment to s | ite | | |
| | | | <u> </u> | Conventional | Equipment dow | n ravine | | |
| | | | | Conventional | Equipment to to | op of ravi | ne | |
| | | | | Crane (less th | | | | |
| | | ~ | | Cable Way (s Small equipm | | | | |
| | | | 1 | Chute/skid | | | | |
| Potential Reduct | tion in O | &M costs N | lone | Small | Moderate | | Significant | |
| Restoration of co Concept: () | | | | Native | Landscaped | - | <u>50</u> LF | |
| | Dutfall pr | | - | | _LF | | | |
| | Bypass P | • | - | | LF | | | |
| | Check da | | | | LF | | | |
| | | restoration | | ······ | LF | | · | |
| | | estoration | | 100 | LF | | | |
| | Other, | | | | | · | | |
| downer | Ting | In Tr | TibhTar | 3 | | | | |
| | | | . • | | | | | |
| | | | | | | | · · · | |
| <u>.</u> | | | | | | | | |
| Potential Monitor | ing Oil- | | əs N | 10 | | | ···· | |

Subbasin 46 B

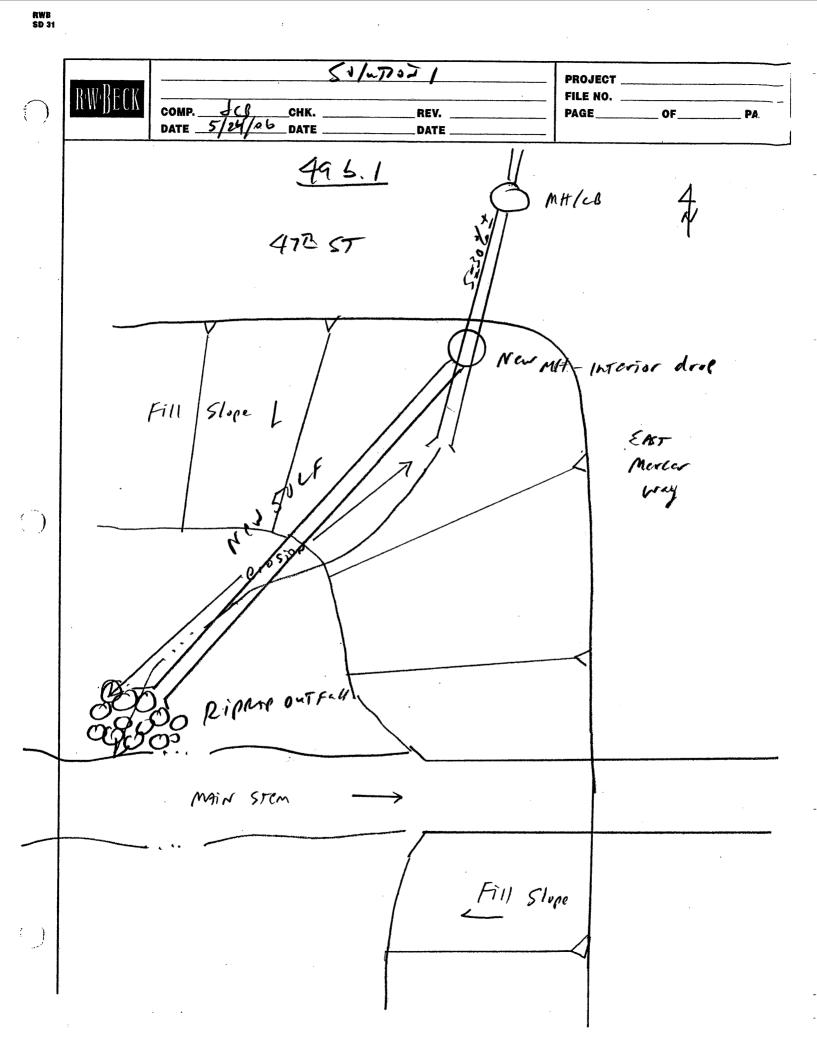
Problem No<u>.465. |</u> By: J. Bjork <u>12 / B / 05</u>

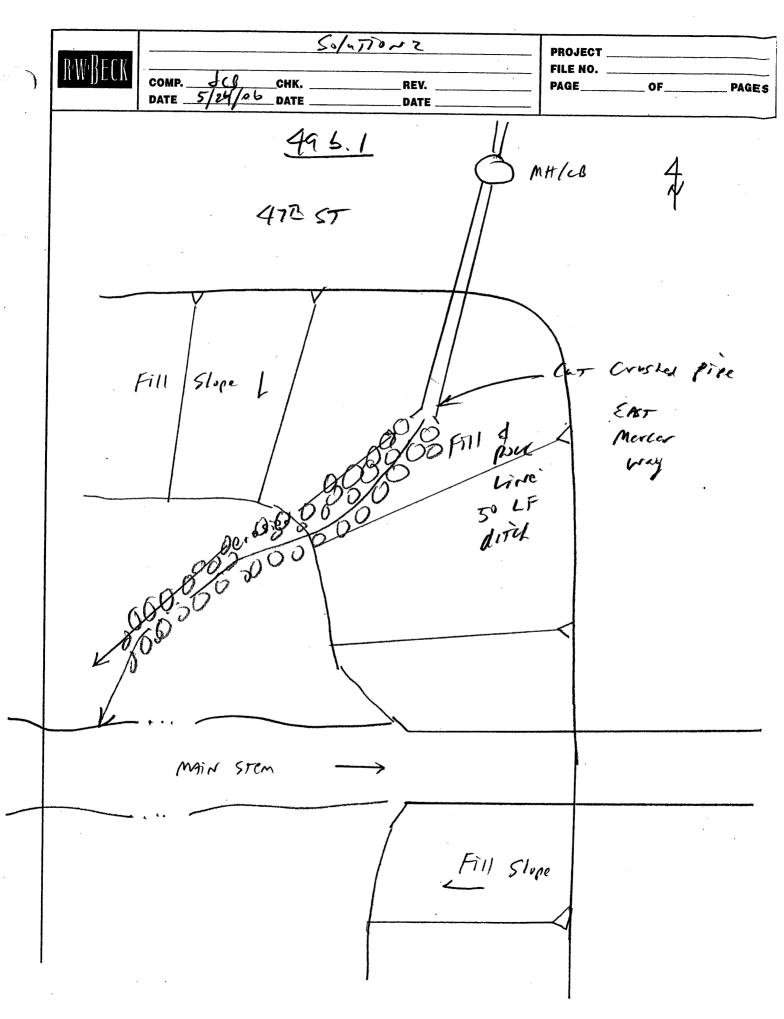
| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined slide |
|-----------------|-----------|---------------|-----------------|--|--|-----------|--|
| Flow Today: | | dry gpm | ıcfs | Ar | | | nt 0-1% 2-5% 5-10% >10% 50-75% |
| Bank Vegetat | ion type: | | Native | Invasive | | | |
| Bank Vegetat | ion qual | ity: | Excellent | and the second sec | Eair | • | Poor |
| Aquatic Habit | at: | - | Excellent | | Fair | | Poor NONE |
| Proximity to [| Drainage | Outfalls: | | downstream | None | | |
| Erosion of: | Ŭ | bed | left bank | right bank | headcut | | |
| Apparent rate | of Erosi | ion: | stable | Slow chang | | bongo | |
| | | | Risks | (Check App | | nange | Rapid change urknown |
| | | | None | Private | Public | c | Creates Unsafe Condition |
| Bank Stability | | | <u> </u> | | 1 upin | • | creates onsale condition |
| Upper Slope S | • | | | ~ | | - | |
| | NOT MA | red | <u> </u> | ~ | | - | |
| Sediment sour | | | | <u></u> | | - | ····· |
| Habitat destruc | | | | | | | |
| Threatens hom | | | <u></u> | | | _ | |
| Threatens othe | | | <u> </u> | <u> </u> | | _ | |
| Threatens priva | | | | | | | |
| Threatens infra | | • | | | · · · · · · · · · · · · · · · · · · · | _ | |
| Threatens publ | | | | | | _ | |
| Risk to Homes | 5: | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard |
| No risk | - | | | 9166 | 542 | | Low Med High ? |
| Construction / | Access: | yes | Solutions No | _ | I Equipment to s | ite | _Low Med High |
| | | | | Conventiona | I Equipment dow I Equipment to to than 200') straight line) | vn ravine | |
| Potential Redu | iction in | O&M costs | None | Small | Moderate | | Cimplificant |
| Restoration of | | | | Native | Landscaped | | Significant |
| Concept: | | protection | | MA | LF | | <u>////</u> LF |
| • | Bypass | | | M | LF | | |
| | Check of | • | | | LF | | |
| | - | I restoration | | | | ~ | |
| | | | • | | | | |
| | | restoration | - | ······ | _LF | | |
| 1 | Other | | | / | | | |
| LAndslide | Decu | ured h | tre a | ten y | CARS ASO. | Sire | near The of |
| Slope So | Surfa | LE WATE | run. | | | + for | son lor 2 roaf |
| leaders of | | X 100' | area. | This i | | Astid | c not an |
| erosio | nal | Proslem | | | | | |
| Potential Monif | toring Si | | Yes | No | | | ······································ |

Subbasin 495

Problem No. 4951 By: J. Bjork 1218 105

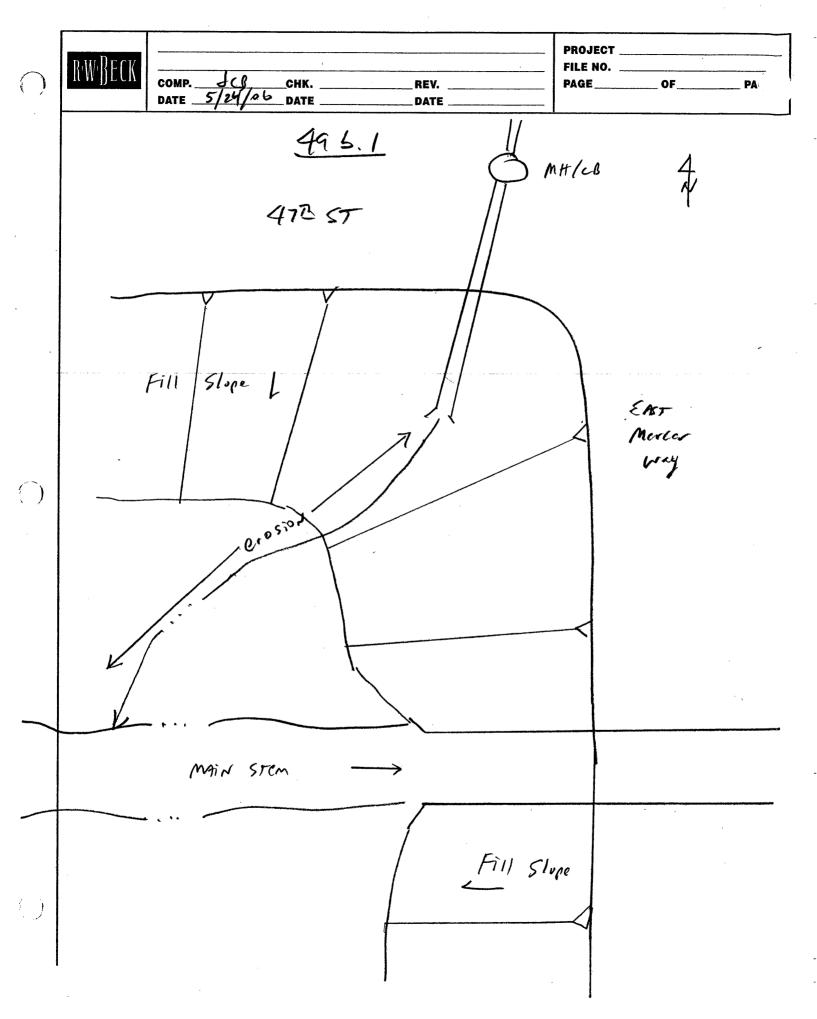
| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermi | ned slide |
|--|---|--|-------------------------------|-------------------------------------|--|--|-------------|----------------|
| Flow Today: | | 20-40gpn | ncfs | Арр | rox. Channel (| Contraction of the local division of the loc | | 5-10%>10% 30 2 |
| Bank Vegetati | on type: | | Native | I <u>nvasi</u> ve | Landsca | | | |
| Bank Vegetati | on quali | ty: | Excellent | | Fair | • | Poor | |
| Aquatic Habita | at: | | Excellent | | Fair | | Poor No | M |
| Proximity to D | rainage | Outfalls: | at ft. up/ | downstream | 24 | | | C CPEP 2' drop |
| Erosion of: | | bed | left bank | right bank | headcut | <u></u> | | |
| Apparent rate | of Erosi | on: | stable | Slow change | Moderate ch | hange . | Rapid char | nae |
| | | | <u>Risks</u> | (Check Applie | | J. | | .90 |
| | | | None | Private | Public | | Creates Un | safe Condition |
| Bank Stability | | | | | 1111 | _ | | <u> </u> |
| Upper Slope Sta Landslide | | pped | <u> </u> | | | - | | |
| Sediment source | | f 17 | <u> </u> | | | - | | |
| Habitat destruct | | | | | | - | | |
| Threatens home | | | 1212 | | | - | - | |
| Threatens other | r structur | е | ~ | | | - | - | |
| Threatens priva | | • | ~ | | | - | - | |
| Threatens infras | | | | | | | | |
| Threatens public | | | | | Low | - | | |
| Risk to Homes | | Horiz (ft) | Vert (ft) | | Address | 1 | Apparent H | lazard |
| No risk_ | | | | | | | Low Med | High |
| | | | | | | I | Low Med | High |
| | | | Solutions | <u>5</u> | | | | |
| Construction A | | yes | No | 0 | | • | | |
| Construction A | CCess: | | | | Equipment to si | | | |
| | | ······ | | | Equipment dow Equipment to to | | | |
| | | | ~ | Crane (less th | | p or ravi | IE | |
| | | | | Cable Way (st | | | | |
| | | | | | | | | |
| | | | | Small equipme | ent | | | |
| | | · | | Chute/skid | ent | | | · |
| Potential Redu | | | None | Chute/skid Small | Moderate | S | Significant | |
| Restoration of | construe | ction acces | None | Chute/skid | Moderate Landscaped | 5 | Significant | LF |
| Restoration of | constru Outfall p | ction acces | None s: | Chute/skid Small Native | Moderate Landscaped LF | - | Significant | LF |
| Restoration of | constru Outfall p Bypass | c tion acces protection Pipe วา | None s: | Chute/skid Small | Moderate Landscaped LF LF Fron C | - | Significant | LF |
| Restoration of | construc Outfall p Bypass Check d | ction acces protection Pipe ০৭ lams | None s: | Chute/skid Small Native | Moderate Landscaped LF LF <i>Fron</i> C | - | Significant | LF |
| Restoration of | construe Outfall p Bypass Check d Channel | ction acces protection Pipe ৫৭ lams I restoration | None s: | Chute/skid Small Native | Moderate Landscaped LF LF <i>From</i> C LF LF | - | Significant | LF |
| Restoration of | construc Outfall p Bypass Check d Channel Stream | ction acces protection Pipe ০৭ lams | None s: | Chute/skid Small Native | Moderate Landscaped LF LF <i>Fron</i> C | - | Significant | LF |
| Restoration of Concept: | Construe Outfall p Bypass Check d Channe Stream Other | ction acces protection Pipe 2n lams I restoration restoration | None s: | Chute/skid Small Native | Moderate Landscaped LF LF <i>From</i> C LF LF | - | Significant | LF |
| Restoration of | Construe Outfall p Bypass Check d Channe Stream Other | ction acces protection Pipe 2n lams I restoration restoration | None s: | Chute/skid Small Native | Moderate Landscaped LF LF From C LF LF LF | - | | LF |
| Restoration of Concept: อศาวัย Mac | Construct Outfall p Bypass Check d Channel Stream Other | ction acces protection Pipe 29 lams I restoration restoration | None s: .'' C Maiwi- | Chute/skid Small Native 50 | Moderate Landscaped LF LF From C LF LF LF | ding | | |
| Restoration of Concept: | Construct Outfall p Bypass Check d Channel Stream Other | ction acces protection Pipe 2n lams I restoration restoration | None s: .'' C Maiwi- | Chute/skid Small Native | Moderate Landscaped LF LF From C LF LF LF | ding | | |





RWB SD 31

RWB SD 31



Subbasin 49.5

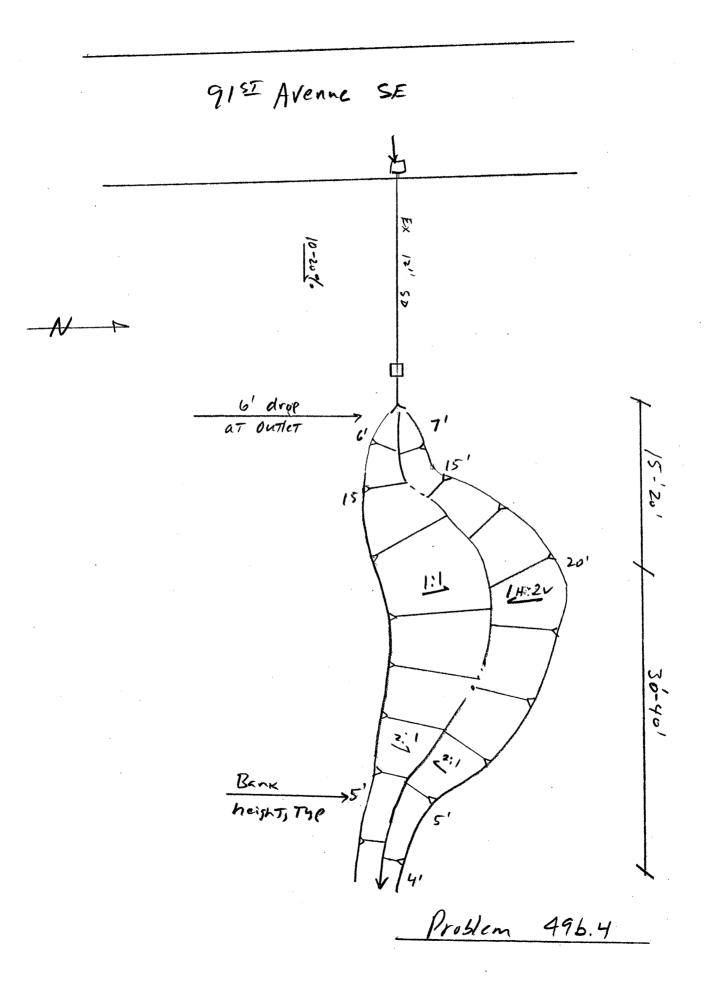
Problem No. 495. 2 By: J. Bjork 12/8/05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Undetermined slide |
|-------------------------------------|----------|------------------|--------------------|--|------------------|----------|--|
| Flow Today: | | <i>lo-го</i> дрт | cfs | Арр | rox. Channel G | Fadien | t 0-1% 2-5% 5-10%>10% |
| Bank Vegetati | on type: | | Native | Invasive | Landsca | | · estation ran |
| Bank Vegetati | on quali | ty: | Excellent | Good | Fair | | Poor |
| Aquatic Habita | at: | | Excellent | Good | Fair | | Poor |
| Proximity to D | rainage | Outfalls: | ft. up/ | downstream | NONE | 1 | CMP RCP PVC CPEP |
| Erosion of: | | bed | l <u>eft ba</u> nk | <u>right b</u> ank | headcut | | <u> </u> |
| Apparent rate | of Erosi | on: | stable | Slow change | Moderate ch | ange | Rapid change |
| | | | <u>Risks</u> | (Check Applic | able) | - | |
| | | | None | Private | Public | ; | Creates Unsafe Condition |
| Bank Stability Upper Slope Sta | obility | | ····· | <u> </u> | | | |
| Landslide | ability | | ~ | | | | |
| Sediment sourc | e | | | | | | |
| Habitat destruct | lion | | | 1 | | | |
| Threatens home | | | | - | | | |
| Threatens other | | - | | | | | |
| Threatens priva Threatens infras | | | | | • | | |
| Threatens public | | | | | | | |
| Risk to Homes | | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard |
| No risk | _ | 944 | | ST. Pin p | le Support | ed . | Low Med High |
| | | · | | | · · · | | Low Med High |
| | | | Solutions | 3 | | | _ |
| . | | yes | No | | | | |
| Construction A | ccess: | | | | Equipment to si | | |
| | | <u> </u> | | | Equipment dow | | |
| | | | | Crane (less th | Equipment to to | p of rav | ine |
| | | | | Cable Way (st | • | | |
| | | | | Small equipme | - / | | |
| | | | | Chute/skid | | | |
| Potential Reduce Restoration of | | | | Small | Moderate | | Significant |
| _ | | protection | 5. | Native | Landscaped LF | | LF |
| | Bypass | | | · ······· | LF | | |
| | Check d | • | | ······································ | LF | | |
| | | restoration | | | LF | | |
| | | restoration | | | LF | | |
| | Other | 0010101011 | - | | | | |
| 700 | STeep | 50 1 | Leer D | <u> </u> | <u></u> | | |
| | -, cep | <u> </u> | con D | inns . | ······ | | ······································ |
| | | | | | | | |
| | | | | | | | |

Subbasin 496

Problem No. 496. 4 By: J. Bjork 12/14/05

| Geology: Qtb | Qva | Q∨t | Qvr | Colluvium fill | Undetermined slide |
|--|---|--------------|-----------------------------------|--|--|
| Flow Today: | <u> </u> | cfs | Ap | prox. Channel Gradie | ent 0-1% 2-5% 5-10%>10% 30 % Them |
| Bank Vegetation type: | | Native | Invasive | Landscaped | 10% |
| Bank Vegetation quality | Bank Vegetation quality: | | | Fair | Poor |
| Aquatic Habitat: | Excellent | Good | Fair | Poor | |
| Proximity to Drainage | Outfalls: | AT ft. up/ | downstream | 12 | " CMP RCP PVC CPEP |
| Erosion of: | bed | left bank | right bank | headcut | Pipe outles 6'drop |
| Apparent rate of Erosi | on: | stable | Slow change | | ······································ |
| | | Risks | (Check Appl | 0 | (<u>Alexandre</u> l) |
| | | None | Private | Public | Creates Unsafe Condition |
| Bank Stability | | | <u> </u> | | |
| Upper Slope Stability | | | ~~ | | |
| | | | <u></u> | • <u>••••</u> •• | |
| Sediment source Habitat destruction | | | | | |
| Threatens home | | · | 222 | | |
| Threatens other structur | е | 1212 | | | |
| Threatens private road/c | | ~ | | | ···· |
| Threatens infrastructure | · | <u> </u> | | | |
| Threatens public road | | | | | |
| Risk to Homes: | Horiz (ft) | Vert (ft) | | Address | Apparent Hazard |
| No risk | 100' | 30' | 4680 9 | 115 Avenue SA | <u>Low</u> Med High |
| Construction Access: Potential Reduction in | yes | Solutions No | - Conventional Conventional | straight line) | |
| Restoration of construe | ction acces | s: | Native | Landscaped | 720 LF |
| | protection | | | _LF ' | |
| Bypass | Pipe | | 75-100 | LF | |
| Check of | lams | | | LF | |
| | I restoration | | 7 | LF | |
| Channe | residiation | | | | |
| | restoration | • | | LF | |
| | | | | _LF | |
| Stream Other | | pro | blem a | - | nTlet. INSTAIL |
| Stream Other | restoration | | blem at | T pipe 0 | |
| Stream Other Large Scele | restoration erosion er cn | | | T pipe O or at outle | T. Mapped as |
| Stream Other Large Scele Gabior BASK | erosion erosion er en on s chan | ersy d | | T Pipe O or as Outle Actornative | T. Mapped as |



Subbasin 505

Problem No. 5061 By: J. Bjork 12/8/05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | <u>Undetermine</u> d slide | |
|-------------------------------|----------|---------------------------------------|---|------------------------------|----------------|-------------|--|---|
| Flow Today: | | <u>50 g</u> pm | cfs | | | | nt 0-1% 2-5% 5-10%>10% <i>30 7</i> | . |
| Bank Vegetation | n type: | | Native, | Invasive | Lands | | | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ |
| Bank Vegetatior | n qualit | y: | Excellen | | Fa | · · | Poor | |
| Aquatic Habitat: | | - | Excellen | designation of . | _Fa | | Poor | |
| Proximity to Dra | inage (| Outfalls: | | /downstream | | 24' | CMP RCP PVC CPEP STeel | |
| Erosion of: | - | bed | left bank | right bank | headcut | <i>L</i> | <u>none</u> | |
| Apparent rate of | Erosio | n: | stable | Slow chang | | change | | |
| | | | Risks | (Check App | | change | Rapid change | |
| | | | None | Private | Pub | olic | Creates Unsafe Condition | |
| Bank Stability | | | 1- | | | | | |
| Upper Slope Stab Landslide | ility | | | | | | ······································ | |
| Sediment source | | | | | | | | |
| Habitat destruction | n | | | | | | | |
| Threatens home | | | < 2 1 1 1 1 2 1 X 1 X 1 X 1 X 1 X 1 X 1 X | | | | | |
| Threatens other s | tructure |) | | · | | | All and a strained | |
| Threatens private | | | ~ | | <u> </u> | | | |
| Threatens infrastr | | • | ~ | | <u> </u> | | | |
| Threatens public r | oad | | ~ | | | | | |
| Risk to Homes: | | Horiz (ft) | Vert (ft) | | Address | | Apparent Hazard | |
| No risk | | | | | | | Low Med High | |
| | | | | | | | Low Med High | |
| | | 9 | Solution | <u>s</u> | | | | |
| Complexed and b | | yes | No | | | | | |
| Construction Acc | ess: | | | Conventiona | Equipment to | site | | |
| | | | | Conventiona | l Equipment do | wn ravin | 9 | |
| | | · · · · · · · · · · · · · · · · · · · | | Conventiona Crane (less t | Equipment to | top of rav | vine | |
| | | | | Cable Way (| | | | |
| | | | | Small equipn | | | | |
| _ | | | | Chute/skid | | | | |
| Potential Reduction | on in O | &M costs (| <u>Von</u> e | Small | Moderate | | Significant | |
| Restoration of co | | | : | <u>Native</u> | Landscaped | | LF | |
| | | otection | | | _LF | | | |
| • | /pass P | • | | ····· | _LF | | | |
| | neck da | | | | _LF | | | |
| | | restoration | | | _LF | | · . | |
| St | ream re | storation | _ | | LF | | | |
| Ot | her | | | | - | | | |
| Channel | don | INSTREAM | of | Ontle) | T drups | acros | is Quarry | |
| spalls at | - h | Gradien | T of | about | | Then | flattens Out | |
| • | TCAL | M.I. | | | 2-3% | | | |
| althou | 12 | more | gnard | | | | | |
| Potential Monitori | | | | No dowr | | OKS | ok. helpful. Channel | |

<u>Subbasin 506</u>

Problem No. 506. 3 By: J. Bjork 12/8/06

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill Un | determined | alida | |
|----------------------------------|------------|--------------|-----------------|---|--|--|-----------------|---------------|-----|
| Flow Today: | | dry g | pmcfs | . A | Approx. Channel G | | | slide | 0 % |
| Bank Vegetat | ion type: | - | Nativ | | | | /0 2-0 /0 0-107 | %×10% 10=5 | |
| Bank Vegetat | ion quali | ty: | Excelle | | | Po | or | | |
| Aquatic Habit | at: | | Excelle | | Fair | Po | | | |
| Proximity to D |)rainage | Outfalls: | ft. u | p/downstream | | | - | | |
| Erosion of: | | bed | left ban | | | CM | P RCP PVC CPE | 2 | |
| Apparent rate | of Erosic | on: | stable | Slow chan | | | | | |
| | | | Risk | | • | lange Ra | pid change | | |
| | | | None | | | Cre | ates Unsafe Co | o in d141 o u | |
| Bank Stability Upper Slope St | | | | | | | ales Unsale Ci | Sugaron | |
| Upper Slope St Landslide | ability - | Not er | | | <u> </u> | | | | |
| Sediment source | <u> </u> | | | | · | | | | |
| Habitat destruc | | | | | | | | | |
| Threatens hom | | | | • | | | <u> </u> | | |
| Threatens othe | | | | · | | | | | |
| Threatens priva | te road/d | riveway | | | | | | | |
| Threatens infra | | | | | · · · · · · · · · · · · · · · · · · · | | | | |
| Threatens publi Risk to Homes | c road | | | | | | | | |
| | | Horiz (ft | :) Vert (ft |) | Address | Арр | arent Hazard | | |
| No risk_ 🗸 | · - | | | | | Low | Med High | | |
| | - | | 010 | • | | Low | Med High | | |
| | | | <u>Solution</u> | ns | | | | | |
| Construction A | CCess: | yes | No | Convention | at the second second | | | | |
| | | | | _ Convention | al Equipment to site | e | | | |
| | | | | Convention | al Equipment down al Equipment to top | i ravine | | | |
| | | | | _ Crane (less | than 200') | o lavine | | | |
| | | | | | (straight line) | | | | |
| | | | | _ Small equip | ment | | | | |
| Potential Reduc | tion in C | 0.14 4 | | Chute/skid | | | | | |
| Restoration of | construct | tion acco | s <u>None</u> | Small | Moderate | | ficant | | |
| | Outfall pr | | 33. | Native | Landscaped | N | <u>A</u> LF | | |
| | Bypass P | | | | | | | | |
| | Check da | • | | | | | | | |
| | Channel | | n | | LF | | | | |
| | Stream re | | | | | | | | |
| | Other | 5001 411011 | | | LF | | | | |
| | | | | | | | | | |
| No Contribut | • • • | , , | 5 | | | the second s | ed Slupes | 70 | |
| | Lill | (nom | | | lected in M | ew dra | linnge S. | STCM | |
| M . (| STCM | flow - | | A | ing risk o | | ability | 1s. | |
| Potential Monito | ring Site | <u>Teepn</u> | | - Slope | and prob. | | PAL FIL. | | |
| | ning site | • | Yes | <u>No</u> | • | | | | |

Subbasin 50C

Problem No. 50C1 By: J. Bjork 12/14 / 05

Site Conditions

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium fi | ll <u>Undetermine</u> d slide |
|--------------------------|---------|-------------|-------------|---|-------------------|-----------------------------------|
| Flow Today: | | 570 gpm | cfs | Ap | | dient 0-1% 2-5% 5-10%>10% |
| Bank Vegetation | n type: | | Native | Invasive | Landscaped | |
| Bank Vegetation | | tv: | Excellen | | Fair | |
| Aquatic Habitat: | | • | Excellen | | Fair | Poor |
| Proximity to Dra | | Outfalls | | /downstream | 12"+12" | Poor |
| Erosion of: | | bed | left bank | | | |
| Apparent rate of | Frasi | | stable | right bank | headcut | |
| · pparone rate of | LIUSK | /11. | Risks | Slow change | | ge Rapid change |
| | | | None | (Check Appli | | _ |
| Bank Stability | | | None | Private | Public Low | Creates Unsafe Condition |
| Upper Slope Stab | oility | | · / | | | |
| Landslide | , | | ~ | - | | ································· |
| Sediment source | | | | | Low | |
| Habitat destructio | n | | | | LOW | |
| Threatens home | | | ~ | | | |
| Threatens other s | | - | | | | |
| Threatens private | road/d | riveway | | • <u>•</u> •••••••••••••••••••••••••••••••••• | | |
| Threatens infrastr | | | 112 | | | |
| Threatens public I | oad | 11-1-1-100 | | | | |
| Risk to Homes: | | Horiz (ft) | Vert (ft) | | Address | Apparent Hazard |
| No risk | - | | ····· | | | Low Med High |
| | - | | | | | Low Med High |
| | | 5 | Solution | <u>5</u> | | |
| Construction 1 | | yes | No | | | |
| Construction Acc | cess: | <u> </u> | | Conventional | Equipment to site | |
| • | | | · | Conventional | vine | |
| | | <u>K</u> | | Conventional | ravine | |
| | | <u> </u> | | Crane (less th | | |
| | | | | Cable Way (s | | |
| | | ~ | | Small equipm Chute/skid | en | |
| Potential Reducti | on in C | &M costs I | None | Small | Moderate | Significant |
| Restoration of co | nstruc | tion access | : | Native | Landscaped | Significant |
| | | otection | | ð | LF | OLF |
| B | ypass F | Pipe | • | | LF | |
| С | heck da | ams | | ······································ | LF | |
| C | hannel | restoration | | | LF | |
| | | estoration | - | | LF | |
| | ther | | - | ····=······ | | |
| Guarry | SPA | 110 Ale | / | 1 00 | | |
| | | | <u>c</u> ed | for Ma | st of ou | Tlet area. About |
| <u> </u> | Moy | - 1120 | ded. | | ····· | |
| | | | | | | |
| Potential Monitori | na 01/- | | | | · | |
| | ng Site | e: Y | es | No | | |

Potential Monitoring Site:

Subbasin 50C

Problem No.50C.2 By: J. Bjork 12/18 105

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill Undetermined slide |
|------------------------------------|----------------|--------------|-----------------|---|--|---------------------------------|
| Flow Today: | | <u>0 g</u> p | mcfs | An | | adient 0-1% 2-5% 5-10%>10% |
| Bank Vegetat | ion type: | | Native | Invasive | Landscape | |
| Bank Vegetat | ion quali | ty: | Excellen | | Fair | • |
| Aquatic Habit | | - | Excellen | | Fair | Poor |
| Proximity to [| Drainage | Outfalls: | | /downstream | Fail | Roor |
| Erosion of: | | bed | left bank | right bank | beedeut | CMP RCP PVC CPEP |
| Apparent rate | of Erosi | | stable | Slow change | headcut | |
| •• | | 5111 | <u>Risks</u> | (Check Appl | | nge Rapid change |
| | | | None | Private | Public | |
| Bank Stability | | | Home | Theate | Public | Creates Unsafe Condition |
| Upper Slope St | tability | | | - | | |
| Landslide | | | | | | |
| Sediment source | | | Ar-A | | ······································ | |
| Habitat destruc | | | N <u>T</u> | | | |
| Threatens hom | - | | | | | |
| Threatens othe | | | | | | |
| Threatens priva Threatens infra | | riveway | | | | |
| Threatens publi | | | | | | |
| Risk to Homes | | Horiz (ft) | Vort (ft) | | | |
| No risk | • | | Vert (ft) | | Address | Apparent Hazard |
| | | | NA | | | Low Med High |
| Construction A | ccess: | yes | Solutions No | - Conventional | Equipment to site | Low Med High |
| | | /y | | Conventional Crane (less the Cable Way (s | traight line) | avine f ravine |
| | | *······ | | Small equipm | ent | |
| Potential Reduc | ction in C | 8M coste | | Chute/skid Small | Madarat | |
| Restoration of | construc | tion acces | | Native | Moderate Landscaped | Significant |
| | Outfall pr | | •• | | LF | LF |
| | Bypass F | | • - | -/V/+ | _LF | |
| | Check da | • | - | ······································ | LF | |
| | | restoration | - | | - | |
| | | estoration | - | | LF | |
| | | 25101211011 | - | | LF | |
| | | | | | | |
| n | Other | | 7 | | | · · · · · |
| Problem e | limin | | by Inst | alletion | of pipe 5 | 45Ten and Home |
| Δ | limin | | 7 | | ot pipe 5 | ystem and Home |
| Problem e | limin | | | | ot pipe 5 | ystem and Home |
| Problem e | limino 5 En | st Men | | | ot pipe s | ystem and Home |

Subbasin 50C

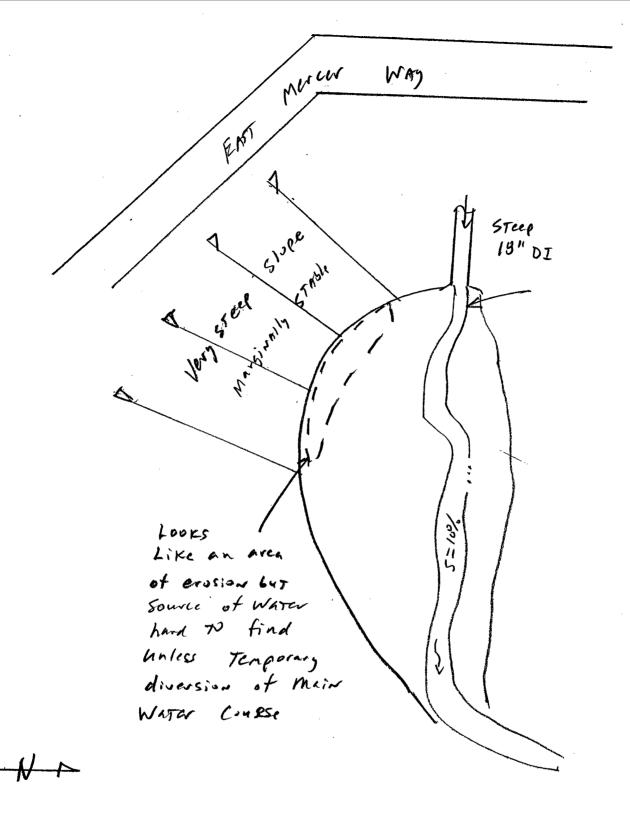
Problem No. 50C. 3 By: J. Bjork 12/19/05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill (| Undetermined | - 13-4 |
|----------------------------------|------------|-------------|-----------|-------------|--|----------|---------------------------------------|-----------|
| Flow Today: | | • | cfs | | Approx. Channel G | - | | slide |
| Bank Vegetat | ion type: | | Native | Invasiv | e Landscap | | 5-1% 2-5% 5-1 | 0%>10% |
| Bank Vegetat | ion quali | ty: | Excellen | | Fair | • | | |
| Aquatic Habit | at: | • | Excellen | | Fair | | Poor | |
| Proximity to [| Drainage | Outfalls: | | /downstrear | | - | <u>200</u> r | |
| Erosion of: | • | bed | left bank | right bank | the second s | | MP RCP PVC CF | EP |
| Apparent rate | of Erosid | on: | stable | Slow chan | | | · · · · · · · · · · · · · · · · · · · | |
| | | | Risks | (Check Ap | | ange R | Rapid change | |
| • | • | | None | Private | | 0 | Creates Unsafe | Condition |
| Bank Stability | | | N | A | | . 0 | neales offsale | Condition |
| Upper Slope S Landslide | tability | | <u> </u> | | | , | · | |
| Sediment source | 20 | | <u> </u> | | · | | | |
| Habitat destruc | | | <u></u> | | | | | |
| Threatens hom | | | | · | | | | |
| Threatens othe | | | | | *********** | | | |
| Threatens priva | ate road/d | riveway | | | | | | |
| Threatens infra | | | <u> </u> | | | | | |
| Threatens publi Risk to Homes | | 11.1.100 | | · | · · · · · · · · · · · · · · · · · · · | | | |
| | 5 | Horiz (ft) | Vert (ft) | | Address | Ar | pparent Hazar | d |
| No risk | | | | | | Lo | w Med High | 1 |
| | - | | | | | Lo | w Med High | I |
| | | | Solutions | 2 | | | - | |
| Construction | locase. | NA | No | 0 | | | | |
| | 100033. | <u> </u> | | Convention | al Equipment to site | Э. | | |
| | | | | Convention | al Equipment down al Equipment to top | ravine | | |
| | • | | | Crane (less | than 200') | orravine | | |
| • | | | | | (straight line) | | | |
| | | | | Small equip | | | | |
| Potential Redu | ofion in C | | | Chute/skid | | | | |
| Restoration of | construct | tion accore | | Small | Moderate | Sig | nificant | |
| | Outfall pr | | • | Native | Landscaped LF | | <u> 6 </u> LF | 1 |
| • | Bypass F | | - | NIA | ^{LF} | | | |
| | Check da | • | - | | ^L F | | | |
| | | restoration | - | | LF | | | |
| | | estoration | - | | | | • . | |
| | Other | | - | ······ | | | | |
| Erosion Pros. | | | 1 | - 11 - | | | • | |
| | En Ch | MINK) CA | og /1) | DA HATION | of pipe sy | sten a | along long | driveway. |
| reported | in arc | ELA | ung w | | et inspire | | indy soil | Slide |
| | channi | | | | has created | MUL | | egular |
| Potential Monito | oring Site | $rac{1}{2}$ | | Prosle | n area bu | 5 107 | tor en | ~ or sc. |
| | | | | | | | | |

<u>Subbasin</u> 519

Problem No. 5/a. | By: J. Bjork 12/14 / 05

| Geology: | Qtb | Qva | Qvt | Qvr | Colluvium | fill | Lindata | | |
|--|---------|-------------|---------------------------------------|---|---------------------------------------|-----------|------------|----------------|---|
| Flow Today: | | Idb | n <u>1/2 cfs</u> | | | | Undeterm | ined | slide |
| Bank Vegetation | ı type | : | Native | e Invasivo | pprox. Channe | Gradient | 0-1% 2-59 | % <u>5-10%</u> | <u>}10%</u> |
| Bank Vegetation | | | Excelle | | | · · | | | |
| Aquatic Habitat: | - | | Excelle | | Fa | | Poor | | |
| Proximity to Dra | | Outfalls: | | p/downstream | . Fa | | Poor | | |
| Erosion of: | | bed | l <u>eft ba</u> nk | | | 18 " | CMP RCP P | VC CPEP | DI |
| Apparent rate of | Erosi | | stable | The second se | headcut | | | | |
| | | | <u>Risks</u> | Slow chan | | change | Rapid cha | nge | |
| | · | | None | Check Ap | • | | | | |
| Bank Stability | | | none | Filvale | Pub | lic | Creates Ur | isafe Con | dition |
| Upper Slope Stabi | ility | | | | | ~ | - | | |
| Landslide | | | | 1111 | | | - | · | |
| Sediment source | | | | V | | | | | |
| Habitat destruction | 1 | | | ~ | | | | | |
| Threatens home Threatens other st | | | _ <u>r</u> _ | | | | | | |
| Threatens private | | | | | | | - | | |
| Threatens infrastru | icture | nveway | | | | | | | |
| Threatens public ro | nad | | <u> </u> | | | _ | | | |
| Risk to Homes: | | Horiz (ft) | Vert (ft) | | × | | | | |
| No risk_ | | | vort (it) | | Address | | Apparent H | | |
| | • | | · · · · · · · · · · · · · · · · · · · | | | | ow Med | - | |
| | | | Solution | ~ | · · · · · · · · · · · · · · · · · · · | L | ow Med | High | |
| | | yes | Solution No | 5 | | | | | |
| Construction Acc | ess: | yes | INO | Convention | | | | | |
| | | v | | Conventiona | al Equipment to | site | | | |
| | | | | Conventiona | al Equipment do al Equipment to t | wn ravine | _ | | |
| | | ~ | | Crane (less | than 200') | | 3 | | |
| | | <u> </u> | | Cable Way (| (straight line) | | | | |
| | | | | Small equipr | nent | | | | |
| Potential Deduction | | | | Chute/skid | | | | | |
| Potential Reductio Restoration of con | on in C | J&M Costs | None | Small | Moderate | Si | gnificant | | |
| | | rotection | 5: | Native | Landscaped | | 150 | LF | |
| - | bass F | | | | | | | | |
| | eck da | • | | | _LF | | | | |
| | | restoration | | 50 | _LF | | | | |
| | | | | _LF | | | | | |
| | | estoration | | | _LF | | | | |
| Oth | | | | | | | | | |
| Minor cross | | AT OU | TFAI1 | ot 1-2' | Step Cro | deble | Chiane | : / WIT | 2 [^] |
| | 500 | | K Whi | clis s | teep and | MARCE | iNAlla | STALL | A. |
| DOWNSTream of | _ | re is i | 50 LF | of LOW | INTENSITY 6 | rosion | Consa | le sella | <i>تـــ</i> ـــــــــــــــــــــــــــــــــ |
| Sand in C | han | el . MP | strenm | <u>Slide</u> | Mappel | Chann | | Inn! | <u> </u> |
| Potential Monitorin | g Site | e: Y | es | No ups: | Tream of | E.M.W. | 15 01 | 100 | |
| | | | | • | | | | - J. | |



Prublem 51C, 1 JCB

Mercer Island Comprensive Drainage Plan- Field Reconnaissance

Subbasin 52

Problem No. 52.1 By: J. Bjork 12/14/05

Site Conditions

| Geology: | Qtb | <u>Qva</u> | Qvt | Qvr | <u>Colluvium</u> | fill | Indotormina | |
|------------------------------------|---------------------|-----------------|--------------|--|--------------------|-------------|--|-------------------|
| Flow Today: | | <u>.01 g</u> pr | ncfs | Δ | | | Undetermine | d slide |
| Bank Vegetati | on type | | Native | e Invasivo | pprox. Channel | Glaulei | 11 0-1% 2-5% 5 | - <u>10%</u> >10% |
| Bank Vegetati | on qual | ity: | Excelle | introlont | | · · | | |
| Aquatic Habita | | • | Excelle | | Fair | | Poor | |
| Proximity to D | | Outfalls | | | Fair | | Poor | |
| Erosion of: | | bed | left bank | p/downstream | | 8 | CMP RCP PVC | CPEP |
| Apparent rate | of Frasi | | stable | and the second sec | headcut | | ······································ | |
| | | 011. | <u>Risks</u> | Slow chang | | hange | Rapid change |) |
| | | | None | • • | | | | |
| Bank Stability | | | None | Private | 1 451 | - | Creates Unsa | fe Condition |
| Upper Slope Sta | ability | | | | | | | |
| Landslide | - | | | | | - | | · |
| Sediment sourc | | | | | | | | |
| Habitat destruct | | | | | | - | | |
| Threatens home | | | _ <u>_</u> _ | | | | | |
| Threatens other | | | | | · | - | | |
| Threatens privat | e road/d | riveway | <u></u> | | | - | | |
| Threatens infras | | | | | | - | | |
| Threatens public Risk to Homes: | ; road | | Long | | | - | ······ | · |
| | | Horiz (ft) | Vert (ft) | | Address | _ | Apparent Haz | ard |
| No risk | - | | | | | | Low Med Hi | |
| | - | | | | | | Low Med Hi | - |
| | | 5 | Solution | S | | | | gn |
| Comptendent | | yes | No | | | | | |
| Construction A | ccess: | | | Conventiona | al Equipment to si | ite | | |
| | | | | Conventiona | I Equipment dow | n ravine | | |
| | | -K | | Conventiona | I Equipment to to | p of ravi | ne | |
| | | <u>`</u> | | Crane (less | than 200') | | | |
| | | | · | Cable Way (| straight line) | | | |
| | | | | Small equipr Chute/skid | nent | | | |
| Potential Reduc | tion in C | 0&M costs | Vone | Small | Madauata | | | |
| Restoration of c | onstruc | tion access | : | Native | Moderate | | Significant | |
| | | otection | | Nuavo | Landscaped | - | 50 | _F . |
| | Bypass F | | | | ' LF | | | |
| | Check da | • | | 150 | - | | | |
| C | Channel | restoration | | | - ' | • | | |
| | | estoration | | 150 | | | | |
| | Other | 53101211011 | | ······ | _LF | | | |
| | | / . | | | ····· | | | |
| erosion of | | hel 2 | | Allel T | | Rapid | bed and | bank |
| 7.75' of here | 1 over | 121 01 | P da | NIGTL Z | 4' TOP W | idn | 3-7' dee | e). only |
| AMCA ADVIAN | | | | R S J M A C | ~ ~ ` ~ ' | - I among | ~ / | |
| Juse Dies | Toonin | turne. | 1 # 417 | STOPA S | O Minor 1 | <u>n/c)</u> | Clossing M | iould |
| Potential Monitor | Topp in ing Site | 1. 1. 110 | | 14 E.M.V No | V. Steep gr | ound | Slope N | iould |

Appendix F TV INVESTIGATIONS (BY CITY)





MERCER ISLAND TURN-IN 01-09-06 STORM

MAP SHEET A1---SITES 1-4 MAP SHEET A3---SITES 1-19 MAP SHEET B1---SITES 1-7 MAP SHEET B2---SITES 1-13 MAP SHEET B4---SITES 1-2 MAP SHEET C3---SITES 1-2 MAP SHEET F3---SITES 1-5 MAP SHEET F5---SITES 1-2 MAP SHEET H2---SITES 1-2 MAP SHEET H3---SITES 1-2 MAP SHEET I3---SITES 1-2 MAP SHEET I3---SITES 1-2 MAP SHEET I3---SITES 1-2 MAP SHEET I3---SITES 1-2



DATE

-



Pro-Vac/Gary's Tele Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

Site Data for Project: Mercer Island-SD-A1

| | Site ID's | City | | fp Stree | t | Date | Time |
|----|--------------|---------------|------------|---------------|-----------------|------------|----------------|
| ΙC | | Mercer Island | | GOTH AV S & S | E22THST | 09/12/2005 | 11:24:15 AM |
| | M.H. Start | | М.Н. : | Stop | M.H. Depth | Starting D | ist Final Dist |
| | | | OPE | PIPE. | | 6.0 | +131.9 |
| | Type of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Condit | tion O | perator |
| | CONC | 12 | 3 | Áway-D | Gravel Shoulder | Jerry Hya | att |
| | | | - | Comment | . | | |
| | | WITH | THE FLOW-S | TORM DRAINAGE | MAP SHEET | | AT CARL |
| | | | | | | | |

| Obs IQ | Ft. | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID VidID TapeCnt |
|--------|-------|-------|----------------|------------------|---------------------------------------|---------|--------|--------|-----------------------|
| 1-52 | 0 | | Other | Downstream CB | | | | | 43.96 02.05:45 |
| 2 | 32.2 | | Service Corin. | Service top | · · · · · · · · · · · · · · · · · · · | | | | 119.75 |
| | 32.2* | | Service Conn. | Protructing 6"+ | | | | | 148.93 |
| | 131.9 | | Other | Open Pipe | | | ė- | | 320.59 |





cell 20 Site Data for Project: Mercer Island-SD-A1

| Site ID | Gĩty | | Street | | Date | Time |
|------------|---------------------------------------|----------------------|---------------|-----------------|--|-----------------|
| 2 | Mercer Island | | 601H AV S & S | E 22TH ST | 09/12/2005 | 01:53:54 PM |
| M.H | I. Start | м.н. : | Stop | M.H. Depth | Starting | Dist Final Dist |
| | 2 | OPEI | N PIPE |] | 6.0 | +110.0 |
| Type of Pi | pe Pipe Size(| n) Sec. Igth | Direction | Surface Cond | lition | Operator |
| ACMP | 12 | 10 | Away-U | Gravel Shoulder | Jerry H | yatt |
| | | | Comment | | | nd. salit |
| | • • • • • • • • • • • • • • • • • • • | WNST THE FLOW | STORM DRAINAG | E-MAP SHEET A1 | ······································ | |
| | | | | | | |

Observation Data

| OSID Ft | Lat Ft Ca | tegory Category Detail | s ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---------|-----------|------------------------|------------|---------|--------|--------|---------|---------------------------------------|----------|
| P | Other | Downstream CB | | | | | 21.20 | | 02:10:59 |
| 2 100,0 | Other | CMP TO CIP | | | | | 216.55 | | |
| 110.0 | Pipe Prot | Hem Ovaled | | 10% | | | 280.60 | e e e e e e e e e e e e e e e e e e e | N |
| 110.0 | Other | end/inspection | | | | | 304.45 | | |



Site Data for Project: Mercer Island-SD-A1

| City | | Street | Date | Time | |
|-----------------|--|----------------|--|--|---|
| Mercer Island | | 60TH AV S & SE | | 09/12/2005 | 02:16:23 PM |
| rt | M.H. St | ор | M.H. Depth | Startin | g Dist_Final Dist |
| · · · · | 1 | | • | 6. | 0 +38.1 |
| Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| 12 | 10 | Away-D | Gravel Shoulder | Jerry | / Hyatt |
| · · · | | Comment | | | |
| \ <u>\</u> //TL | THE ELOWLST | ORM DRAINAGE | MAP SHEET A1 | | · |
| | Mercer Island rt Pipe Size(in) 12 | Mercer Island | Mercer Island 60TH AV S & S rt M.H. Stop 1 Pipe Size(in) Sec. Igth Direction 12 10 Away-D Comment | Mercer Island 60TH AV S & SE 22TH ST rt M.H. Stop M.H. Depth 1 1 Pipe Size(in) Sec. Igth Direction Surface Conc 12 10 Away-D Gravel Shoulder | Mercer Island 60TH AV S & SE 22TH ST 09/12/2005 rt M.H. Stop M.H. Depth Startin 1 6. Pipe Size(in) Sec. Igth Direction Surface Condition 12 10 Away-D Gravel Shoulder Jerry Comment Comment Comment Comment |

Observation Data

| · Obs ID | Ft | Lat F | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidiD | TapeCnt |
|----------|------|-------|----------|---|--|---------|--------|--------|---------|-------|------------|
| | o | | Other | Upstream CB | | | | | 9.15 | | 02:16:36 |
| 2 | 38.1 | | Other | Downstream CB | · . | | - | | 79.95 | | |
| 2 | | | | * · · · · · · · · · · · · · · · · · · · | ······································ | L | | | | | - - |

Nell



Pro-Vac/Gary's Tele-Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

Site Data for Project: Mercer Island-SD-A1

| Site ID | | City | | Stree | et | Date | Time | |
|-----------|----------|---------------|--------------|----------------------|-----------------|--------------|---------------|--|
| 4 | | Mercer Island | | 60TH AV \$ & | SE 22TH ST | 09/12/2005 | 02:27:05 PM | |
| М. | H. Start | | т.н. е | Stop | M.H. Depti | h Starting D | ist Final Dis | |
| 1 | | | QPEN | I PIPE | | 6.0 | +51.9 | |
| Type of P | ipe | Pipe Size(in) | Sec. lgth | Direction | Surface Con | dition C | perator | |
| CONC | | 12 | - 10 | Away-D | Gravel Shoulder | Jerry Hy | att | |
| | | | | Comment | | | | |
| | | WIT | H THE FLOW-S | FORM DRAINAGE | MAP SHEETA1 | | | |

Observation Data

| Obs ID | Ft Lat F | t Category | Category Details | ClockPos | Sevr Ly | Ph1 10 | Ph2.ID | VclipID | VidID | TapeCnt |
|--------|----------|--------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| | 0 | Other | Upstream CB | | | | | 26.87 | | 02 18 18 |
| 2 | 51.9 | Pipe Problem | debris | | HEAVY | | | 152.49 | | |

Site Data for Project: Mercer Island-SD-A3

| | Site ID | City | | Stree | Date | Time | |
|---|--------------|---------------|---------------|--------------|----------------|--|-----------------|
| | 1 | Mercer Island | | 2222 80TH | AV SE | 09/07/2005 | 12:22:54 PM |
|] | M.H. Start | | M.H. SI | ор | M.H. Dep | oth Starting E |)ist Final Dist |
| | CB 33 | | CB | 35 | | 6.0 | 35.1 |
| | Type of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Co | ondition C | Operator |
| | CONC | 12 | 3 | Away-U | Yard | Jerry Hy | att |
| | | | | Comment | | • | |
| | | AGAIN | ST THE FLOW-S | TORM DRAINAG | E-MAP SHEET A3 | | iner. |
| L | ····· | | | | 9 3 94 | ······································ | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|------|--------|------|-------|---------------|-------------------------|----------|---------|--------|--------|---------|-------|----------|
| ÷ | 1 | 0 | | Other | Downstream CB | | | | | 71.70 | | 01:37:29 |
| | 2 | 8.0 | | Root Problem | begin roots | | MEDIUM | | | 118.59 | | |
| • |). | 22.4 | | Pipe Problem | debris | | MEDIUM | | | 349.06 | | |
| er - | 4 | 35.1 | | Sérvice Conn. | LEFT | | | | | 490.60 | | |
| | 5 | 35.1 | | Root Problem | Heavy | | | | | 657.72 | | |
| | 6 | 35.1 | | Other | CAN'T COMPLETE | | | | | 669.25 | | |

war et one



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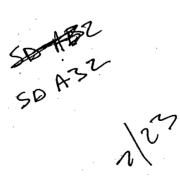
Pro-Vac/Gary's Tele-Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

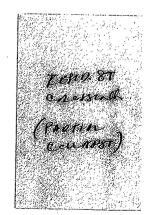
Site Data for Project: Mercer Island-SD-A3

| | Site ID | | City | · | Stree | t | Dat | te | Time |
|---|-----------|---------------|---------------|---------------------|--------------|---------------------------------------|-------------|-------------|--------------|
| | 2 | Mercer Island | | | 2227 80TH | I AV SE | 09/07/2005 | | 01:02:41 PM |
| | M.1 | H. Start | | M.H. S | top | M.H. Depth | Sta | Inting Dist | t Final Dist |
| | | 37 | | 36 | |][| | 6.0 | 20.6 |
| l | Type of P | ipe | Pipe Size(in) | Sec. Igth Direction | | Surface Cond | fition Oper | | erator |
| | CONC | | 12 | 3 | Away-U | Paved Asphalt | | Jerry Hyatt | |
| | | | | • | Comment | | | | |
| | | | AGAINS | ST THE FLOW-S | TORM DRAINAG | E-MAP SHEET A3 | | | |
| L | | | | | | · · · · · · · · · · · · · · · · · · · | | | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|-----|--------|------|-------|-------------------|--------------------|----------|---------|----------|----------|---------|----------|----------|
| | 1 | 0 | | Other | Downstream CB | | | | | 30.84 | | 01:49:39 |
| Ì | 2 | 10.6 | | Other | PIPE CURVES LT | | | 2 | | 61.13 | · · · | |
| | | 11.7 | | Other | OLD REPAIR | 02/04 | | | | 141.24 | | |
| . , | | 11.7 | | Pipe Problem | Longit Crack | N. | MEDIUM | · · · | | 295.43 | | - |
| | 5 | 14.3 | | Pipe Problem | Order States and | | HEAVY | | 1 M | 345.41 | | |
| | 6. | 14.4 | · | | SOILAVISIDIT | | | ON | | 415.60 | | ···· |
| | 7 | 14.8 | | Coeladdenb, 12 es | Diald States State | | MEDICIM | | <u> </u> | 459.96 | | |
| | 8 | 19.2 | : | Pipe Problem | possible sag | | | <u> </u> | | 574.73 | <u>`</u> | |
| | 9 | 20.6 | | Other | CAN'T COMPLETE | | | | | 826.84 | | 1 |







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Pro-Vac/Gary's Tele-Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

Site Data for Project: Mercer Island-SD-A3

| Site ID | | City | | Street | | Date | Time |
|------------|------------------------|---------------------------------------|--|--|---|--|---|
| 3 | Ĺ | Mercer Island | | 2227 80TH | AV SE | 09/07/2005 | 01:21:14 PM |
| M.F | I. Start | · . | M.H. S | top | M.H. Depth | Starting I | Dist Final Dist |
| | 37 | | OPEN | PIPE |][| 6.0 | +45.2 |
| Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition (| Operator |
| CONC | · | 12 | 3 | Away-D | Paved Asphalt | Jerry Hy | ratt |
| | | | | Comment | | | |
| , | | WITH | THE ELOW-STO | ORM DRAINAGE | MAP SHEET A3 | · · · · · · · · · · · · · · · · · · · | |
| | 3 M.F Type of Pi | 3 M.H. Start 37 Type of Pipe | 3 Mercer Island M.H. Start 37 37 | 3 Mercer Island M.H. Start M.H. Start 37 OPEN Type of Pipe Pipe Size(in) Sec. Igth CONC 12 | 3 Mercer Island 2227 80TH M.H. Start M.H. Stop 37 OPEN PIPE Type of Pipe Pipe Size(in) Sec. Igth Direction CONC 12 3 Away-D Comment | 3 Mercer Island 2227 80TH AV SE M.H. Start M.H. Stop M.H. Depth 37 OPEN PIPE | 3 Mercer Island 2227 80TH AV SE 09/07/2005 M.H. Start M.H. Stop M.H. Depth Starting I 37 OPEN PIPE 6.0 Type of Pipe Pipe Size(in) Sec. Igth Direction CONC 12 3 Away-D Paved Asphalt Jerry Hy Comment |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|-------|------------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | 0 | | Other | Upstream CB | | | | | 17.15 | | 02:01:47 |
| 2 | 29.7 | | Root Problem | begin roots | | LIGHT | | · · | 76.08 | | |
| | 44.5 | | doint Dirich and | 3'-6" | | HEAVY | | | 148.76 | | |
| | 44.5 | | Joint Problem | SOIL VISIBLE | | | | | 165.38 | | |
| 5 | 45.2 | | Other · | CAN'T COMPLETE | | | | | 235.09 | · · | |



Site Data for Project: Mercer Island-SD-A3-2

| Site ID | | City | | Street | t | Date | Time |
|---------------------------------------|------------|---------------------------------------|--|---------------|-----------------|--|--|
| 4 | | MERCER ISLAND | | 2227 80TH | AV SE | 01/08/2006 | 6 02:06:34 PM |
| N | I.H. Start | t | M.H. S | itop | M.H. Depth | ı Startir | ng Dist Final Dist |
| | 1 | | U/ | /S |] | 7. | |
| Type of | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| Concre | ete | 12 | 3 | Away-U | Gravel Shoulder | Jerry | y Hyatt |
| · · · · · · · · · · · · · · · · · · · | | · · | • | Comment | | ····· | · · · · |
| | | AGAIN | ST THE FLOW-S | STORM DRAINAG | E-MAP SHEET A3 | ************************************** | |
| · · · | | · · · · · · · · · · · · · · · · · · · | ······································ | | | | <u>`````````````````````````````````</u> |

| Obs ID | Ft | LatF | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|---------|---------|
| 1 ` | 0 | 1.2 | Other | Downstream CB | | | | | | | |
| 2 | 2022 | | loint-Problem | OFFSEISSIE | | LARGE | | | | | |
| | | 2260a | | | | CARCES | | | | | · |
| | 7.5 | . 5°2 | Pipe Problem | FULL OF ROCKS | | | | | · | <u></u> | |





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PRO-VAC 6622 112th ST E Puyallup, WA 98373 Cell#206-423-2445 Office#253-435-4328

Site Data for Project: Mercer Island-SD-A3-2

| Site ID | | City | | Stree | t | Da | te | Time |
|-----------|----------|----------------------|---------------|---------------------------------------|-----------------|--------|-------------|--------------|
| 5 | N | IERCER ISLAND | | 7638 SE 22 | 2ND ST | 01/08/ | 2006 | 02:19:47 PM |
| . M.I | H. Start | | M.H. S | top | M.H. Depth | Sta | arting Dis | t Final Dist |
| | 2 |][| 7 | · · · · · · · · · · · · · · · · · · · | | | 7.0 | 95.7 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Ope | erator |
| Concret | e | 12 | 3 | Away-U | Gravel Shoulder | | Jerry Hyatt | |
| | | | • | Comment | | · | | |
| | | AGAIN | ST THE FLOW-S | STORM DRAINAG | E-MAP SHEET A3 | | | |
| · . | | | | | | | | |

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidlD | TapeCnt |
|---|--------|------|-------|---------------|------------------|----------|---------|---------------|--------|---------|-------|---------|
| | 1 | 0 | | Other | Downstream CB | | | | | | | |
| | 2 | 14.3 | | Other | PIPE CURVES LT | | | | | | | |
| | , j | 72.0 | | Other | Repair Coupler | | | | | | | • |
| | 1 | 72.0 | | Joint Problem | OFFSET | | Light | | | | | |
| | 5 | 75.1 | | Other | Repair Coupler | | | | | | | |
| | 6 | 75.1 | | Joint Problem | OFFSET | | LIGHT | | | | | |
| · | 7 | 95.7 | | Other | Upstream CB | | | · · · · · · · | | | | |



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Site Data for Project: Mercer Island-SD-A3

| S | ite IQ | | City | | Stree | t | Date | Time |
|-------|--------|-------------|---------------|-------------|----------------|-----------------|------------|-----------------|
| | 6 | | Mercer Island | | 78TH AV SE & | SE 22ND ST | 09/20/2005 | 01:58:52 PM |
| | | M.H. Star | t | М.Н. | Stop | M.H. Dept | h Starting | Dist Final Dist |
| | | 11 | | | 12 | | 6.0 | +69.8 |
| | Туре с | of Pipe | Pipe Size(in) | Sec. lgth | Direction | Surface Con | dition | Operator |
| | CC | NC | 12 | 3 | Away-U | Gravel Shoulder | Jerry H | yatt |
| • : • | · . | · · · · · · | | | Comment | | | |
| | | | AGAIN | ST THE FLOW | -STORM DRAINAG | E-MAP SHEET A3 | | |
| | | ···· · | | | | | | |

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lva | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------------|--------|-------|-------|---------------|------------------|----------|----------|---------|----------|---------|-------|----------|
| :. .: | 1 | o | | Other | Downstream CB | | | | - | 19.04 | | 00:09:11 |
| | 2 | 2.0 | | Other | FIPE CURVES LT | | | | | 35.15 | | |
| : | | 4.0 | | Joint Problem | GROUT | | MEDIÚM | 1 | | 187.38 | · · · | |
| | | 69.8 | | Other | Upstream QB | | | · · · · | | 399.16 | | |
| <i>#</i> ??? | | · · · | | 1 | | | ¥ | · | <u> </u> | I | L | l |



Site Data for Project: Mercer Island-SD-A3

| Site ID | | City | | Street | t · | Date | Time |
|-----------|-----------|---------------|-------------|----------------|--|------------|-----------------|
| 7 | | Mercer Island | | 78TH AV SE & 3 | | 09/20/2005 | 02:26:34 PM |
| М | .H. Start | | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | 11 | | 21 | 1 | | 6.0 | +146.6 |
| Type of I | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition | Operator |
| CON | C · | 12 | 3 | Away-D | Gravel Shoulder | Jerry H | yatt |
| | | | | Comment | | | |
| | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET A3 | | |
| · | | | · · · · | • | ······································ | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|----------------|-------|------------|------------------|----------|---------|---------|--------|---------|-------|----------|
| 1 | o [.] | | Other | Upstream CB | | | | | | | 00:16:09 |
| . 2 | 146.6 | | Other | Downstream CB | | | | | 301.50 | | |
| | | | | • | | | · · · · | | L | | |



Site Data for Project: Mercer Island-SD-A3-2

| Site ID | | City | • | Stree | Date | Time | |
|------------|----------|-------------|---------------|----------------|-----------------|------------|-----------------|
| 8 | MER | CER ISLAND | | 78TH AV SE & S | SE 22ND ST | 01/08/2006 | 02:27:17 PM |
| M.H | I. Start | | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | 20 |][| 2 | 1 | | 0 | 125.5 |
| Type of Pi | pe Pi | pe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| Concrete | | 12 | 3 | Away-U | Gravel Shoulder | Jerry Hy | /att |
| | | | | Comment | | | |
| | | AGAINS | ST THE ELOW-S | STORM DRAINAG | E-MAP SHEET A3 | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------------|----------|------------------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | | Other | Upstream CB | | | | | | x | |
| 2 | 8.8 | | Joint Problem | OFFSET | | LIGHT | | | | - | |
| 1 | 1 55 | | Galladian (* 19 | OILS (CARSES) | | MEDIUM | | | i | ···· | 1 |
| | 35.4 | 談 | Jeint Problem | OFFSET | | MEDIUM | | | · · | ···· | |
| 5 | 109.5 | | | OFFSET | | Light | | | | | |
| 6 | 125.5 | | Other | Upstream CB | | | | | • | | |

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n h



Site Data for Project: Mercer Island-SD-A3-2

| Site ID | | City | | Street | Date | Time | | |
|-------------|-------|---------------|-------------|----------------|-----------------|------------|--|--|
| · 9 · | M | ERCER ISLAND | | 78TH AV SE & S | E 22ND ST | 01/08/2006 | 02:35:32 PM | |
| М.Н. | Start | 4 | M.H. S | top | M.H. Depth | n Starting | Dist Final Dist | |
| 4 | 20 | | 19 |) | | 0 | 113 | |
| Type of Pip | e | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator | |
| Concrete | | 12 | 3 | Away-D | Gravel Shoulder | Jerry H | /att | |
| | | | | Comment | | | · | |
| | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET A3 | | ······································ | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliptD | VidID | TapeCnt |
|---|--------|-------|-------|------------|---------------------------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | | p · | | Other | Upstream CB | | | | | | | 1 |
| 2 | | 113.0 | | Other | Downstream CB | | | | | | | 11 |
| | · · · | | | | · · · · · · · · · · · · · · · · · · · | | | | | | | t |



Site Data for Project: Mercer Island-SD-A3-2

| | | Street | | Date | Time |
|---------------|----------------------------|---|--|---|--|
| MERCER ISLAND | | 78TH AV SE & S | E 22ND ST | // | 02:41:31 PM |
| art | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | 19 |) |][| 0 | 123.2 |
| Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition | Operator |
| 12 | 3 | Away-U | Gravel Shoulder | Jerry H | lyatt |
| | | Comment | | | · |
| AGAINS | ST THE FLOW-S | TORM DRAINAG | E-MAP SHEET A3 | | <u> </u> |
| | art Pipe Size(in) 12 | art M.H. S 19 Pipe Size(in) Sec. Igth 12 3 | art M.H. Stop 19 Pipe Size(in) Sec. Igth Direction 12 3 Away-U Comment | art M.H. Stop M.H. Depth 19 19 Pipe Size(in) Sec. Igth Direction Surface Cond 12 3 Away-U Gravel Shoulder | art M.H. Stop M.H. Depth Starting 19 0 Pipe Size(in) Sec. Igth Direction Surface Condition 12 3 Away-U Gravel Shoulder Jerry H Comment |

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------|-------|---------------|------------------|----------|---------|--------|--------|---------|--------|---------|
| 1 | о | | Other | Downstream CB | | | | | | | |
| 2 | 8.0 | | Other | PIPE CURVES LT | | | | | | | |
| 1 | 80.7 | | Service Conn. | nght | | | | | | | |
| | 122.2 | | Joint Problem | OFFSET | · | MEDIUM | | | | | |
| 5 | 123.2 | | Other | CAN'T COMPLÉTE | | | | | | ······ | |



Site Data for Project: Mercer Island-SD-A3-2

| | City | | Street | t · | Date | Time. | |
|----------|---------------|---|--|---|---|--|--|
| | MERCER ISLAND | | 80TH AV SE & S | SE 22ND ST | 01/08/2006 | 02:50:42 PM | |
| I. Start | | M.H. St | top | M.H. Dept | Dist Final Dist | | |
| 18 | | 22 | |] | 0 | 83.7 | |
| ре | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator | |
| } | 12 | 3 | Away-U | Gravel Shoulder | Jerry Hy | /att | |
| | | • • | Comment | | | | |
| | AGAINS | ST THE ELOW-S | TORM DRAINAG | E-MAP SHEET A3 | ····· | | |
| | I. Start | MERCER ISLAND I. Start 18 pe Pipe Size(in) 12 | MERCER ISLAND I. Start M.H. St 18 22 pe Pipe Size(in) Sec. Igth 12 3 | MERCER ISLAND 80TH AV SE & S A. Start M.H. Stop 18 22 pe Pipe Size(in) Sec. Igth Direction 12 3 Away-U Comment | MERCER ISLAND 80TH AV SE & SE 22ND ST I. Start M.H. Stop M.H. Depth 18 22 ipe Pipe Size(in) Sec. Igth Direction Surface Con 12 3 Away-U Gravel Shoulder | MERCER ISLAND 80TH AV SE & SE 22ND ST 01/08/2006 I. Start M.H. Stop M.H. Depth Starting 18 22 0 ipe Pipe Size(in) Sec. Igth Direction Surface Condition 12 3 Away-U Gravel Shoulder Jerry Hy Comment | |

Observation Data

| | Obs ID | Ft . | Lat Ft | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidID | TapeCnt |
|----|--------|------|--------|---------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| .* | 1 | þ | | Other | Downstream CB | | | | | | | |
| • | 2 | 7.4 | | Point Problem | OFFSET | | MEDIUM | | | | | |
| | 9 | 15.7 | 5 | Service Conn. | right | | | | | | | |
| | Į | 15.7 | 1 | Service Conn. | protructing4-6* | | | | | | | |
| | 5 | 46.5 | 5 | Service Conn. | right | | | | | | | |
| | 6 | 83.7 | (| Other | Upstream CB | | | | | | · | |

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Site Data for Project: Mercer Island-SD-A3

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| Site ID | City | | Street | t | Date | Time |
|------------|------------------|---------------|----------------|-----------------|------------|-----------------|
| 12 | Mercer Island | | 78TH AV SE & S | SE 22ND ST | 09/22/2005 | 10:07:16 AM |
| М.Н | . Start | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | 14 | 1 | 5 | | 6.0 | +61.1 |
| Type of Pi | pe Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition | Operator |
| (CONC | 12 | 3 | Away-U | Gravel Shoulder | Jerry H | yatt |
| | | | Comment | | | |
| | AGAIN | ST THE ELOW-S | STORM DRAINAG | E-MAP SHEET A3 | | |

Observation Data

| - | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|---------|------|-------|------------|------------------|----------|----------|--------|--------|---------|-------|----------|
| | ۰. ۱ | 0 | | Other | Downstream CB | | | d. | | 46.78 | | 00:41:08 |
| 1 | 2., | 61.1 | | Other | Upstream CB | | <i>.</i> | · · | | 139.67 | | |



Site Data for Project: Mercer Island-SD-A3

| Site ID | | | | Street | t | Date | Time | |
|-----------|----------|---------------|------------|----------------|-----------------|--|---------------------------------------|--|
| 13 | | Mercer Island | | 78TH AV SE & S | SE 22ND ST | 09/22/2005 | 11:49:47 AM | |
| М. | H. Start | · | М.Н. 9 | Stop | M.H. Depth | n Starting l | Dist Final Dist | |
| | 14 | | 4 | 3 | | 6.0 | +45.1 | |
| Type of F | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition (| Operator | |
| CONC | | 12 | 3 | Away-D | Gravel Shoulder | Jerry Hy | vatt | |
| · | | | | Comment | · · · | | · · · · · · · · · · · · · · · · · · · | |
| | | WITH | THE FLOW-S | FORM DRAINAGE- | MAP SHEET A3 | ······································ | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | 0 | | Other | Upstream CB | | | | | 10.60 | | 00:43:42 |
| 2 | 11.8 | | Joint Problem | Offset | | LIGHT | 9 | | 49.17 | | |
| | 18.1 | | Joint Problem | Offset | 1 | MEDIUM | | | 82,82 | | |
| · | 45.1 | | Other | Downstream CB | | | | | 136.21 | · . | |

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Pro-Vac/Gary's Tele-Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

Site Data for Project: Mercer Island-SD-A3

| Si | te ID | | City | | Stree | t | Date | Time | |
|---------|----------|---------------------|---------------|---------------|----------------|-----------------|--------------|---------------------------------------|--|
| | 14 | | Mercer Island | | 78TH AV SE & 8 | SE 22ND ST | 09/22/2005 | 02:34:12 PM | |
| | | H. Start 3 added | | M.H. S | | M.H. Dept | | Dist Final Dist | |
| Τ | ype of P | | Pipe Size(in) | | Direction | Surface Con |] <u>6.0</u> | +103.3 Operator | |
| | CONC | | 12 | 3 | Away-U | Gravel Shoulder | Jerry Hy | att | |
| | | | • | | Comment | | | | |
| | | | AGAINS | ST THE FLOW-S | TORM DRAINAG | E-MAP SHEET A3 | · | · · · · · · · · · · · · · · · · · · · | |
| | | | | | | | · · · · | | |

| 1 | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|------|--------|-------|-------|------------|------------------|----------|---------|---------------------------------------|---------------------------------------|---------|----------|----------|
| •••• | 1 | 6:0 | | Other | Downstream CB | | | | | 16.50 | | 00:46:13 |
| | 2 | 103.3 | | Other | Upstream CB | | , | | | 187.21 | | + |
| جأس | - | | | | | | | · · · · · · · · · · · · · · · · · · · | · · · · · · · · · · · · · · · · · · · | | <u> </u> | |





Site Data for Project: Mercer Island-SD-A3-2

| ID | City | | Street | Date | Time | |
|------------|------------------------------------|--|--|--|--|--|
| 5 | MERCER ISLAND | | 2218 80TH | AV SE | 01/08/2006 | 03:09:14 PM |
| M.H. Star | t | M.H. S | top | n Starting | Dist Final Dist | |
| 35 | | 33 | |] | 0 | 254.7 |
| pe of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition | Operator |
| Concrete | 12 | 3 | Away-D | Gravel Shoulder | Jerry Hy | /att |
| | | | Comment | | | |
| | with | THE FLOW-STC | RM DRAINAGE-N | MAP SHEET A3 | | |
| | 5 M.H. Star 35 pe of Pipe | 5 MERCER ISLAND M.H. Start 35 35 Pipe Size(in) Concrete 12 | 5 MERCER ISLAND M.H. Start M.H. Start 35 35 pe of Pipe Pipe Size(in) Concrete 12 | MERCER ISLAND 2218 80TH M.H. Start M.H. Stop 35 33 pe of Pipe Pipe Size(in) Sec. Igth Concrete 12 3 Away-D Comment | MERCER ISLAND 2218 80TH AV SE M.H. Start M.H. Stop 35 33 pe of Pipe Pipe Size(in) Sec. Igth Direction Surface Concrete 12 3 Away-D | MERCER ISLAND 2218 80TH AV SE 01/08/2006 M.H. Start M.H. Stop M.H. Depth Starting 35 33 0 pe of Pipe Pipe Size(in) Sec. Igth Direction Surface Condition Concrete 12 3 Away-D Gravel Shoulder Jerry Hy |

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------|-------|---------------|------------------|----------|---------|----------|-----------|---------|-------------------------------------|----------|
| 1 | 0 | | Other | Upstream CB | | | | | | | |
| 2 | 6.7 | | Pipe Problem | debris | | MEDIUM | | | | | |
| . Ja | 18.5 | 1 | Joint Problem | OFFSET | | MEDIUM | | · · · | | | |
| 4 | 26.4 | | Service Conn. | left . | | | | | | | |
| 5 | 88.1 | | Service Conn. | top | | | Hamm | w + | ap. | | |
| 6 | 88.2 | Ι | Pipe Problem | Longit Crack | | LIGHT | | | - | | |
| 7 | 88.9 | | Pipe Problem | Longit Crack | 12 | LIGHT | | | | · · · | |
| 8 | 88.9 | | Service Conn. | left | | | | | | | |
| 9 | 88.9 | | Service Conn. | protruding1-3" | | | | | | | |
| 10 | 89.6 | | Other , | PIPE CURVES LT | | | | | | | |
| 11 | 100.4 | | Other | PIPE CURVES RT | 1 | | | | | | |
| 12 | 101.3 | | Other | PIPE CURVES RT | | | | | | | · . |
| 13 | 101.3 | | Root Problem | begin roots | | Light | | · · · · · | | | |
| . 14 | 130.8 | | Other | PIPE CURVES LT | | | | | | | |
| 15 | 145.9 | | Other | PIPE CURVES LT | | | | | | · · · | |
| 16 | 154.6 | 1 | Service Conn. | left | | | | | | | <u> </u> |
| 17 | 154.6 | | Service Conn. | protruding 1-3" | | | | | | | |
| 18 | 157.3 | | Joint Problem | OFFSET | | MEDIUM | | | | · · · · · · · · · · · · · · · · · · | |
| 19 | 162.5 | | Service Conn. | right | | | | | | | |
| 120 | 162.5 | | Pipe Problem | Longit Crack | | LIGHT | <u> </u> | | · · · | | · · · · |



Site Data for Project: Mercer Island-SD-A3-2

| Site ID | City | | Street | | | Date | Time | |
|-----------|----------|---------------|--------------|--------------|-----------------|---|-------------|--|
| 15 | M | MERCER ISLAND | | 2218 80TH AV | | 01/08/2006 | 03:09:14 PM | |
| M.I | H. Start | | M.H. St | top | n Starting | rting Dist Final Dist | | |
| | 35 | | 33 | | | 0 | 254.7 | |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator | |
| Concrete | e | 12 | 3 | Away-D | Gravel Shoulder | Jerry H | yatt | |
| - | | | | Comment | • | | • • • | |
| | | with ' | THE FLOW-STO | RM DRAINAGE- | MAP SHEET A3 | · , · · · · · · · · · · · · · · · · · · | | |

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------|-------|---------------|------------------|----------|---------|--------|--------|---------|---------|---------|
| 21 | 178.2 | | Service Conn. | right | | | | | | | |
| 22 | 178.2 | | Service Conn. | Break in Conn. | | MEDIUM | soll, | rsible | No gra | F | |
| 3 | 199.7 | | Pipe Problem | debris | | UGHT | bly ro | ck ph | est loo | ks like | a brail |
| 24 | 220.0 | | Service Conh. | left | | | | | | | |
| 25 | 230.0 | | Service Conn. | right | | | | | · | | |
| 26 | 254.7 | | Other | Downstream CB | | , | | | | | |

227 Sume reput sheet A3



Site Data for Project: Mercer Island-SD-A3

| City | | Street | Date | Time | |
|---------------|-----------------------------|--|--|---|---|
| Mercer Island | | SE 20TH ST & 8 | OTH AV SE | 11/14/2005 | 11:24:51 AM |
| tart | M.H. St | top | M.H. Depth | Starting I | Dist Final Dist |
|][] | OPEN | PIPE |][| 6.0 | +95.0 |
| Pipe Size(in) | Sec. igth | Direction | Surface Cond | ition (| Operator |
| 12 | 3 | Away-U | Gravel Shoulder | Jerry Hy | ratt |
| | •• | Comment | | | |
| AGAINS | ST THE FLOW-S | TORM DRAINAG | E-MAP SHEET A3 | | |
| | tart Pipe Size(in) 12 | tart M.H. S OPEN Pipe Size(in) Sec. Igth 12 3 | tart M.H. Stop OPEN PIPE Pipe Size(in) Sec. Igth Direction 12 3 Away-U Comment | tart M.H. Stop M.H. Depth OPEN PIPE Pipe Size(in) Sec. Igth Direction Surface Cond 12 3 Away-U Gravel Shoulder | tart M.H. Stop M.H. Depth Starting I OPEN PIPE 6.0 Pipe Size(in) Sec. Igth Direction Surface Condition O 12 3 Away-U Gravel Shoulder Jerry Hy Comment |

Observation Data

| 1 | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|--------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| | 1 | o | | Other | Downstream CB | | | | | 42.86 | ·- · | 00:32:29 |
| | 2 | 67.0 | | Joint Problem | GROUT | | MEDIUM | | | 215.82 | i i i | · . |
| | ý. | 67.0 | | Other | OLD REPAIR | | | | · | 239.52 | | |
| Ľ | + | 95.0 | | Other | Open Pipe | | | | | 320.38 | | |

N

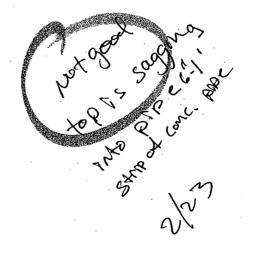


Site Data for Project: Mercer Island-SD-A3

| Site ID | | City | | Street | Date | Time | |
|-----------|------------|---------------|-------------|----------------|-----------------|------------|-----------------|
| 17 | | Mercer Island | | SE 20TH ST & 8 | OTH AV SE | 11/14/2005 | 11:37:26 AM |
| | M.H. Start | | | top | M.H. Depth | | Dist Final Dist |
| | 10 17 1 |] | . 24 | L | _] [| | +140.1 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition (| Operator |
| CONC | | 12 | 3 | Away-D | Gravel Shoulder | Jerry Hy | vatt |
| | | | | Comment | | | |
| | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET A3 | | · · ·] |
| | | | | | | • . | |

| Observation | Data |
|-------------|------|
|-------------|------|

| Obs IE | D Ft | Làt F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------|----------|---------------------|------------------|----------|---------|--------|--------|---------|---------------------------------------|----------|
| 1 | o | | Qther | Upstream CB | | | | | 41.63 | | 00:38:17 |
| 2 | 23.6 | il. T | Joint Problem | Separated . | | MEDIUM | | | 177.38 | | |
| F_ | 23.6 | | Joint Problem. | SOIL VISIBLE | | | | | 189.89 | | |
| | 23.6 | | Joint Problem | Offset | | MEDIUM | | · · · | 207.58 | | |
| 5 | 75.6 | | Pipe Problem | possible sag | - | | | | 343.04 | · · · · · · · · · · · · · · · · · · · | |
| 6 | 76.9 | | Service Conn. | service right | | | | | 370.98 | | · |
| 7 | 86.6 | | Pipe Problem | 1/4 pipe 14-0 | | | | | 452.89 | | - |
| 8 | 103.9 | | | end sag | | | | | 513.14 | | |
| 9 | (Ma | | kjus Problem - Sala | | | MEDIM | | | 708.92 | | |
| 10 | 140.1 | | Other | Downstream CB | | | | | 859.64 | | · · · |





Site Data for Project: Mercer Island-SD-A3

| City | : | Street | Date | Time | | | |
|---------------------------------------|---|---|---|--|---|--|--|
| Mercer Island | 1 | 2000 82ND AVE SE | | 11/14/2005 | 01:11:41 PM | | |
| Start | M.H. S | M.H. Stop M.H. Dept | | | Dist Final Dist | | |
| 00 | 19 | 25 | 6.0 | | | | |
| e Pipé Size(| in) Sec. Igth | Direction | Surface Cond | ition (| Operator | | |
| . 12 | 3 | Away-D | Shoulder: | Jerry Hy | ratt | | |
| · · · · · · · · · · · · · · · · · · · | · . | Comment | | | | | |
| N | VITH THE FLOW-ST | ORM DRAINAGE | -MAP SHEET A3 | · · · · | | | |
| H | Mercer Island Start 00 Pipe Size(12 | Mercer Island Start M.H. S 00 19 e Pipe Size(in) Sec. Igth 12 3 | Mercer Island2000 82NDStartM.H. Stop001925ePipe Size(in)Sec. Igth123Away-DComment | Mercer Island2000 82ND AVE SEStartM.H. StopM.H. Depth001925ePipe Size(in)Sec. IgthDirection123Away-DShoulder | Mercer Island 2000 82ND AVE SE 11/14/2005 Start M.H. Stop M.H. Depth Starting I 00 1925 6.0 e Pipe Size(in) Sec. Igth Direction Surface Condition Comment | | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|-------|--------|------|-------|---------------|------------------|----------|---------|--------|-------------|---------|-------|----------|
| | 1 | 0 | | Other | Upstream CB | | | | | 46.36 | | 00:53:08 |
| | 2 | 20.7 | | Joint Problem | Broken | · | MEDIUM | | | 138.28 | | |
| | | 72.1 | | Pipe Problem | Cilcular Gack | A | LIGHT | | Mr. | 307.96 | | |
| ••••• | | 73.7 | ŀ | Service Conn. | Service to A | Ally | elated | | spec | 398.79 | | |
| | 5 | 73.7 | ŀ | Pipe Problem | Cingular clack | IVI | MEDIUM | ivista | · · · · · · | 452.36 | | |
| | 6 | 73.8 | | Pipe Problem | SOILIMFIL | | | | | 604.50 | | |
| | 7 | 87.6 | i i | Other | Downstream CB | woode | r fo | | | 884.62 | | |





Site Data for Project: Mercer Island-SD-A3

| | Site ID | City | · | Street | 1.45 1.55 1.55 | Date | Time |
|----|--------------|---------------|---------------|---------------|----------------------|--------------|-----------------|
| | 19 | Mercer Island | | 2000 82ND A | VESE | 11/14/2005 | 01:36:13 PM |
| | M.H. S | tart | ∖ M.H. S | top | M.H. Dept | n Starting I | Dist Final Dist |
| | 2000 |) | | 9. 9. (| • | 6.0 | +52.0 |
| | Type of Pipe | Pipe Size(in) | Sec. lgth 🖉 | Direction | Surface Con | dition | Operator |
| | CONC | 12 | 3 | Away-U | Shoulder | Jerry Hy | /att |
| | | | | Comment | | | |
| | | AGAIN | ST THE FLOW-S | TORM DRAINAGE | MAP SHEET A3 | n.) 242 L | and a |
| 24 | | | 2 | | | <u>.</u> | dest. |

| | Obs IE | D Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidiD |
|----|--------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|
| | ¥ | 0 | | Other | Downstream CB | | | | | 23.47 | |
| | 2 | 6.1 | | Joint Problem | Broken | | LIGHT | | | 96.23 | |
| 1. | | 12.0 | | Joint Problem | Broken | | MEDIUM | | | 191.67 | |
| | 2. | 52.0 | | oles : | Upstream CB | | | | 1 | 314.89 | |



Site Data for Project: Mercer Island-SD-B1

| Site ID | | City | | Stree | t | Date | Time | |
|-----------|----------------------|---------------------------------------|---------------------------------------|-------------------------|-----------------|------------|-----------------|--|
| 1 | | Mercer Island | | SE 27TH ST & 63RD AV SE | | | 09:34:32 AM | |
| M. | H. Start | • • | M.H. S | top | M.H. Depth | n Starting | Dist Final Dist | |
| 31 | | · · · · · · · · · · · · · · · · · · · | 32 | |] | 6.0 | +61.2 | |
| Type of P | f Pipe Pipe Size(in) | | Sec. Igth Direction | | Surface Con | dition | Operator | |
| Concret | e | 12 | 3 | Away-U | Gravel Shoulder | Jerry Hy | vatt | |
| <u> </u> | | | | Comment | | | | |
| AGA | | | NST THE FLOW-STORM DRAINAGE-MAP SHEET | | | | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--|------|------------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | 0 | | Other | Downstream CB | | | | | 24.82 | | 00:49:23 |
| 2 | 54.8 | | Joint Problem | Offset | | MEDIUM | | | 117.85 | ć | |
| The second secon | 61.0 | | Senvice Conn. | service left | | | | | 205.74 | | · · |
| | 61.0 | | Service Conin | Promoting | | | | | 221.67 | | |
| 5 | 61.2 | 20 22 1 | Other | CAN'T COMPLETE | 1 | | | | 283.32 | | 1 |

Leves along a source and expired



Site Data for Project: Mercer Island-SD-B1

| Site ID | City | | Stree | t | Date | Time |
|--------------|---------------|--|----------------|-----------------|------------|----------------|
| 2 | Mercer Island | | SE 27TH ST & 6 | 53RD AV SE | 09/23/2005 | 09:56:28 AM |
| М.Н. S | Start | M.H. S | top | M.H. Depth | Starting | Dist Final Dis |
| 31 | | 30 | | | 6.0 | +40.5 |
| Type of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition | Operator |
| Concrete | 12 | 3 | Away-D | Gravel Shoulder | Jerry H | lyatt |
| | | | Comment | | | |
| • | WITH | TH THE FLOW-STORM DRAINAGE-MAP SHEET B | | | | |

| Obs | s ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt | |
|-----|------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|--------------|
| 1 | | 0 | | Other | Upstream CB | | | | | 18.69 | • | 00:54:24 | ŀ |
| 2 | | 4.0 | | Joint Problem | Offset | | MEDIUM | | 2 | 64.71 | | | 1 |
| | 8 | | | John Froblem | Olisets | | HEAVYS | | | 17175 | à. | | ŀ |
| 1. | | 40:5 | | Other | CAN'T COMPLETE | | | | | 203.01 | · | | † . – |



1

Site Data for Project: Mercer Island-SD-B1

| Site ID | | City | • | Stree | t | Date | Time |
|-------------|-----------------------------|--|---|---|---|---|--|
| 3 | M | ercer Island | | 2432 63RD | AVSE | 09/23/2005 | 10:15:46 AM |
| М.Н. | Start | • · | M.H. S | top | M.H. Depth | Starting I | Dist Final Dist |
| 2 | 288 29 | | 28 | A | | 6.0 | +6.6 |
| Type of Pip | e P | ipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| Concrete | | 12 | 3 | Away-D | Gravel Shoulder | Jerry Hy | /att |
| | | | | Comment | - | | · 1 |
| | | WITH | THE FLOW-ST | ORM DRAINAGE | -MAP SHEET B1 | | · · |
| | 3 M.H. 20 Type of Pip | 3 M.H. Start 28日 こう Type of Pipe P | 3 Mercer Island M.H. Start 28B 28B 2 Type of Pipe Pipe Size(in) Concrete 12 | 3Mercer IslandM.H. StartM.H. S-28B2928B29Type of PipePipe Size(in)Concrete123 | 3 Mercer Island 2432 63RD M.H. Start M.H. Stop -26B Z 28A Type of Pipe Pipe Size(in) Sec. Igth Direction Concrete 12 3 Away-D Comment | 3 Mercer Island 2432 63RD AV SE M.H. Start M.H. Stop M.H. Depth 26B Z 28A Type of Pipe Pipe Size(in) Sec. Igth Direction Surface Cond Concrete 12 3 Away-D Gravel Shoulder | 3 Mercer Island 2432 63RD AV SE 09/23/2005 M.H. Start M.H. Stop M.H. Depth Starting 26B Z 28A 6.0 Type of Pipe Pipe Size(in) Sec. Igth Direction Surface Condition Concrete 12 3 Away-D Gravel Shoulder Jerry Hy Comment |

Observation Data

| Ċ |)bs ID | Ft. | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt | _ |
|---|--------------|-----|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|---|
| 1 | | 0 | | Other | Upstream CB | | | | | 114.99 | | 00:58:10 | ŀ |
| 2 | | 6.3 | ŀ | Joint Problem | Offset | | HEAVY | | | 145.42 | | | ĺ |
| | بر | 6.3 | | Pipe Problem | pipe curves RT | | | | | 170.71 | • • | | |
| 2 | .)- <u>.</u> | 6.6 | | Other | | | | | | 264.37 | | | |

LEOT SURD WHY. SLIGHT SAG BUT PIPS COOKED OK LOCKING ATTAN FIPSONVO MY HAVE ISTEN PROB. FOR COMERA

200 AN AND A X



Site Data for Project: Mercer Island-SD-B1

| 5 | Site ID | | City | | Stree | t | Date | Time |
|----|-----------|----------|---------------|---------------|---------------|-----------------|------------|---------------------------------------|
| | 4 | | Mercer Island | | 2440 63RD | AV SE | 09/23/2005 | 10:37:43 AM |
| | M.I | H. Start | | M.H. S | top | M.H. Depth | Starting E | ist Final Dist |
| [· | | 28B | | 2 | 9 | | 6.0 | +11,6 |
| | Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition C | perator |
| | Concret | e | 12 | 3 | Away-U | Gravel Shoulder | Jerry Hya | att |
| | | • | 4 | | Comment | | • . | · . |
| | | | AGAINS | GT THE FLOW-S | STORM DRAINAG | ·. | | |
| | | | | | | | • | · · · · · · · · · · · · · · · · · · · |

| • | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID. | TapeCnt |
|---|--------------|------|-------|---------------|------------------|----------|---------|--------|---------|---------|--------|----------|
| | 1 | 0 | | Other | Downstream CB | | (| | | 72.71 | | 01:02:54 |
| | 2 | 6.7 | | Joint Problem | Separated | | HEAVY | | · · · · | 102.95 | 5 | |
| | , , <u>г</u> | 8:4 | | Joint Problem | Broken | | MEDIUM | _ | | 173.03 | · | |
| | | 8.4 | | Joint Problem | Offset | | MEDIUM | | * | 200.81 | | |
| . | 5 | 11.1 | | Joint Problem | Offset | | HEAVY | | | 241.96 | | |
| | 6 | 11.1 | | Voint Problem | Separated | | HEAVY | | | 257.18 | ······ | |
| | 7 | 11.6 | | Other | CAN'T COMPLETE | | | | | 307.39 | | |



Site Data for Project: Mercer Island-SD-B1

| Site ID | | City | | Stree | t | Date | Time |
|-----------|------------|---------------|---|-----------|-----------------|----------|---------------------|
| 5 | | Mercer Island | | 2420 63RD | AV SE | 09/23/20 | 05 10:58:45 AM |
| M.I | H. Start | · | M.H. S | top | M.H. Depth | start | ing Dist Final Dist |
| QP | OPEN PIPE | | 29 | 9 |] | | 5.0 +6.4 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| Concret | e . | 12 | 3 | Away-D | Gravel Shoulder | Je | erry Hyatt |
| · . | | | - | Comment | · · · | | |
| | | AGAINS | IST THE FLOW-STORM DRAINAGE-MAP SHEET E | | | · | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|----------------|-----|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| | 1 | o | . | Other | OPEN DITCH | ÷. • | | | | 37.54 | | 01:08:29 |
| : | 2 [·] | 3.0 | | Joint Problem | Separated | (| HEAVY | · · | | 64.50 | | |
| 7 | | 3.0 | | Root Problem | begin roots | | LIGHT | | | 98.81 | | |
| | | 6.4 | | Joint Problem | Separated | | HEAVY | | | 171.74 | | |
| | 5. | 6.4 | | Joint Problem | Offset | | HEAVY | BR | | 186.18 | | |
| | 6 | 6.4 | | Joint Problem | SOIL VISIBLE | | | | | 195.37 | | |
| | 7 | 6.4 | | Other | CAN'T COMPLETE | | | | | 234.28 | | |

I CANT COMPLETE



Site Data for Project: Mercer Island-SD-B1-2

| Site ID City | | | Street | | | Date | Time | |
|--------------|---------------|---------------|--------------|----------------|-----------------|-----------------|-------------|--|
| 6 | MERCER ISLAND | | | SE 28TH ST & 6 | SIST AV SE | 01/08/2006 | 03:38:21 PM | |
| M.H. Start | | | M.H. S | Stop | M.H. Depth | Dist Final Dist | | |
| 2801 | | | 2808 | |][| 0 | 32 | |
| Type of Pi | pe l | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator | |
| Concrete | | 12 | 3 | Away-U | Gravel Shoulder | Jerry H | yatt | |
| | | • | · | Comment | | | | |
| | | AGAINS | ST THE ELOW- | STORM DRAINAG | E-MAP SHEET B1 | | · · · · · | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|------------|------|-------|---------------|------------------|----------|---------|---------|--------|---------|---------------------------------------|--|
| 1 | 0 | | Other | Downstream CB | | | | | | | |
| 2 | 7.0 | | Joint Problem | OFFSET | | MEDIUM | | | | | |
| ۱ <u>,</u> | 9.3 | | Other | CONC TO VCP | | | | | | | |
| . 1 | 9.3 | | Joint Problem | broken | | LARGE | Soll | niete | | | |
| 5 | 9.3 | | Joint Problem | soil visible | | | · | | | | |
| 6 | 14.4 | | Other | VCP TO CONC | | | | | | | · |
| 7 | 18.7 | | Joint Problem | OFFSET | | MEDIUM | | | | · · · · · · · · · · · · · · · · · · · | 1 |
| 8 | 28.3 | | Other | CONC TO VCP | | | | | | | |
| 9. | 30.7 | | Service Conn. | right | | | | | | | |
| 10 · | 30.7 | | Service Conn. | protruding4-6" | | | | | | | ······································ |
| 11 | 32.0 | | Pipe Problem | Broken | | MEDIUM | | | | | |
| 12 | 32.0 | | Other | CAN'T COMPLETE | | | /*····· | | | | |

or



Site Data for Project: Mercer Island-SD-B1-2

| Site ID | | City | | Street | t s | Date | Time |
|-------------|----------|---------------|-------------|----------------|-----------------|------------|-----------------|
| 7 | [N | MERCER ISLAND | | SE 28TH ST & 6 | SIST AV SE | 01/08/2006 | 03:55:23 PM |
| M.H | I. Start | | M.H. S | stop | M.H. Depth | Starting | Dist Final Dist |
| | 2808 | · · · · | 2801 | |] | 0 | 88.1 |
| Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| Concrete | € | 12 | 3 | Away-D | Gravel Shoulder | Jerry Hy | yatt |
| | | | | Comment | | | |
| | WITI | | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET B1 | | |
| | | | | | · . | | |

| Obs ID | Ft | Lat Ft | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|--------|--------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | | Other | Upstream CB | | | | | | • | |
| 2 | 11.9 | | Root Problem | begin roots | | MEDIUM | | | | , | |
| 3 | 47.5 | I I | Pipe Problem | Longit Crack | | LIGHT | | [| | • | 1 |
| 1 | 50.1 | F | Pipe Problem | end crack | | | | | | | |
| 5 | 55.7 | F I | Root Problem | end roots | | | | | : | • • | |
| 6 | 88:1 | | Other | Buried CB | | | | | | - | |

Ð



Site Data for Project: Mercer Island-SD-B2

| Site ID | | City | | Street | | Date | Time |
|-------------|---------|---------------|--------------|---------------|----------------|------------|-------------------|
| 1 | ME | RCER ISLAND | | 3049 71ST | AV SE | 09/23/2005 | 11:23:29 AM |
| М.Н. | . Start | | M.H. S | top | M.H. Depth | Starting | g Dist Final Dist |
| HS# | # 3049 | | HS# | 2935 |] | 6.0 |) +282.8 |
| Type of Pip | je | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| Concrete | | 12 | 3 | Away-U | Paved Asphalt | Jerry | Hyatt |
| | | | | Comment | | | |
| | • | AGAINS | ST THE FLOW- | STORM DRAINAG | E-MAP SHEET B2 | | · · · · · |
| | | | · · · | | | | |

Observation Data

| | Öbs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|-----|--------|-------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| ř., | 1 | 0 | | Other | Downstream CB | | | | | 53.71 | | 01:12:27 |
| · | 2 | 282,8 | | Other | Upstream CB | | ; | | | 535.56 | | |

ee S



Site Data for Project: Mercer Island-SD-B2

| Site ID | | City | | Street | Date | Time | |
|---------------------------------------|------------|---------------|-------------|---------------|---------------|------------|----------------------------|
| 2 |) <u> </u> | MERCER ISLAND | | 3049 71ST | AV SE | 09/23/2005 | 11:52:08 AM |
| М. | H. Start | | M.H. S | top | M.H. Depth | Starting | Dist [®] Final Di |
| Н | S# 3049 | | HS# | 3073 |][| 6,0 | +156.2 |
| Type of F | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition | Operator |
| Concre | te | 12 | 3 | Away-D | Paved Asphalt | Jerry H | yatt |
| | | • | | Comment | | | . (|
| · · · · · · · · · · · · · · · · · · · | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEFT B2 | | |

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|----|--------|-------|-----------|---------------------------------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| i. | 1 | o | | Other | Upstream CB | | •. | | | 25.75 | : | 01:21:44 |
| | 2 | 156.2 | | Other | Downstream CB | ۱ | | × | - | 301.89 | | · |
| | | | • • • • • | · · · · · · · · · · · · · · · · · · · | | | | | | | ····· | |

2 who who we have a stand of the second of t



Site Data for Project: Mercer Island-SD-B2

| 5 | Site ID | City | | | Date | | Time | | | |
|---|------------|------------|---------------------------------------|--------------|----------------|----------------|-----------|-------------------|-----------|--|
| | 3 | Ň | MERCER ISLAND | | SE 29TH ST & 7 | OTH AV SE | 09/23/200 | 2005 12:14:06 P | | |
| | M.F | M.H. Start | | | Stop | M.H. Depti | n Startir | Starting Dist Fin | | |
| | 184 | | | OPEN | I PIPE |][| 6 | 5.0 | +47.3 | |
| | Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Oper | ator | |
| | Concrete | Э | 12 | 3 | Away-U | Paved Asphalt | Jerr | y Hyatt | | |
| | | · | | | Comment | , | | | | |
| | | | AGAINS | ST THE FLOW- | STORM DRAINAG | E-MAP SHEET B2 | | | | |
| • | • | | · · · · · · · · · · · · · · · · · · · | • • | | | | | ,,,,,,,,, | |

| Obs ID | Ft | Lat Ft | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidID | TapeCnt |
|--------|------|--------|--------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | 0 | c | Other | Downstream CB | | | | | 22.18 | | 01:26:56 |
| 2 | 19.7 | J | oint Problem | Offset | | MEDIUM | | | 60.46 | | |
| | 47.3 | ŀ | oint Problem | Offset | | HEAVY | | | 129.64 | | |
| 2 | 47.3 | 0 | Other | CAN'T COMPLETE | | | | | 151.10 | | |

1 Joint from the attet 2/20



Site Data for Project: Mercer Island-SD-B2

| Site ID | ł | City | | Stree | t | Date | Time |
|---------|------------|---------------|------------|----------------|---------------|------------|--------------------|
| 4 | N | AERCER ISLAND | | SE 29TH ST & 7 | 70TH AV SE | 09/23/2005 | 5 12:19:24 PM |
| | M.H. Start | | м.н. 9 | Stop | M.H. Depth | n Startir | ng Dist Final Dist |
| | 184 | | 185 | | <u></u> | 6 | .0 +96.4 |
| Туре | of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| Со | ncrete | 12 | 3 | Away-D | Paved Asphalt | Jerr | y Hyatt |
| | | · · · | | Comment | | | |
| | | WITH | THE FLOW-S | TORM DRAINAGE | MAP SHEET B2 | | |
| | | | | | | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------------|-------|-----------------|-------------------------|----------|---------|--------|--------|---------|---------|----------|
| 1 | 0 | | Other | Upstream CB | | | | | 11.23 | | 01:29:32 |
| 2 | 4 .0 | | Pipe Problem | Longit Crack | | LIGHT | | | 60.16 | | |
| · | 5.0 | | Service Conn. | service left | | | - | | 81.11 | | |
|) | 38.0 | 1 | | Offset | | MEDIUM | | | 160.08 | | |
| 5 | 38.0 | • | Other | OLD REPAIR | | · | | | 182.58 | | |
| 6 | 41.3 | | Joint | Separated partial | repaird | HEAVY | | | 221.94 | | |
| 7 | 41.3 | | Joint Participa | SOIL VISIBLE | | | | | 228.02 | | |
| 8. | 62.8 | | Joint Findsom | Offset | | LIGHT | | | 293.42 | | |
| 9 | 73.1 | | Pipe Brobler | Circular Crack | ~ | MEDIUM | | | 344.28 | | |
| 10 | 96.4 | | Other | Downstream CB | | | | | 481.85 | <u></u> | |

2 sectors fractured

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Site Data for Project: Mercer Island-SD-B2

| Site | ID | City | | Stree | t | Date | Time |
|---------|------------|---------------|--------------|----------------|----------------|--|-----------------|
| 5 | | MERCER ISLAND | | SE 29TH ST & 7 | 70TH AV SE | 09/23/2005 | 12:53:48 PM |
| | M.H. St | art | M.H. S | stop | M.H. Depth | n Starting I | Dist Final Dist |
| · · · · | 186A | | 18 | 36 | | 6.0 | +7.3 |
| Ту | pe of Pipe | Pipe Size(in) | Sec. lgth | Direction | Surface Con | dition (| Operator |
| • | Concrete | · 12 | 3 | Away-U | Paved Asphalt | Jerry Hy | att |
| · | · | · | | Comment | | | |
| | | AGAIN | ST THE FLOW- | STORM DRAINAG | E-MAP SHEET B2 | · · · · · · · · · · · · · · · · · · · | · |
| | · · | | | | | ······································ | |

Observation Data

| Ft | Lat Ft Cate | egory Category Detail | is ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|------------------|-----------------|--------------------------------|--|--|--|--|--|--|--|
| 0 | Other | Downstream CB | | | | | 61.19 | · · | 01:37:50 |
| ⁻ 5.9 | Joint Probl | lem Offset | | HEAVY | - | | 106.37 | ······ | - |
| 7.3 | Other | 12X 8 Reducer | 0 | | • | | 324.15 | | |
| 7.3 | Other | CANTCOMPLETE | | | | | 341.50 | | |
| | 0 5.9 7.3 | 0Other5.9Joint Problem7.3Other | 0 Other Downstream CB 5.9 Joint Problem Offset 7.3 Other 12X 8 Reducer | 0 Other Downstream CB 5.9 Joint Problem Offset 7.3 Other 12X 8 Reducer | 0 Other Downstream CB 5.9 Joint Problem Offset 7.3 Other 12X 8 Reducer | 0 Other Downstream CB 5.9 Joint Problem Offset 7.3 Other 12X 8 Reducer | 0 Other Downstream CB 5.9 Joint Problem Offset 7.3 Other 12X 8 Reducer | 0 Other Downstream CB 61.19 5.9 Joint Problem Offset HEAVY 106.37 7.3 Other 12X 8 Reducer 9 324.15 | 0 Other Downstream CB 61.19 5.9 Joint Problem Offset HEAVY 106.37 7.3 Other 12X 8 Reducer 2 324.15 |

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Site Data for Project: Mercer Island-SD-B2

| Site ID | City | | Stree | t | Date | Time |
|--------------|--------------|----------------|----------------|---------------|--|----------------|
| 6 | MERCER ISLAN | D | SE 29TH ST & 7 | 70TH AV SE | 09/23/2005 | 01:02:36 PM |
| М.Н. 9 | Start | M.H. S | Stop | M.H. Dept | h Starting | Dist Final Dis |
| 186 | A | 1 | 87 | | 6.0 | +30.7 |
| Type of Pipe | Pipe Size(ii | n) Sec. lgth | Direction | Surface Con | dition | Operator |
| Concrete | 12 | 3 | Away-U | Paved Asphalt | Jerry H | yatt |
| ÷ | | | Comment | | | |
| | \A/I | TH THE ELOW-ST | FORM DRAINAGE | MAP SHEET B2 | •••••••••••••••••••••••••••••••••••••• | ····· |

Observation Data

| Obs | s ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|-----|------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | | 0 | | Other | Upstream CB | | | | | 16.85 | | 01:43:40 |
| 2 | | 6.0 | | Joint Problem | Offset | | MEDIUM | τ | . , | 47.52 | | |
| | | 30.7 | | Other | Downstream CB | | | | | 121.82 | | |

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Site Data for Project: Mercer Island-SD-B2

| Site ID | | City | | Street | | Date | Time |
|---------|------------|---------------|-------------|----------------|---------------|--|-----------------|
| 7 | N | MERCER ISLAND | | SE 29TH ST & 7 | 0TH AV SE | 09/23/2005 | 01:14:58 PM |
| N | I.H. Start | · . | · M.H. S | Stop | M.H. Depth | Starting | Dist Final Dist |
| | 187 | | 18 | 7A |] | 0 | +36.0 |
| Type of | Pipe | Pipe Size(in) | Sec. lgth | Direction | Surface Cond | lition | Operator |
| Concr | ete | 12 | 3 | Away-U | Paved Asphalt | Jerry H | yatt |
| • | | | | Comment | | | |
| | ···· | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET B2 | ······································ | |
| | • | | · · · · | | | | · · · · |

Observation Data

| Obs ID |) Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | 0 | | Other | Upstream CB | | | | | 23.27 | | 01:45:51 |
| 2 | 11.5 | | Service Conn. | service left | | | c | - | 47.69 | | |
| | 36.0 | | Other | Downstream CB | | | | | 111.16 | | |





Site Data for Project: Mercer Island-SD-B2

| Site ID | | City | | Stree | t | Date | Time | |
|-----------|-----------|---------------|-------------|----------------|---------------|------------------|----------------|--|
| 8 | | MERCER ISLAND | | SE 29TH ST & 7 | 70TH AV SE | 09/23/2005 01:19 | | |
| М. | .H. Start | | M.H. S | stop | M.H. Depth | Starting | Dist Final Dis | |
| | 187A | | 18 | 88 | _][| 0 | +137.3 | |
| Type of F | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition | Operator | |
| Concre | te | 12 | . 3 | Away-D | Paved Asphalt | Jerry H | yatt | |
| | | | | Comment | | | | |
| | | WITH | THE FLOW-ST | FORM DRAINAGE | -MAP SHEET B2 | | | |

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------|-------|---------------|------------------|----------|---------|--------|--------|-------------------|-------|----------|
| 1 | þ | · . | Other | Upstream CB | | | | | 7.97 [°] | | 01:47:51 |
| 2 | 60.2 | | Joint Problem | Offset | | MEDIUM | 3 | | 112.87 | | |
| | 60.2 | | Other . | OLD REPAIR | | | | | 123.29 | | |
| | 137.3 | | Other | Downstream CB | | | | | 315.38 | | |





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Pro-Vac/Gary's Tele-Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

| Site ID | | City | | Street | Date | Time | |
|-----------|----------|---------------|-------------|----------------|---------------|------------|-----------------|
| 9 | M | IERCER ISLAND | | SE 29TH ST & 7 | OTH AV SE | 09/23/2005 | 01:26:39 PM |
| M.I | H. Start | • | M.H. S | top | M.H. Depti | h Starting | Dist Final Dist |
| ······ | 188 | | | 91) |] | 0 | 127.0 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| Concret | e | 12 | 3 | Away-D | Paved Asphalt | Jerry H | yatt |
| | | | · . | Comment | | | |
| | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET B2 | | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph | 1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------------|--------|-------|-------|---------------|------------------|----------|-----------|--------|--------|---------|---------|---------------------------------------|----------|
| | 1 | ο. | | Other | Upstream CB | | | | | | 47.58 | | 01:53:16 |
| | 2 | 38.4 | | Joint Problem | Offset | | MEDIUM | | | | 115.05 | | |
| j | | 38.4 | | Joint Problem | Separated | | MEDIUM | | | | 124.06 | | · · |
| [.] | ų. | 39.6 | | Joint Problem | Broken | | MEDIUM | | | | 211.52 | · · · · · · · · · · · · · · · · · · · | |
| | 5 | 79.9 | · . | Joint Problem | Offset | | Light | | ÷••••• | | 320.44 | | |
| | 6 | 89.2 | | Pipe Problem | Longit Crack | | light | | 7 | | 389.02 | ···· ·· · · · · · · · · · · · · · · · | |
| | 7. | 92.2 | | Joint Problem | Offset | | MEDILIM | | 1 | | 430.57 | ···· | |
| | 8 | 110.4 | | Joint Problem | Offset | | HEAVY | \sum | In | lon Tok | 533.72 | . * | |
| | 9 | 120.8 | | Pipe Problem | end crack | | \square | フ | 1 | ves- | 643.18 | | |
| 1 | 10 | 127.0 | | Other | Downstream CB | | | | | | | | |

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Pro-Vac/Gary's Tele-Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

Site Data for Project: Mercer Island-SD-B2

| Site ID | City | | Street | t | Date | Time | |
|--------------|---------------|-------------|----------------|---------------|------------|---------------|--|
| 10 | MERCER ISLAND | | SE 29TH ST & 7 | 70TH AV SE | 09/23/2005 | 01:40:37 PM | |
| M.H. S | Start | M.H. S | top · | M.H. Depth | Starting I | Dist Final Di | |
| 18 | 9 | HS#3 | 8056 |] | 2,5 | +55.9 | |
| Type of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition (| Operator | |
| Concrete | 12 | 3 | Away-D | Paved Asphalt | Jerry Hy | att | |
| | | | Comment | | | | |
| | 1 TRAL | THE ELOW OT | ORM DRAINAGE- | MAD CHEFT DO | | · · · · | |

Observation Data

| - | Dbs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|--|------|-------|---------------|------------------|----------|---------|--------|--------|---------|---------------------------------------|-----------|
| 1 | | 0 | | Other | Upstream CB | | | | | 42.38 | | 02:06:00 |
| 2 | | 8.9 | | Joint Problem | Broken | 1 | LIGHT | | | 86.43 | · · · | |
| | à chiến chiế | 32.3 | | Service Conn. | service left | | | | | 167.82 | | |
| | C | 32.3 | | Other | OLD REPAIR | | | | | 227.53 | • | · · · · · |
| 5 | | 55.9 | | Other | Downstream CB | | | | | 311.49 | · · · · · · · · · · · · · · · · · · · | |



Site Data for Project: Mercer Island-SD-B2

| Site ID | | City | | Street | t | Date | Time | |
|-----------|----------|---------------|-------------|----------------|---------------|---------------------------------------|---------------------------------------|--|
| 11 |][M | ERCER ISLAND | | SE 29TH ST & 7 | OTH AV SE | 09/23/2005 | 01:50:00 PM | |
| M. | H. Start | | M.H. 8 | Stop | M.H. Depth | Starting | Dist Final Dist | |
| ŀ | IS#3056 | | 1 | 90 | | 0 | +65.7 | |
| Type of F | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition | Operator | |
| Concre | te | 12 | 3 | Away-D | Paved Asphalt | Jerry H | yatt | |
| | | | | Comment | | | | |
| | · · · · | WITH | THE FLOW-ST | FORM DRAINAGE | MAP SHEET B2 | · · · · · · · · · · · · · · · · · · · | · · · · · · · · · · · · · · · · · · · | |
| | | | | | | | | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|------|--------|-------------------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| •••• | 1 | 0 | | Other | Upstream CB | | | | | 12.46 | | 02:11:27 |
| · | 2 | 65.7 ¹ | ŀ | Other | Downstream CB | | | | | 1278.54 | | |

Farend on 12?

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Site Data for Project: Mercer Island-SD-B2

| Site ID | City | • | Street | t i i i i i i i i i i i i i i i i i i i | Date | Tíme |
|------------|-----------------|----------------|----------------|---|------------|-----------------|
| 12 | MERCER ISLANI | D[| SE 29TH ST & 7 | OTH AV SE | 09/23/2005 | 02:24:29 PM |
| М.Н | . Start | M.H. S | top | M.H. Depth | Starting I | Dist Final Dist |
| HS | #3056 | 19 | 0 |] | 2.0 | +50.6 |
| Type of Pi | pe Pipe Size(in | n) Sec. lgth | Direction | Surface Cond | lition (| Operator |
| Concrete | 12 | 3 | Away-D | Paved Asphalt | Jerry Hy | /att |
| | | | Comment | • | , | |
| | 14/17 | TH THE ELOW OT | ORM DRAINAGE- | MAD QUEET DO | | |

| 0 | bs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidID | TapeCnt |
|---|-------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | | 2.0 | | Other | Upstream CB | | | | | 52.21 | N | 02:33:12 |
| 2 | | 32.2 | ł | Joint Problem | Offset | 50 | HEAVY | | | 122.05 | | |
| |) | 50.6 | | Other | Downstream CB | | | | | 204.67 | | |

Same as 11? & \v



Site Data for Project: Mercer Island-SD-B2

| Site | e ID | City | | Stree | Date | Time | |
|------|------------|---------------|--------------|----------------|---------------|------------|-----------------|
| 1 | 3 | MERCER ISLAND | | SE 29TH ST & 7 | OTH AV SE | 09/23/2005 | 02:30:11 PM |
| | M.H. St | art | м.н. | Stop | M.H. Depth | Starting | Dist Final Dist |
| | 190 | | 1 | 90A |] | 0 | +30.2 |
| Ту | pe of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| | DIP | 12 | 18 | Away-D | Paved Asphalt | Jerry H | yatt |
| | | | | Comment | | • . | |
| · | • | ŴĬŤĬ | I THE FLOW-S | TORM DRAINAGE | MAP SHEET B2 | | ····· |
| | • • • | | | | | | |

Observation Data

| ` | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|--------|------|-------|------------|-------------------------|----------|---------|--------|--------|---------|-------|----------|
| | 1 . | 0 | | Other | Upstream CB | | | | | 65.89 | | 02:36.44 |
| | 2 | 30.2 | | Other | Downstream CB | | | | | 130.77 | | |

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Site Data for Project: Mercer Island-SD-B4-2

| Site ID | City | | Street | Date | Time | |
|-----------|-------------------|---------------|---------------|----------------|------------|-----------------|
| . 1 | MERCER ISLAND | | 8452 N MER | CER WY | 01/09/2006 | 07:03:11 AM |
| M.I | I. Start | M.H. S | Stop | M.H. Depth | n Starting | Dist Final Dist |
| | 10 | 1 | 1 |] | 0 | 174.2 |
| Type of P | ipe Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition | Operator |
| CMP | 30 | 20 | Away-U | Yard | Jerry H | yatt |
| | | | Comment | | | |
| | AGAIN | IST THE FLOW- | STORM DRAINAG | E-MAP SHEET B4 | | |
| | | | | | | |

| _ | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|--------|-------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| | 1 | 0 | | Other | Downstream CB | | | | | | | |
| - | 2 | 174.2 | | Other | Upstream CB | | | | | | | |

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Site Data for Project: Mercer Island-SD-B4-2

| Site | 1D | City | | Stree | t | Date | Time |
|-------|------------|---------------|-------------|---------------|--------------|--------------|-----------------|
| 2 | | MERCER ISLAND | | 8452 N MER | CER WY | 01/09/2006 | 07:09:02 AM |
| | M.H. Starl | t | M.H. S | top | M.H. Depth | n Starting I | Dist Final Dist |
| L | · 10 | | ç |) | | 0 | 99.0 |
| Тур | e of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition (| Operator |
| | CMP | 30 | 20 | Away-D | Yard | Jerry Hy | /att |
| _ | | | | Comment | | | |
| | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET B4 | | |
| ····· | | | | | | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|---------|---------------------------|-----------------------------------|--|---|---|---|---|---|---|--|
| [| 0 | | Other | Upstream CB | - | | | | | | |
| 2 | 16.2 | | Other | | 1 | | | | | | |
| ۱ | 49.9 | | Pipe Problem | Ovaled | | 10% | | | | | |
| | 59.0 | | Root Problem | Light | | | | | | | |
| ; | 99.0 | | Pipe Problem | Shovel in Pipe | | | <u></u> | | | | |
| | 99.0 | | Other | CAN'T COMPLETE | \uparrow | | | | | | |
| | <u></u> | 0 16.2 49.9 59.0 | 0 16.2 49.9 59.0 99.0 | 0 Other 2 16.2 Other 49.9 Pipe Problem 59.0 Root Problem 99.0 Pipe Problem | 0 Other Upstream CB 2 16.2 Other OLD REPAIR 49.9 Pipe Problem Ovaled 59.0 Root Problem Light 99.0 Pipe Problem Shovel in Pipe | 0 Other Upstream CB 16.2 Other OLD REPAIR 49.9 Pipe Problem Ovaled 59.0 Root Problem Light 99.0 Pipe Problem Shovel in Pipe | 0 Other Upstream CB 16.2 Other OLD REPAIR 49.9 Pipe Problem Ovaled 59.0 Root Problem Light 99.0 Pipe Problem Shovel in Pipe | 0 Other Upstream CB 16.2 Other OLD REPAIR 49.9 Pipe Problem Ovaled 59.0 Root Problem Light 99.0 Pipe Problem Shovel in Pipe | 0 Other Upstream CB 16.2 Other OLD REPAIR 49.9 Pipe Problem Ovaled 59.0 Root Problem Light 99.0 Pipe Problem Shovel in Pipe | 0 Other Upstream CB 16.2 Other OLD REPAIR 49.9 Pipe Problem Ovaled 59.0 Root Problem Light 99.0 Pipe Problem Shovel in Pipe | 0 Other Upstream CB Intrib Intrib Intrib Intrib 16.2 Other OLD REPAIR Intrib Intrib Intrib Intrib 49.9 Pipe Problem Ovaled 10% Intrib Intrib Intrib 99.0 Pipe Problem Shovel in Pipe Intrib Intrib Intrib Intrib |

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Site Data for Project: Mercer Island-SD-C3

| | Site | ID | City | | Street | t | Date | Time |
|----|-------|----------------|---------------|---------------|----------------|----------------|------------|---------------------------------------|
| | 1 | | MERCER ISLAND | | SE 37TH ST & 7 | 7TH AV SE | 09/30/2005 | 01:24:30 PM |
| | : | M.H. Sta | art | M.H. S | top | M.H. Depti | n Starting | Dist Final Dist |
| | ····· | 43 | | 1 | 7 |] | 6.0 | +287.0 |
| | Тур | oe of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| | | Concrete | 12 | 3 | Away-U | Paved Asphalt | Jerry H | yatt . |
| | • | o [.] | | | Comment | | | · · · · · · · · · · · · · · · · · · · |
| ΙΓ | | | AGAINS | ST THE FLOW-S | STORM DRAINAG | E-MAP SHEET C3 | | |
| E | | G | | | | | | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|--------|------------|-------|------------|------------------|--------------------------------|---------|--------|--------|---------|-------|----------|
| | 1 | Q . | | Other | Downstream CB | | | | | 37.60 | | 03:13:04 |
| 1 | 2 | 287.0 | | Other | Upstream CB | | | | | 497.55 | | |
| | ~ ~ | | | | • | ارینہ _{میں} انہ میں ا | L | | | · · · · | | |

Page 1 of 1

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Pro-Vac/Gary's Tele-Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

Site Data for Project: Mercer Island-SD-C3

| Site ID | | City | | Street | t | Date | Time |
|-----------|----------|--|-------------|----------------|---------------|------------|-----------------|
| 2 | <u> </u> | MERCER ISLAND | | SE 37TH ST & 7 | 7TH AV SE | 10/06/2005 | 01:26:25 PM |
| М. | H. Start | ······································ | M.H. S | | M.H. Depth | n Starting | Dist Final Dist |
| | 46 | "JL | 3 | 3 | | 6.0 | +298.7 |
| Type of F | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition | Operator |
| Concre | te. | 18 | 3 | Away-D | Paved Asphalt | Jerry I | lyatt |
| | | · · | | Comment | | | |
| | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET C3 | | · · · · · · |
| • | | | | • | · / | | |

Observation Data

| 0 | bs ID | Ft | Lat | Ft Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|-----|-------|-------|-----|---------------|------------------|----------|---------------------------------------|--------|--------|---------|--------|---------------------------------------|
| . 1 | | 0 | | Other | Upstream CB | | | | | 41.26 | | 00:17:23 |
| . 2 | | 137.3 | | Service Conn. | service left | • | | | | 260.29 | | |
| | | 177.9 | | Service Conn. | service left | | · · · · · · · · · · · · · · · · · · · | | | 354,35 | | 1 |
| | | 254.1 | | Service Conn. | service right | | i | | | 490.00 | | |
| 5 | | 259.7 | | Service Conn. | service left | | | · · | | 524.22 | | 1 |
| 6 | | 281.7 | Ι | Service Conn. | service left | | | | | 582.45 | · | |
| 7 | | 293.2 | | Service Conn. | service left | | | | | 621.57 | | 1 |
| 8 | | 294.0 | | Service Conn | service left | | | · . | · | 680.42 | | · · · · · · · · · · · · · · · · · · · |
| 9 | | 298.7 | | Other | Downstream CB | | | | | 714.33 | ·····. | 1 |



Site Data for Project: Mercer Island-SD-C3

| Site ID | | City | - | Street | 2 | Dat | te | Time | |
|--|----------|---------------|---------------|----------------|----------------|---------|--|-------------|--|
| 3 | . K | AERCER ISLAND | | SE 37TH ST & 7 | 7TH AV SE | 10/06/2 | 2005 | 01:47:45 PN | |
| M.I | H. Start | | M.H. S | top | M.H. Depth | i Sta | rting Dist | Final Di | |
| ······································ | 46 | | 42 | 2 |][| | 7.0 | +122.9 | |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Ope | rator | |
| Concrete | 9 | 12 | 3 | Away-U | Paved Asphalt | | Jerry Hyatt | | |
| | | | · | Comment | • | , | | | |
| | | AGAINS | ST THE ELOW-S | TORM DRAINAG | E-MAP SHEET C3 | | ···· · · · · · · · · · · · · · · · · · | ×. | |

Observation Data

| O | bs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|-----------|-------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | • • | Ö | | Other | Downstream CB | | | | | 20.61 | | 00:33:45 |
| 2 | | 77.7 | | Service Conn. | service left | | | . · ·. | 1 | 138.06 | | |
| |),- ,- | 122.9 | | Other . | Upstream CB | | | | | 258.68 | | |
| | | | | | | | | | | | | |



Site Data for Project: Mercer Island-SD-C3-2

| Site ID | | City | | Street | t | Date | Time |
|-----------|----------|---------------|---------------|----------------|---------------------------------------|--|-----------------|
| 4 | | MERCER ISLAND | | SE 37TH ST & 7 | 6TH AV SE | 01/08/2006 | 04:17:34 PM |
| M. | H. Start | • • • | M.H. S | top | M.H. Depti | h Starting | Dist Final Dist |
| L | 17 | | 8 | 7 | • | 0 | 91.4 |
| Type of F | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition (| Operator |
| Concre | te | 12 | 3 | Away-U | Paved Asphalt | Jerry Hy | /att |
| | | | | Comment | | | |
| | | AGAINS | ST THE FLOW-S | STORM DRAINAG | E-MAP SHEET C3 | ······································ | · · |
| | | · . | | | · · · · · · · · · · · · · · · · · · · | | |

| Obs ID | Ft | Lat Ft Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|-----------------|------------------|----------|---------|--------|--------|---------|-------------------------------|-------------|
| 1 | . 0 | Other | Downstream CB | | | | | | | |
| 2 | 62.5 | Pipe Problem | Possible Sag | | | | | | · · · · · · · · · · · · · · · | |
| 14 | 55.6 | Joint Problem | Separated | | MEDIUM | | | | ~~~~ | · · · · · · |
| | 59.2 | Joint Problem | OFFSET | • | MEDIUM | | | | | |
| 5 | 60.2 | Pipe Problem | End Sag | | | | | | | |
| 6 | 91.4 | Other | Upstream CB | | · · · · | | | | ···· | |

dist many gent and the losts



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PRO-VAC 6622 112th ST E Puyallup, WA 98373 Cell#206-423-2445 Office#253-435-4328

Site Data for Project: Mercer Island-SD-C3-2

| Site ID | | | | Street | Date | Time | |
|-----------|-----------------|---------------|--------------|----------------|----------------|------------|-----------------|
| 5 |][! | MERCER ISLAND | | SE 37TH ST & 7 | '6TH AV SE | 01/08/2006 | 04:34:16 PM |
| M | .H. Start | | M.H. S | itop | M.H. Depth | n Starting | Dist Final Dist |
| | 17 | } | 1 | 8 | | 0 | 85.9 |
| Type of I | Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition | Operator |
| Concre | te [.] | 12 | 3 | Away-U | Paved Asphalt | Jerry H | yatt |
| | | | | Comment | | | |
| | | AGAINS | ST THE FLOW- | STORM DRAINAG | E-MAP SHEET C3 | | |
| | | | | | | | |

| Ft | Lat Ft Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidID | TapeCnt |
|------|---------------------------|--|---|---|---|---|---|---|---|
| 0 | Other | Downstream CB | | | | | | · · | |
| 54.1 | Pipe Problem | Possible Sag | - ^ | 1800 | SGRO | UT 1 | n re | 1D in | 1 |
| 80,1 | Joint Problem | OFFSET | | HEAVY | 07 | 581 | ARATE | ارور م | ~~ |
| 82.6 | Pipe Problem | End Sag | | | | | | | 1 |
| 85.9 | Other | Upstream CB | | | | | | | |
| | 0 54.1 80,1 82.6 | 0 Other 54.1. Pipe Problem 80,1 Joint Problem 82.6 Pipe Problem | 0 Other Downstream CB 54.1. Pipe Problem Possible Sag 80,1 Joint Problem OFFSET 82.6 Pipe Problem End Sag | 0 Other Downstream CB 54.1. Pipe Problem Possible Sag 80,1 Joint Problem OFFSET 82.6 Pipe Problem End Sag | 0 Other Downstream CB 54.1. Pipe Problem Possible Sag 80,1 Joint Problem OFFSET 82.6 Pipe Problem End Sag | 0 Other Downstream CB 54.1. Pipe Problem Possible Sag 80,1 Joint Problem OFFSET 82.6 Pipe Problem End Sag | 0 Other Downstream CB 54.1. Pipe Problem Possible Sag 80,1 Joint Problem OFFSET 82.6 Pipe Problem End Sag | 0 Other Downstream CB 54.1. Pipe Problem Possible Sag 80,1 Joint Problem OFFSET 82.6 Pipe Problem End Sag | 0 Other Downstream CB 54.1. Pipe Problem Possible Sag 80,1 Joint Problem OFFSET 82.6 Pipe Problem End Sag |

Second John Scon Warnele Warnele



Site Data for Project: Mercer Island-SD-C3-2

| Site ID | | City | Street | | | | ite | Time |
|---------|------------------------|---------------|--------------|----------------|---------------------------------------|--------|------------|---------------|
| 6 | ! | MERCER ISLAND | | SE 36TH ST & 7 | '6TH PL SE | 01/08/ | /2006 | 04:38:39 PM |
| · N | I.H. Start | | M.H. S | itop | M.H. Depth | n Sta | arting Di | st Final Dist |
| | 31 |] | 3 | 3 | | | 0 | 212 |
| Type of | Type of Pipe Pipe Size | | Sec. Igth | Direction | Surface Con | dition | Op | perator |
| Concr | ete | 12 | 3 | Away-U | Paved Asphalt | | Jerry Hyat | t |
| | | | | Comment | • | | | |
| | | AGAINS | ST THE FLOW- | STORM DRAINAG | E-MAP SHEET C3 | | | |
| ······· | | | | | · · · · · · · · · · · · · · · · · · · | | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidID | TapeCnt |
|----------|-------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | | Other | Downstream CB | | | | | | | |
| 2 | 6.1 | | Root Problem | begin roots. | | LIGHT | | | | | |
| ، ا | 6.1 | | Joint Problem | Infiltration | | Light | | | - | | |
| <u>A</u> | 8.0 | | Root Problem | Medium | | | | | | | |
| 5 | 25.5 | | Root Problem | end roots | | | | | | | |
| 6 | 64.8 | | Joint Problem | OFFSET | | MEDIUM | | | | | |
| 7 | 64.8 | | Joint Problem | soil visible | | | | | | | |
| 8 · | 83.5 | | Root Problem | Light | | | | | | | |
| 9 | 170.4 | | Joint Problem | OFFSET | | Medium | | | | | |
| 10 | 212.0 | | Other | Upstream CB | | | | | | | |

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Site Data for Project: Mercer Island-SD-C3-2

| Site ID | | City | | Street | t | Date | Time |
|-----------|----------|---------------|---------------|----------------|----------------|--------------|-----------------|
| 7 | ۸ | MERCER ISLAND | | SE 36TH ST & 7 | '6TH PL SE | 01/08/2006 | 04:47:32 PM |
| М. | H. Start | | M.H. S | top | M.H. Depti | n Starting I | Dist Final Dist |
| | 30 | | 28 | 3 | | 0 | 71.3 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition (| Operator |
| Concret | e | 12 | 3 | Away-U | Paved Asphalt | Jerry Hy | /att |
| | | | | Comment | | | |
| | | AGAINS | ST THE FLOW-S | TORM DRAINAG | E-MAP SHEET C3 | | |
| | | | | | | | |

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt | |
|------|----------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|---------|--------|
| 1 | | 0 | | Other | Downstream CB | | | | | | | | ĺ |
| 2 | 2 | 65.8 | | Joint Problem | OFFSET | , · | MEDIUM | | | | | | ĺ |
| ુંડુ |) | 71.3 | | Other | Upstream CB | | | | | | | | , t |

S

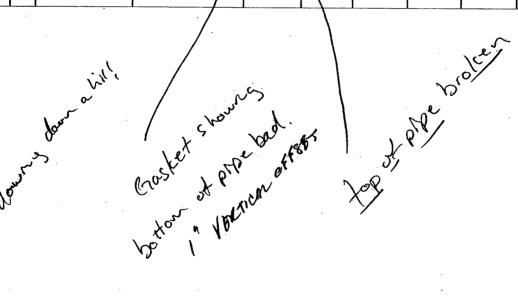


Site Data for Project: Mercer Island-SD-C3-2

| | City | | Street | Date | Time | |
|------------|---------------|---|--|--|--|--|
| | MERCER ISLAND | | SE 34TH ST & 7 | '6TH PL SE | 01/08/2006 | 04:50:32 PM |
| M.H. Start | | M.H. S | top | M.H. Depti | n Starting | Dist Final Dist |
| 28 | | 27 | 7 | | 0 | 177.7 |
| of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| ncrete | 12 | 3 | Away-D | Paved Asphalt | Jerry H | yatt |
| | | | Comment | | | |
| | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET C3 | | |
| | | MERCER ISLAND M.H. Start 28 of Pipe Pipe Size(in) horete 12 | MERCER ISLAND M.H. Start 28 27 of Pipe Pipe Size(in) Sec. Igth norrete 12 3 | MERCER ISLAND SE 34TH ST & 7 M.H. Start M.H. Stop 28 27 of Pipe Pipe Size(in) Sec. lgth Direction ncrete 12 3 Away-D Comment | MERCER ISLAND SE 34TH ST & 76TH PL SE M.H. Start M.H. Stop M.H. Depth 28 27 of Pipe Pipe Size(in) Sec. Igth Direction Surface Content ncrete 12 3 Away-D Paved Asphalt | MERCER ISLAND SE 34TH ST & 76TH PL SE 01/08/2006 M.H. Start M.H. Stop M.H. Depth Starting 28 27 0 of Pipe Pipe Size(in) Sec. Igth Direction Surface Condition ncrete 12 3 Away-D Paved Asphalt Jerry H Comment Comment |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|----------------|-------|-------|---------------|------------------|----------|---------|---------------------------------------|--------|---------|-------|---------|
| 1 | 0 | | Other | Upstream CB | | | | | | | |
| 2 | 76.4 | | Joint Problem | OFFSET | | MEDIUM | · · · · · · · · · · · · · · · · · · · | | | | |
| l ₃ | 109.7 | | Joint Problem | OFFSET | · | HEAVY | | | · | | |
| <i>.y</i> | 139.4 | | Pipe Problem | Circular Crack | | Medium | ٤٠٢) | 57 5P0 | 125PM | 2) | |
| 5 | 176.2 | | Joint Problem | OFFSET | | MEDIUM | | | | 7 | |
| 6 | 177.7 | | Other | Downstream CB | | | | | | | |



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Site Data for Project: Mercer Island-SD-C3-2

| 1 | Site ID | City | <i>I</i> | | Stree | Date | Time | | |
|------------|------------|-----------|----------|--------------------|-------------------------------|---------------|-----------------------------|-------------|--|
| | 9 | MERCER | ISLAND | | SE 34TH ST & T | 76TH PL SE | 01/08/2006 | 04:57:18 PM | |
| | M.ł | I. Start | | M.H. Stop M.H. Dep | | | epth Starting Dist Final Di | | |
| [Ľ | | 27 | | | 26 | | 0 | 64.7 | |
| | Type of Pi | pe Pipe S | ize(in) | Sec. Igth | Sec. Igth Direction Surface C | | | Operator | |
| | Concrete | | 2 | . 3 | Away-D | Paved Asphalt | t Jerry Hyatt | | |
| | | | | | Comment | | | | |
| , | | | WİTH | THE FLOW-S | ORM DRAINAGE | MAP SHEET C3 | · · · | | |
| | | | - | | | | | • | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|-------|------------|-------------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | | Other | Upstream CB | | | | | | | |
| 2 | 64.7 | | Other | Downstream CB | | | | | | | |
| | | | | | | | | | | | -L |

.√ √



| | | Site D |)ata for P | roject: Me | rcer Island-S | D-C3-2 | : |
|------------|----------|---------------|--------------|----------------|----------------|------------|-----------------|
| Site ID | | City | | Street | OR 7 the Ares | Date | Time |
| 10 | M | ERCER ISLAND | | SE 34TH ST & 7 | 6TH PL SE | 01/08/2006 | 04:59:55 PM |
| M.H | I. Start | 0 | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | 44 20 | 4 | 4 | 5 25°. |] | 0 | 146.1 |
| Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | ition | Operator |
| Concrete |) | 12 | 3 | Away-U | Paved Asphalt | Jerry I | Hyatt |
| · | | | | Comment | | | |
| | | ÀGAINS | ST THE FLOW- | STORM DRAINAĠI | E-MAP SHEET C3 | | |
| | • | | | | · | | |

| ĺ | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidID | TapeCnt |
|---|--------|-------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 1 | 0 | | Other | Downstream CB | | | | | | | · · |
| 2 | 2 | 146.1 | | Other | Upstream CB | | | | | | | |

12000



Site Data for Project: Mercer Island-SD-C3-2

| Site ID | | City | | Street | t - | Date | Time |
|---------|------------|---------------|-------------|----------------|---------------|------------|-----------------|
| 11 | | MERCER ISLAND | | SE 37TH ST & 7 | 7TH ST SE | 01/08/2006 | 05:02:10 PM |
| | M.H. Start | | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | 44 | | 4 | 3 |][| 0 | 72.8 |
| Туре | of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| Co | ncrete | 12 | 3 | Away-D | Paved Asphalt | Jerry H | yatt |
| | | | | Comment | | | · . |
| | | WITH | THE FLOW-ST | ORM DRAINAGE- | | | |
| | | | - | | | | - |

| 1 0 Other Upstream CB | | | |
|----------------------------|---|--|--|
| | 1 | | |
| 2 72.8 Other Downstream CB | | | |

700



Site Data for Project: Mercer Island-SD-C3-2

| Site ID | City | | Street | t | Date | Time | |
|-----------|-------------------|---------------|----------------|---------------|-----------------------|------|--|
| 12 | MERCER ISLAND | | SE 37TH ST & 7 | 7TH ST SE | 01/08/2006 05:05:10 F | | |
| M.I | H. Start | M.H. S | stop | Starting | Dist Final Dist | | |
| | 43 | 4 | 2 | | | 42.0 | |
| Type of P | ipe Pipe Size(in) | Sec. Igth | Direction | ition | Operator | | |
| Concrete | ə 12 | 3 | Away-D | Paved Asphalt | Jerty H | vatt | |
| | , | • | Comment | | · · · | | |
| | WITI | I THE FLOW-ST | ORM DRAINAGE- | MAP SHEET C3 | | | |
| | | | | | | | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|----|--------|------|-------|---------------|------------------|----------|---------|----------|--------|---------|-------|---------|
| | 1. | 0 | | Other | Upstream CB | | | - | | | - | |
| | 2 | 19.5 | | Pipe Problem | Possible Sag | | | | | | | |
| | | 19.5 | | Joint Problem | OFFSET | | MEDIUM | | | | | |
| | .! | 26.1 | T | Joint Problem | OFFSET | | MEDIUM | ·, | | | | |
| | 5 | 26.1 | | Pipe Problem | 1/2 Pipe | | | | | | | |
| -[| 3 | 32.3 | | Joint Problem | OFFSET | | HEAVY ~ | <u> </u> | | | | |
| | 7 | 32.3 | | Pipe Problem | End Sag | | | | | | | |
| 1 | } | 32.3 | | Other | Grade Change | | | / | | | | |
| |) | 42.0 | · | Other | Downstream CB | | / | | | | | |

I looks like the pipe is dropping over a sank, the pop of the pipe is well growted

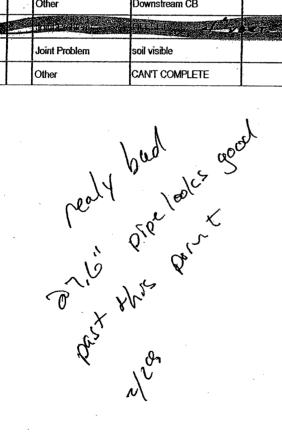
2/200



Site Data for Project: Mercer Island-SD-C3-2

| | Site ID | | City | | Stree | Date | Time | |
|-----|------------|----------|---------------|-------------------|---------------|---------------------------------------|------------|-----------------|
| | 13 | . M | ERCER ISLAND | | 3835 83RD | AV SE | 01/08/2006 | 05:14:30 PM |
| | M.H | H. Start | | M.H. Stop M.H. De | | | Starting I | Dist Final Dist |
| | | 199 | | 20 | 00 | | 0 | 7.6 |
| | Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition (| Operator |
| . · | Concrete | 9 | 12 | 3 | Toward-U | Paved Asphalt | Jerry Hy | /att |
| | | | | | Comment | | | |
| | | | AGAINS | ST THE FLOW- | STORM DRAINAG | E-MAP SHEET C3 | | |
| | | | | | | · · · · · · · · · · · · · · · · · · · | | |

| | Obs | D | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---|-----|---|-------------|-------|------------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| | 1 | | o | | Other | Downstream CB | | . · | | | | | |
| [| 2 | | 40 . | | n aun Ero Ventra | | | 56AA | | | | | 1 |
| F | • | | 7.6 | | Joint Problem | soil visible | | | · · | A | | | |
| |) | | 7.6 | | Other | CAN'T COMPLETE | | | | | | | 1 |





Site Data for Project: Mercer Island-SD-C3-2

| Site ID | | City | | Stree | t | Date | Time | |
|---------------------------------------|----------|---------------|-------------------------|--------------|---------------|--------------------------|----------|--|
| 14 | М | ERCER ISLAND | | 3835 83RD | AVSE | 01/08/2006 05:18: | | |
| M.I | H. Start | | M.H. S | top | M.H. Depth | A.H. Depth Starting Dist | | |
| · · · · · · · · · · · · · · · · · · · | 199 | | 19 | 8 | | 0 | 86.7 | |
| Type of Pipe Pipe Size | | Pipe Size(in) | in) Sec. Igth Direction | | Surface Conc | lition (| Operator | |
| Concret | e | 12 | 3 | Away-D | Paved Asphalt | Jerry Hy | ratt | |
| | | | | Comment | | | · · · | |
| | | WITH | THE FLOW-STO | ORM DRAINAGE | MAP SHEET C3 | · · | | |

| Obs | s ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt | |
|-------|------|------|-------|--------------|------------------|----------|---------|-----------|--------|---------|-------|---------|-------|
| 1 | | 0 | | Other | Upstream CB | | | | | | | | |
| 2 | | 25.2 | | | PIPE CURVES LT | | | | - | | | | 1 |
| | ١ | 86.7 | | Pipe Problem | | | ÎÎ AVY | - TS R.C. | icon | 70P. | RITE | PULLO | n. it |
| la st | | 86.7 | | | CAN'T COMPLETE | | | | | | | DEGRA | 4 |

CAN CAN Deter heres onder heres onder heres on here heres on here heres on


Site Data for Project: Mercer Island-SD-C3-2

| S | Site ID | | City | | Stree | Date | Time | |
|---|---------------------------|----------|---------------|--------------|---------------|---------------|------------|-----------------|
| | 15 | N | MERCER ISLAND | | 3843 83RD | AV SE | 01/08/2006 | 05:23:34 PM |
| | M. | H. Start | · . | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | • | 201 | | 20 | 10 | | 0 | 80.8 |
| | Type of Pipe Pipe Size(ii | | | Sec. Igth | Direction | Surface Cond | lition | Operator |
| | Concret | e . | 12 | 3 | Away-U | Paved Asphalt | Jerry H | yatt |
| | | | | | Comment | | | |
| | | | AGAINS | T THE FLOW-S | STORM DRAINAG | ······ |] | |
| | | | | | • | | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------------|------|------------|---------------------------------------|--|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | | Other | Downstream CB | | | | | | | |
| 2 | 80.8 | | Other | Upstream CB | | | | | | | |
| N | | - - | · · · · · · · · · · · · · · · · · · · | •••••••••••••••••••••••••••••••••••••• | | | | | | | |

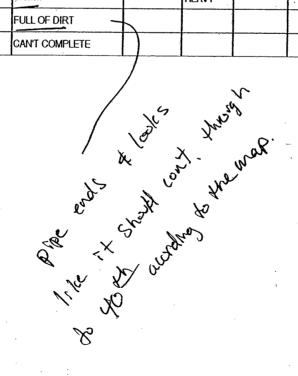




Site Data for Project: Mercer Island-SD-C3-2

| Site ID | | | | Stree | Date | Time | |
|---------|----------------------------|---------------|-------------|-------------------------------------|---------------|------------|-----------------|
| 16 | | MERCER ISLAND | | 3843 83RD | AV SE | 01/08/2006 | 05:26:37 PM |
| N | I.H. Start | | M.H. S | top | M.H. Depth | 1 Starting | Dist Final Dist |
| | 201 | | 20 | 12 | | 0 | 79.9 |
| Type of | Type of Pipe Pipe Size(in) | | | Direction | Surface Cond | dition | Operator |
| Concre | ete | 12 | 3' | Away-D | Paved Asphalt | Jerry H | lyatt |
| | | | | Comment | | | |
| | | WITH | THE FLOW-ST | HE FLOW-STORM DRAINAGE-MAP SHEET C3 | | | |
| | | | • | | | | |

| Ft | Lat Ft Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---------------|-----------------------------------|---|---|---|--|--|--|---|---|
| 0 | Other | Upstream CB | | | | | | | |
| 40.6 | Root Problem | Light | | | | | | | |
| 43.4 | Joint Problem | OFFSET | | LIGHT | | 1 | | ······································ | ··· |
| 79.9 | Pipe Problem | Broken | | HEAVY | | | | | |
| 7 <u>9</u> .9 | Pipe Problem | FULL OF DIRT - | | | | | | • • • • • • • • • • • • • • • • • • • | |
| 79.9 | Other | CAN'T COMPLETE | | | | | · | | |
| | 0 40.6 43.4 79.9 79.9 | 0Other40.6Root Problem43.4Joint Problem79.9Pipe Problem79.9Pipe Problem | 0 Other Upstream CB 40.6 Root Problem Light 43.4 Joint Problem OFFSET 79.9 Pipe Problem Broken 79.9 Pipe Problem FULL OF DIRT | 0 Other Upstream CB 40.6 Root Problem Light 43.4 Joint Problem OFFSET 79.9 Pipe Problem Broken 79.9 Pipe Problem FULL OF DIRT | 0 Other Upstream CB 40.6 Root Problem Light 43.4 Joint Problem OFFSET 79.9 Pipe Problem Broken HEAVY 79.9 Pipe Problem | 0 Other Upstream CB 40.6 Root Problem Light 43.4 Joint Problem OFFSET 79.9 Pipe Problem Broken Figure Problem FULL OF DIRT | 0 Other Upstream CB 40.6 Root Problem Light 43.4 Joint Problem OFFSET 79.9 Pipe Problem Broken File File | 0 Other Upstream CB 40.6 Root Problem Light 43.4 Joint Problem OFFSET 79.9 Pipe Problem Broken 79.9 Pipe Problem FULL OF DIRT | 0 Other Upstream CB 40.6 Root Problem Light 43.4 Joint Problem OFFSET 79.9 Pipe Problem Broken 79.9 Pipe Problem FULL OF DIRT |





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Site Data for Project: Mercer Island-SD-F3-2

| | Site ID | | City | | Street | t | Date | Time |
|----|------------|----------|---------------|--------------|---------------------------------------|----------------|------------|-----------------|
| 1C | 1 | M | IERCER ISLAND | | 4845 FORES | TAV SE | 01/08/2006 | 06:05:23 PM |
| | M.ł | H. Start | | M.H. S | Stop | M.H. Depth | n Starting | Dist Final Dist |
| | | 4 | | OPEN | N PIPE |][| 0 | 33.4 |
| | Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition | Operator |
| | CMP | | 24 | 10 | Away-U | Yard | Jerry H | yatt |
| | | | • | • | Comment | • | | |
| | | | AGAIN | ST THE FLOW- | STORM DRAINAG | E-MAP SHEET F3 | | |
| | | | | | · · · · · · · · · · · · · · · · · · · | | | |

Observation Data

| Obs ID | Ft | Lat Ft | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidlD | TapeCnt |
|--------|------|--------|-------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | о | Ot | ner | Downstream CB | | | | | | · · | |
| 2 | 28.6 | Se | rvice Conn. | left | | | | | | | |
| | 33.4 | Pip | e Problem | PIPE DOWNSIZES | | | | | | | |
| | 33.4 | Oth | er | CAN'T COMPLETE | | | | | | | |

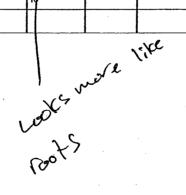


Site Data for Project: Mercer Island-SD-F3-2

| Site ID | | City . | | Street | Date | Time | |
|-----------|---------------------------------------|---------------|---------------------------------------|---------------|--------------|-------------|-----------------|
| 2 | M | ERCER ISLAND | | 4845 FORES | T AV SE | 01/08/2006 | 06:10:57 PM |
| M.I | H. Start | | М.Н. 9 | Stop | M.H. Dep | th Starting | Dist Final Dist |
| ······ | 4 | [| · · · · · · · · · · · · · · · · · · · | 3 | | 0 | 100.1 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Co | ndition | Operator |
| CMP | | 18 | 10 | Away-D | Yard | Jerry H | yatt |
| | | | •. | Comment | · · · | | |
| | · · · · · · · · · · · · · · · · · · · | WITH | THE FLOW-S | TORM DRAINAGE | MAP SHEET E3 | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------|-------|---------------|------------------|-----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | | Other | Upstream CB | | | | | | | |
| 2 | 10.5 | | Other | CMP TO CONC | | | | - | | | |
| | 19.0 | | Service Conn. | top | | | | | | | |
| | 31.2 | | Service Conn. | left | | | | | | | |
| 5 | 31.2 | | Service Conn. | Min Deposits | | HEAVY | | | | | |
| 6 | 41.4 | | Service Conn. | left | Λ | | | | | | |
| 7 | 41.4 | | Service Conn. | protruding4-6" | | | | | | | |
| 8 | 68.9 | | Service Conn. | left | | | | | | | |
| 9 | 70.4 | | Other - | perforated | 10 | | | | | | |
| 10 | 100.1 | | Other | Downstream CB | | | | | | | |





Site Data for Project: Mercer Island-SD-F3-2

| Site ID | City | 1 | | Street | Date | Time | |
|-----------|------------|------------|------------|---------------|--------------|--|-------------|
| 3 | MERCER | SLAND | | 4845 FORES | T AV SE | 01/08/2006 | 06:21:44 PM |
| M.ł | I. Start | | M.H. S | itop | M.H. Depth | Dist Final Dist | |
| [| 3 | | 2 | 2 |] | 0 | 31.8 |
| Type of P | ipe Pipe S | ize(in) \$ | Sec. Igth | Direction | Surface Cond | dition C | Operator |
| CMP | 1 | 8 | 10 | Away-D | Yard | Jerry Hy | att |
| - | | | | Comment | | | • |
| | | WITH T | HE FLOW-ST | ORM DRAINAGE- | MAP SHEET F3 | ······································ | |
| | | | | | | ······································ | ł |

Observation Data

| • | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|----|--------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| .> | 1 | 0 | | Other | Upstream CB | | | | | | | |
| | 2 | 7.8 | | Service Conn. | top | | | | | | | 1 |
| | \sum | 13.2 | | Service Conn. | top | | | | | | | |
| |) | 31.8 | | Other | Downstream CB | | | | | | | 1. |



Site Data for Project: Mercer Island-SD-F3-2

| | Site ID | | City | | Street | Date | Time | |
|--|------------|-----|---------------|-------------|----------------|--------------|-----------------|-------------|
| | 4 | N | IERCER ISLAND | | 4845 FORES | T AV SE | 01/08/2006 | 06:26:18 PM |
| | M.H. Start | | | М.Н. \$ | Stop | M.H. Dept | Dist Final Dist | |
| | | 2 | | • | 1 |] | 0 | 55.5 |
| | Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition C | Operator |
| | Concrete | 3 | 18 | 4 | Away-D | Yard | Jerry Hy | ratt |
| | | | | | Comment | | | |
| | | | WITH | THE FLOW-ST | FORM DRAINAGE- | MAP SHEET F3 | | |
| | | | | | | | | |

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|----|--------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|----------|---------|
| • | 1 | 0 | | Other | Upstream CB | | | | | | | |
| • | 2 | 31.8 | | Service Conn. | right | | | | | | <u>.</u> | |
| | | 36.7 | | Joint Problem | OFFSET | | MEDIUM | | | | | |
| ۰. | | 55.5 | | Other | Open Pipe | | | | | | | |

Carldnot read



Site Data for Project: Mercer Island-SD-F3-2

| Site ID | | City | | Street | t | Date | Time |
|--|----------|---------------|-------------|---------------|--------------|------------|--|
| 5 | M | ERCER ISLAND | | 4845 FORES | T AV SE | 01/08/2006 | 06:32:00 PM |
| M.I | H. Start | | M.H. S | top | M.H. Dept | h Starting | Dist Final Dist |
| ······································ | WC | | 4 | |] | 0 | 195.6 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| CMP | | 18 | 18 | Away-D | Yard | Jerry Hy | yatt |
| ÷ | | | · | Comment | | | · |
| | · · | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET F3 | ···· | ······································ |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|------------|-------|-------|---------------|------------------|-----------|---------|--------|--------|---------|----------|---------|
| 1 | 0 | | Other | Ореп Ріре | | | | | | | |
| 2 | 14.5 | 1 | Other | CMP TO CONC | · · . | | | | | | |
| 5 | 17.5 | | Joint Problem | Mineral Deposi | | MEDIUM | | | | | |
| 1 | 25,8 | | Joint Problem | Infiltration | | MEDIUM | - | | | | |
| 5 | 39.7 | | Joint Problem | Separated | | LIGHT | | | | | |
| 6 | 63.8 | | Joint Problem | OFFSET | | LIGHT | | | • • | | |
| 7 | 64.4 | | Other | PIPE CURVES LT | | | • | | | | |
| 8 . | 75.9 | | Joint Problem | Separated | | HEAVY | | | | | |
| 9 | 75.9 | | Joint Problem | soil visible | | | | | | | |
| 10 | 75.9 | | Joint Problem | void | | MEDIUM | | | | | |
| 11 | 78.6 | | Joint Problem | OFFSET | | LARGE | | | | | |
| 12 | 99.6 | | Joint Problem | Separated | | LARGE | | | | | |
| 13 | 99.6 | | Joint Problem | soil visible | | | | | | | |
| 14 | 102.8 | | Joint Problem | OFFSET | | MEDIUM | | | | | |
| 15 | 117.9 | ŀ | Root Problem | begin roots | | LIGHT | | | | | |
| 16 | 123,8 | | Joint Problem | Separated | · | HEAVY | | | | | |
| 17 | 123.8 | | Joint Problem | soil visible | | | | | | ····· | 1 1 |
| 18 | 163.5 | | Joint Problem | Separated | | LARGE | | | | | |
| 19. | 163.5 | | Joint Problem | soil visible | · · · · · | | | | | | |
| j. | 163.5 | | Joint Problem | void | | LARGE | | | | <u>.</u> | |

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Site Data for Project: Mercer Island-SD-F3-2

| Site ID | | City | | Street | t | Date | Time | |
|-----------|----------|--------------|-------------|---------------|--------------|------------|-----------------|--|
| 5 | MEF | RCER ISLAND | | 4845 FORES | TAV SE | 01/08/2006 | 06:32:00 PM | |
| M.I | H. Start | | M.H. S | top | M.H. Depth | Starting | Dist Final Dist | |
| | WC | | 4 | ļ |] | 0 | 195.6 | |
| Type of P | ipe P | ipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator | |
| CMP | | 18 | 18 | Away-D | Yard | Jerry Hy | /att | |
| | | | | Comment | | | | |
| | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET F3 | | | |
| | | | | | | | | |

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---------------|------------|---------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| | 21 | . 195.6 | | Other | CONC TO CMP | | | | | | | · |
| | 22 | 195.6 | | Other | SIZE CHANGE | | | | | | | |
| <u>с</u> -н.) | <i>ل</i> ر | 195.6 | | Other | CAN'T COMPLETE | | | | | | | |

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12.92

PRO-VAC 6622 112th ST E Puyallup, WA 98373 Cell#206-423-2445 Office#253-435-4328

1

Site Data for Project: Mercer Island-SD-F5-2

| Site ID | | City | | Street | Date | Time | |
|---------|------------|---------------|-------------|----------------|---------------------------------------|--------------|-----------------|
| 1 | | MERCER ISLAND | | 5225 E MER | CERWY | 01/08/2006 | 06:58:44 PM |
| | M.H. Start | | М.Н. S | Stop | M.H. Depth | n Starting I | Dist Final Dist |
| | 22 | | OPEN | N PIPE | | 0 | 46.7 |
| Туре о | f Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition (| Operator |
| Conc | rete | 12 | 3 | Away-D | Paved Asphalt | Jerry Hy | att |
| | | | | Comment | | | |
| L | | WITH | THE FLOW-ST | FORM DRAINAGE- | MAP SHEET F5 | | |
| • | • | | | | · · · · · · · · · · · · · · · · · · · | | |

Observation Data

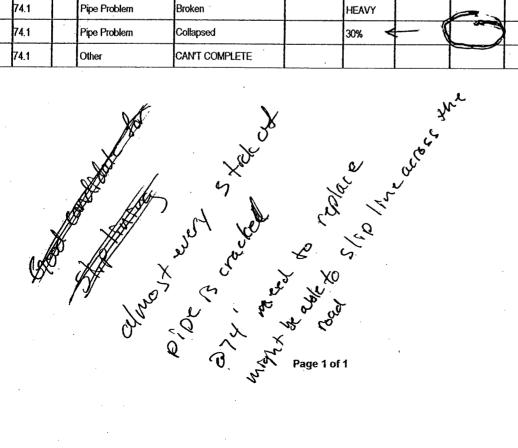
| Obs ID | Ft | Lat Ft | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|--------|--------------|------------------|----------|---------|--------|--------|---------|---------------------------------------|---------|
| 1 | 0 | | Other | Upstream CB | | | | | | | |
| 2 | 34.1 | | Other . | Grade Change | | | | | ! | | |
| - [| 39.5 | | Root Problem | begin roots | | LIGHT | | | | | 11 |
| | 46.7 | | Other | Open Pipe | | | | | | · · · · · · · · · · · · · · · · · · · | 1 |



Site Data for Project: Mercer Island-SD-F5-2

| ŕ | | ······ | | N. OF 490 | 25 EXIW | | · · · · · · · · · · · · · · · · · · · |
|-----------|----------|------------|------------|----------------|---------------|------------|---------------------------------------|
| Site ID | (| City | | Street | | Date | Time |
| 2 | MERC | ER ISLAND | | E MERCER HIGHL | ANDS & EMW | 01/08/2006 | 07:04:06 PM |
| M.I | H. Start | | М.Н. : | Stop | M.H. Depth | Starting I | Dist Final Dist |
| OP | EN PIPE | | OPE | N PIPE |] | 0 | 74.1 |
| Type of P | ipe Pip | e Size(in) | Sec. Igth | Direction | Surface Cond | lition (| Operator |
| VCP | | 18 | 3 | Away-D | Paved Asphalt | Jerry Hy | vatt |
| | | | | Comment | | | |
| | | WITH | THE FLOW-S | TORM DRAINAGE- | MAP SHEET F5 | |] |
| | | | | | | | |

| Obs ID | Ft | Lat Ft | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|------------|-------|--------|-------------|------------------|----------|---------|--------------------|--------|---------|-------|---------|
| 1 | 0 | c | Other | Open Pipe | | | | | · | | |
| 2 | 9.3 | Р | ipe Problem | Longit Crack | 12 | MEDIUM | $\mathbf{\Lambda}$ | | | | |
| | 9.3 | · P | ipe Problem | Longit Crack | 03 | MEDIUM | | BLO | | | |
| - <u>-</u> | 9.3 | Р | ipe Problem | Longit Crack | 06 | MEDIUM | 7 | 9-560 | -0 | | 1 |
| 5 | . 9.3 | Р | ipe Problem | Longit Crack | 09 | MEDIUM | / | | | | |
| 6 | 64.0 | Р | ipe Problem | Collapsed | | 20% | | | | | |
| 7 | 74.1 | P | ipe Problem | Broken | | HEAVY | | | | | |
| 8 | 74.1 | P | ipe Problem | Collapsed | | 30% < | - (| | | | |
| 9 | 74.1 | 0 | ther | CAN'T COMPLETE | | | | | • | | |





Site Data for Project: Mercer Island-SD-G5

| | Site ID | | | | Street | t | Date | Time |
|--|-----------|----------|---------------|-------------|---------------|------------------|------------|-----------------|
| | 1 | M | ERCER ISLAND | | 6160 94TH | AV SE | 10/06/2005 | 11:57:52 AM |
| | M.I | H. Start | | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | | 66 | | 6 | 7 | | 6.0 | +195.0 |
| | Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| | Concrete | e | 12 | 3 | Away-D | Difficult Access | Jerry H | yatt |
| | | • | | • | Comment | · · · · | | |
| | | | WITH | THE FLOW-ST | ORM DRAINAGE- | MAP SHEET G5 | | |
| | | | | | | | | |

| _ | Obs ID | Ft | Lat Ft | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipiD | VidID | TapeCnt |
|-----|--------|-------|--------|--------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| | 1 | 0 | C | Other | Upstream CB | | | | | 41.53 | | 00:00:00 |
| Ī | 2 | 147.9 | 0 | Other | OLD REPAIR | | | | | 445.73 | | |
| | | 154.1 | | Other | PIPE CURVES LT | | | - | | 476.13 | | |
| • • | .) | 192.2 | J | oint Problem | Separated | | HEAVY | | | 618.35 | | |
| | 5 . | 195.0 | | Other | Downstream CB | | | | | 754.89 | | |



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Site Data for Project: Mercer Island-SD-H2-2

| Site ID | | City | | Street | | Date | Time |
|---------|------------|---------------|---------------|--------------|----------------|---------------------------------------|-----------------|
| 1 | | MERCER ISLAND | · · · | 7515 SE 71 | ST ST | 01/08/2006 | 07:15:28 PM |
| | M.H. Start | | M.H. S | top | M.H. Depth | Starting I | Dist Final Dist |
| | 10 | | 10/ | A |] | 0 | 38.9 |
| Туре | of Pipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition (| Operator |
| Co | ncrete | 12 | 3 | Away-U | Yard | Jerry Hy | /att |
| 74.8 · | | | - | Comment | | · · · · · · · · · · · · · · · · · · · | |
| | | AGAINS | ST THE FLOW-S | TORM DRAINAG | E-MAP SHEET H2 | | |
| · · · | | | | | | | |

| Obs ID | . Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|----------|------|-------|---------------|------------------|----------|---------|--------|--------|---------|-----------------------------------|---------|
| 1 | o | | Other | Downstream CB | | | | | | | |
| 2 | 10.0 | | Other | PERF PIPE | | | | | | | |
| <u> </u> | 12.2 | | Root Problem | Light | | | | | | | |
| | 15.5 | | Joint Problem | Separated | | MEDIUM | | | | | |
| 5 | 15.5 | | Root Problem | end roots | | | | | | | |
| 6 | 15.5 | | Other | END PERF PIPE | | - | | | | | |
| 7 | 28.7 | | Other | PIPE CURVES RT | | | | | | | |
| 8 | 28.7 | | Other | PERF PIPE | | | | | | | |
| 11 | 31.3 | | Joint Problem | soil visible | | | | | | | |
| 9 | 31.4 | | Other | END PERF PIPE | | | ÷ | | | | |
| 10 | 31.4 | | Joint Problem | Separated | | MEDIUM | | | | - | · |
| 12 | 38.9 | | Other | PIPE CURVES RT | | | ·. | | | | |
| 13 | 38.9 | | Other | CAN'T COMPLETE | | | | | | 1,42,4 <u>0,40,40,40,40,40,40</u> | |



XXX

Pro-Vac/Gary's Tele-Scan 6622 112th ST E Puyallup, WA 98373 253-435-4328 cell 206-423-2445

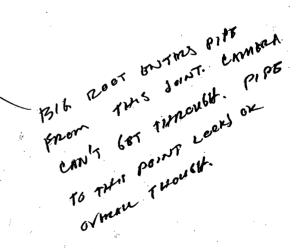
6

Site Data for Project: Mercer Island-SD-H3

| Site ID | | City | | Stree | t | Da | ate | Time |
|---------------------------------------|----------|---------------|-------------|----------------|--------------|------------|--------------|-----------------------|
| 1 | . I | MERCER ISLAND | | 80TH AV SE & S | SE 70TH ST | 09/30 | /2005 | 10:15:50 AM |
| M.F | I. Start | | M.H. S | M.H. Depth | n St | arting Dis | t Final Dist | |
| | 115 | | 11 | 0 | | | 7.0 | +98.2 |
| Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition | Оре | erator |
| Concrete | Э, | 24 | 4 | Away-D | Private Yard | | Jerry Hyatt | ····· |
| | | | | Comment | | | | |
| • | | WITH | THE FLOW-ST | ORM DRAINAGE | MAP SHEET H3 | | | · · · |
| · · · · · · · · · · · · · · · · · · · | | | | | | | | 191 19 |
| | | | | | | | | and the second second |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidiD | TapeCnt |
|-------------------------|------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | o | 1 | Other | Upstream CB | | | | | 35.69 | | 02:21:00 |
| 2 | 8.3 | | | Mineral Deposi | 1 | LIGHT | | | 681.59 | | |
| | 96.5 | | Room | Heavy | | | | | 883.57 | | |
| $\langle \cdot \rangle$ | 98.2 | | Other | CAN'T COMPLETE | | | | | 1035.66 | | |



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Site Data for Project: Mercer Island-SD-H3

| | Site ID | | | | Street | Date | Time | |
|----|------------|----------|---------------|--------------|----------------|----------------|------------|---------------------------------------|
| ļL | 2 | N | IERCER ISLAND | | 80TH AV SE & S | SE 67TH ST | 09/30/2005 | 11:18:13 AM |
| | M.F | I. Start | | м.н. s | Stop | M.H. Depth | 1 Starting | Dist Final Dist |
| | | 62 | | 1 | 10 |] | 7.0 | +61.1 |
| ŀ | Type of Pi | ipe | Pipe Size(in) | Sec, Igth | Direction | Surface Con | dition | Operator |
| 1C | Concrete |) | 24 | 4 | Away-U | Private Yard | Jerry H | yatt |
| | | | | | Comment | | | |
| IL | | | AGAINS | ST THE FLOW- | STORM DRAINAG | E-MAP SHEET H3 | | |
| L | | | | · . | | · | | · · · · · · · · · · · · · · · · · · · |

Observation Data

| Obs ID | Fţ | Lat Ft | Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VelipID | VidID | TapeCnt |
|--------|------|--------|-----------|------------------|----------|---------|--------|--------|---------|-------|----------|
| 1 | o | Oth | er | Downstream CB | | | | | 30.34 | | 02:29:52 |
| 2 | 34.7 | Othe | ж 🤇 | 24" X 18" | | v | | | 168.08 | | |
| · . | 40.7 | . Roo | t Problem | begin roots | | LIGHT | | | 233.95 | | |
| | 59.2 | Roo | Problem | Medium | | | | | 281.93 | | |
| 5 | 61.1 | Othe | er . / | CAN'T COMPLETE | | | ····· | · | 329.23 | | |

1 Smiles Bib Roor





Site Data for Project: Mercer Island-SD-H3

| Site ID | | | | Stree | Date | Time | |
|---------------------------------------|----------|----------|------------|---------------|--------------|------------|--|
| 3 | MERCE | R ISLAND | | 80TH AV SE & | SE 67TH ST | 09/30/2005 | 11:38:24 AM |
| M.H | I. Start | | M.H. 9 | Stop | M.H. Depth | Starting I | Dist Final Dist |
| | 62 | | | 59 | | 7.0 | +327.0 |
| Type of P | ipe Pipe | size(in) | Sec. Igth | Direction | Surface Cond | lition (| Operator |
| Concrete | | 24 | 4 | Away-D | Private Yard | Jerry Hy | vatt |
| | | | | Comment | | | |
| · · · · · · · · · · · · · · · · · · · | | WITH | THE FLOW-S | TORM DRAINAGE | MAP SHEET H3 | | |
| | | | | | | | ······································ |

Observation Data

| Obs ID | Ft | Lat F | Ft Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-------|-------|---------------|------------------|----------|----------------------|-------------------|---------|---------|-------|----------|
| 1 | o | | Other | Upstream CB | | | | | 30.25 | | 02:35:29 |
| 2 | 139.2 | Ţ. | Service Conn. | service right | | | | | 355.32 | | |
| | 141.4 | | Service Conn. | service right | | | | | 382.68 | | |
| | 254.4 | | Service Conn. | service right | | | | | 629.98 | | |
| 5 | 277.1 | 1 | Root Problem | -Light | | | | | 716.53 | | |
| 6 | 327.0 | 1 | Other | Downstream CB | | | | | 922.44 | | |
| 7 | 327.0 | | Other (| Roots in MH | | HEAVY | | | 967.54 | | |
| - | | | | | 14 4 | 1 ⁴ Ck 74 | 7 3) 07 | و کر کې | J Slor | 1 | · |
| | | | | | | | | | | "fo | |
| | | | | 00 | | | | | | | |

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Site Data for Project: Mercer Island-SD-H3

| Site ID | City | | Street | Date | Time | |
|-------------|-----------------|---------------|----------------|----------------|------------|-----------------|
| 4 | MERCER ISLAND | | 80TH AV SE & S | SE 65TH ST | 09/30/2005 | 12:10:19 PM |
| М.Н. | Start | M.H. S | top | M.H. Dept | h Starting | Dist Final Dist |
| × 2 | 3 | 59 |) |][| 7.0 | +102.0 |
| Type of Pip | e Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| Concrete | 24 | 4 | Away-U | Private Yard | Jerry H | lyatt |
| | | | Comment | · · · | | |
| | AGAINS | ST THE ELOW-S | TORM DRAINAG | E-MAP SHEET H3 | ····· | |

Observation Data

| г | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipiD | VidlD | TapeCnt |
|---|--------|-------|-------|---------------|------------------|----------|---------|--------|--------|---------|------------|----------|
| | 1 | 0 | | Other | Downstream CB | | | | | 22.87 | | 02:51:46 |
| - | 2 | 33.2 | | Service Conn. | service left | | | | | 93.06 | - <u> </u> | |
| | · 、 | 100.1 | | Root Problem | begin roots | | HEAVY | | | 216.75 | | |
| | | 102.0 | | Other | CAN'T COMPLETE | | | • | | 309.64 | | |

ROOT MAT

A



Site Data for Project: Mercer Island-SD-H3-2

| Site ID | City | | Stree | Date | Time | |
|-----------|---------------|-----------------|----------------|--------------|---------------------------------------|-----------------|
| 5 | MERCER ISLA | AND | 80TH AV SE & S | SE 65TH ST | 01/08/2006 | 05:36:27 PM |
| M.ł | I. Start | M.H. | Stop | M.H. Depti | n Starting | Dist Final Dist |
| | 23 | OPE | N PIPE | | 0 | 153.3 |
| Type of P | ipe Pipe Size | (in) Sec. Igth | Direction | Surface Con | dition | Operator |
| VCP | 24 | 4 | Away-D | Yard | Jerry H | yatt |
| | | · . | Comment | | | |
| | | WITH THE FLOW-S | TORM DRAINAGE | MAP SHEET H3 | · · · · · · · · · · · · · · · · · · · | |
| | • | | | | | |

Observation Data

| Obs ID | Ft | Lat F | -t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---------|-------|--------------|--------------|------------------|---|---------|--------|------------|---------|-------|----------|
| 1 | 0 | | Other | Upstream CB | | | | | | | |
| 2 | 107.8 | | Pipe Problem | Longit Crack | 12 | | | | | Ī | |
| <u></u> | 117.4 | | Pipe Problem | Longit Crack | 12 | MEDIUM | CRAR | K W | OGNS | Hores | |
| Ž | 117.4 | | Pipe Problem | Longit Crack | 03 | MEDIUM | | | | | |
| 5 | 117.4 | | Pipe Problem | Longit Crack | 06 | MEDIUM | | | | | |
| 6 | 117.4 | | Pipe Problem | Longit Crack | 09 | MEDIUM | | | | | |
| 7 | 130.2 | | Pipe Problem | Longit Cracks | | HEAVY | | | · | | |
| 8 | 134.0 | | Pipe Problem | Collapsed | | 20% | c mos | CRAC | so c | Ronni | |
| 9 | 144.8 | | Pipe Problem | Collapsed | | 30% | of 90 | r ð | | | |
| 10 | 1448 | | Pipe Problem | Broken / | والمعرفين المراجع | HEANY | | \sim | | | <u> </u> |
| 11 | 153.3 | | Pipe Problem | Collapsed | and the second se | 100% | | | | | |
| 12 | 153.3 | ant contract | Pipe Problem | Void | | LARGE | | | | | |
| 13 | 153.3 | SCHARAR CAN | Pipe Problem | Soil Visible | ⁽ , ² | ~ | | | | | |
| 14 | 153.3 | | Other | CAN'T COMPLETE | | | | | | | |



fc26 8010 56 657W &



PRO-VAC 6622 112th ST E Puyallup, WA 98373 Cell#206-423-2445 Office#253-435-4328

Site Data for Project: Mercer Island-SD-I2-2

| Site ID | City | | Street | | | Time |
|-------------|------------------|---|--|---|---|--|
| 1 | MERCER ISL | AND | 7623 W MERC | CER WAY | 01/08/2006 | 07:30:58 PM |
| М.Н. | Start | М.Н. 5 | Stop | M.H. Depth | Starting | Dist Final Dist |
| | 16 | 4 | 17 |] | 0 | 8.2 |
| Type of Pip | e Pipe Size | e(in) Sec. Igth | Direction | Surface Cond | lition | Operator |
| Concrete | 12 | 3 | Away-U | Paved Asphalt | Jerry H | yatt |
| | | | Comment | | | |
| | . Δ | GAINST THE ELOW | STORM DRAINAG | E-MAP SHEET 12 | | ····· |
| | 4 Type of Pip | 1 MERCER ISL M.H. Start 46 Type of Pipe Pipe Size Concrete 12 | 1 MERCER ISLAND M.H. Start M.H. Start 46 46 Type of Pipe Pipe Size(in) Concrete 12 | 1 MERCER ISLAND 7623 W MER M.H. Start M.H. Stop 46 47 Type of Pipe Pipe Size(in) Sec. Igth Concrete 12 3 Away-U Comment | 1 MERCER ISLAND 7623 W MERCER WAY M.H. Start M.H. Stop M.H. Depth 46 47 | 1 MERCER ISLAND 7623 W MERCER WAY 01/08/2006 M.H. Start M.H. Stop M.H. Depth Starting 46 47 0 Type of Pipe Pipe Size(in) Sec. Igth Direction Surface Condition Concrete 12 3 Away-U Paved Asphalt Jerry Hy |

Observation Data

| r | Ob | s ID | Ft | Lat | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|------------|--------|------|-----|-----|------------|------------------|----------|---------|--------|--------|---------|---------------------------------------|---------|
| | 1, | | 0 | | Other | Downstream CB | | | | | | | 1 |
| | 2 | | 8.2 | | Other | PIPE DOWNSIZES | | | | | | | |
| . Г | – ا | · · | 8,2 | | Other | CAN'T COMPLETE | | | | | | · · · · · · · · · · · · · · · · · · · | |

1520W Rossiericia in C347 FROVONS TV AREAS FROM OTHER THAN CB 46

enP r enc. emp TITT

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Page 1 of 1



Site Data for Project: Mercer Island-SD-I2-2

| Site ID City | | | | Street | Date | Time | |
|--------------|-----|---------------|--------------------------------------|------------|---------------|------------|-------------------|
| 2 | М | ERCER ISLAND | | 7800 W MER | CER WAY | 01/08/2006 | 07:36:22 PM |
| M.H. Start | | | M.H. S | Stop | M.H. Deptl | n Startin | g Dist Final Dist |
| 62 | | | 6 | 57 | | 0 | 48.4 |
| Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| VCP | | 12 | 3 | Away-D | Paved Asphalt | Jerry | Hyatt |
| · . | | | | Comment | | | |
| | | WITH | THE FLOW-STORM DRAINAGE-MAP SHEET 12 | | | | |
| | | | | | | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID . | VidID | TapeCnt |
|--------|--------|--------------|---------------|------------------|--|-------------------------|----------------|----------------|-----------|---------|-----------|
| 1 | 0 | | Other | Upstream CB | | | | | | | |
| 2 | 10.4 | | Joint Problem | Mineral Deposi | | LIGHT | | | | | |
|) | 10.4 | | Joint Problem | Infiltration | | LIGHT | | | · · · · | | |
| | 14.3 | | Joint Problem | Mineral Deposi | | LIGHT | | | | | |
| 5 . | 14.3 | | Joint Problem | Infiltration | | LIGHT | | | | | |
| 6. | 18.1 | | Joint Problem | Separated | | HEAVY | | 8 | | | |
| 7 | 18.1 | | Joint Problem | soil visible | | | | | Î. | | |
| 8 | 22.2 | | Joint Problem | OFFSET | | HEAVY | | and the second | | | |
| 9 | 222 | And a second | Joint Problem | soilwisible | and the second s | A Comment of the second | e | | | | |
| 10 | 26.5 . | | Joint Problem | OFFSET | | HEAVY | | | | | |
| 11 | 26.5 | | Joint Problem | soil visible | | | | | | ·*··· | |
| 12 | 30.4 | | Joint Problem | OFFSET | | HEAVY | P ^a | N. | | ······· | |
| 13 | 30.4 | | Joint Problem | soil visible | | | a sector and | Anna . | | ····· | |
| 14 | 46.5 | | Joint Problem | OFFSET | | HEAVY | | | | | |
| 15 | 46.5 | | Joint Problem | soil visible | | | | | | | |
| 16 | 48.4 | | Pipe Problem | Collapsed | | 100% | | | | | |
| 17 | 48.4 | · · | Pipe Problem | Broken | | HEAVY | | | | | |
| 18 | 48.4 | | Pipe Problem | Soil Visible | | | | | | | \square |
| 19 | 48.4 | | Pipe Problem | Void | | LARGE | | | | SPLAT | |

PIPER ROPLACE PIPER ROPLACE PIPER ROPLACE PIPER


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PRO-VAC 6622 112th ST E Puyallup, WA 98373 Cell#206-423-2445 Office#253-435-4328

Site Data for Project: Mercer Island-SD-I3-2

| Site ID City | | | Street | | | | e | Time |
|--------------|-----|---------------|---------------------------------------|-----------|-------------|---------|-------------------------|---------------------------------------|
| 1 | · M | ERCER ISLAND | | 7405 78TH | AV SE | 01/08/2 | 006 0 | 7:56:09 PM |
| M.H. Start | | | М.Н. 9 | Stop | M.H. Depth | n Star | Starting Dist Final Dis | |
| 58 | | | { | 54 |][| | 0 | 139.7 |
| Type of Pi | ipe | Pipe Size(in) | Sec. Igth Direction | | Surface Con | dition | Oper | ator |
| Concrete | э | 15 | 3 | Away-D | Yard | J | lerry Hyatt | |
| | | | Comment | u i | | | | |
| WITI | | | THE FLOW-STORM DRAINAGE-MAP SHEET 1 3 | | | | | |
| | | | | | | | | · · · · · · · · · · · · · · · · · · · |

Observation Data

| Obs ID | Ft | Lat F | category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|---------|-------|-------|---------------|------------------------|----------|---------|--------|--------|---------|---------|---------|
| 1 | þ | | Other | Upstream CB | | | | | | | |
| 2 | 15.3 | | Joint Problem | Mineral Deposi | | light | | | : | | |
| · · · · | 27.7 | | Joint Problem | Mineral Deposi | | Light | | | · | · · · · | |
| с | 27.7 | | Joint Problem | Infiltration | | LIGHT | | | | | |
| 5 | 94.9 | | Pipe Problem | Longit Crack | 12 | LIGHT | | | | | |
| 6 | 100.3 | | Pipe Problem | end crack ⁻ | | | | | | • | |
| 7 | 139.7 | | Other | Downstream CB | | | | | | | 1 |



Site Data for Project: Mercer Island-SD-I3-2

| Site ID | | | | Street | Date | Time | |
|-----------|----------|---------------|--------------|---------------|-------------------|------------|-----------------|
| 2 | M | IERCER ISLAND | | 7408 MERCER T | ERRACE DR | 01/08/2006 | 08:03:10 PM |
| М.І | H. Start | | M.H. S | top | M.H. Depti | n Starting | Dist Final Dist |
| 46 | | | 5 | 4 | | 0 | 113.0 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| Concrete | 9 | 15 | 3 | Away-U | Yard | Jerry H | /att |
| | | | | Comment | | | |
| AGAINS | | | ST THE FLOW- | STORM DRAINAG | BE-MAP SHEET IS 3 | | |
| | | | | | | | ····· |

| Obs iD | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidlD | TapeCnt |
|--------|-------|--------------|---------------|------------------|-------------|---------|---------|--------|---------|-----------|---------|
| 1 | 0 | | Other | Downstream CB | | | | | | | |
| 2 | 45.2 | | Pipe Problem | Circular Crack | | LIGHT | · | | | | |
| | 76.4 | | Service Conn. | left | | | | | | | |
| | 76.4 | | Service Conn. | Roots | | HEAVY | · | | | <u></u> , | |
| 5 | 99.5 | | Service Conn. | right | | | | | | | |
| 6 | 99.5 | | Service Conn. | protruding6"+ | | | | | | | |
| 7 | 101.5 | | Other | Grade Change | | | | | | · · | |
| 8 | 107.6 | | Joint Problem | broken | | Medium | | | | | |
| 9 | 110.0 | | Joint Problem | OFFSET | STATISTICS. | HEAVY | J. Mary | | | | |
| 10 | 113.0 | \mathbf{M} | Joint Problem | OFFSET | | HEAVY | ang. | · | | | 11 |
| 11 | 113.0 | | Other | CAN'T COMPLETE | | | | | | | |





Site Data for Project: Mercer Island-SD-J3

| Site ID | | City | | Street | t | Date | Time |
|-----------|----------|---------------|-------------|-----------------|---------------|--|-----------------|
| 1 |] | MERCER ISLAND | | 8410 W MER | CER WY | 10/27/2005 | 11:43:53 AM |
| М. | H. Start | | M.H. S | top | M.H. Depth | 1 Starting | Dist Final Dist |
| · | 107 | | 10 | 16 |] | 6.0 | +81.2 |
| Type of F | 'ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition | Operator |
| CMP-PERF | PIPE | 12 | 10 | Away-D | Paved Asphalt | Jerry Hy | yatt |
| | × | | | Comment | · · · · | ······································ | |
| | | WITH | THE FLOW-M/ | AP SHEET J3-STO | RM DRAINAGE | | |
| | | | | ······ | | | |

Observation Data

| Obs ID | Ft | Lat Ft C | ategory | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|----------------|------|----------|---------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | Other | | Upstream CB | | | | | 34.37 | | |
| " 2 · | 297 | Other | | PIPE CURVES RT | | | | | 119.81 | | |
| <u>نې د او</u> | 49.6 | Other | • | PIPE CURVES RT | | | | | 194.17 | | |
| - <u></u> | 69.4 | Root Pr | oblem | begin roots | | MEDIÚM | | | 303.99 | · · | |
| 5 | 80.0 | Pipe Pro | blem | under water | | | | | 376.60 | | |
| 6 | 81.2 | Other | | CAN'T COMPLETE | | | | ······ | 420.70 | | 1 |

repaired pipe 11.8.05 12' section.

i.

Garve as 2



Site Data for Project: Mercer Island-SD-J3

| Site ID | | | | Street | t . | Date | Time |
|------------|----------|---------------------------------------|---------------|--------------------------------------|---------------------------------------|------------|-----------------|
| 2 | М | ERCER ISLAND | | 8410 W MER | CER WY | 10/27/2005 | 12:13:47 PM |
| M.H | I. Start | | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| | 106 | · | 10 | 17 | · . | 6.0 | |
| Type of Pi | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | lition | Operator |
| CMP-PERF I | PIPE | 12 | 10 | Away-U | Paved Asphalt | Jerry H | yatt |
| | | · . | | Comment | | | |
| | , | AGAINS | ST THE FLOW-I | THE FLOW-MAP SHEET J3-STORM DRAINAGE | | | ····· |
| | | · · · · · · · · · · · · · · · · · · · | | | · · · · · · · · · · · · · · · · · · · | | |

Observation Data

| Óbs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|--------|-------|--------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | · | Other | Downstream CB | | | | | 63.99 | | |
| 2 | 30.1 | | Pipe Problem | DOWNSIZES | | | | - | 850.56 | | |
| | 30.1 · | | Pipe Problem | Broken | | HEAVY | • | | 868.48 | | 1 |

serve as 1



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PRO-VAC 6622 112th ST E Puyallup, WA 98373 Cell#206-423-2445 Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

| Site ID | City | | Street | · · | Date | Time | |
|------------|---------------------------------------|------------------|-------------------------------------|-----------------|------------|-----------------|--|
| 3 | MERCER ISL | AND | 84TH AV SE & S | E 83RD ST | 01/08/2006 | 08:27:06 PM | |
| М.Н | . Start | M.H. S | top | M.H. Dept | h Starting | Dist Final Dist | |
| | 89 | 88 | 8 |][| 0 | 113.9 | |
| Type of Pi | pe Pipe Size | (in) Sec. Igth | Direction | Surface Con | dition | Operator | |
| Concrete | 18 | 3 | Away-D | Wooded Hillside | Jerry H | yatt | |
| | | | Comment | | | | |
| | · · · · · · · · · · · · · · · · · · · | WITH THE FLOW-ST | HE FLOW-STORM DRAINAGE-MAP SHEET J3 | | | | |

Observation Data

| Obs ID | Ft | Lat F | t Category | (| Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidID | TapeCnt |
|-----------|-------|-------|--------------|------|------------------|----------|---------|--------|----------|---------|---------------------------------------|----------|
| 1 | o | - I | Other | Ups | tream CB | | | | | | | |
| 2 | 58.6 | | Root Problem | begi | n roots | (| MEDIUM |) | | | · · · · · · · · · · · · · · · · · · · | |
| 17 | 80.0 | | Root Problem | Heav | v) | | | | | | | |
| | 113.9 | | Other | CAN | T COMPLETE | | 7 | | | | | |
| · · · · · | | | • | | | ····· | ·/ | | . | | | I |

1 MODIUM REOT. LEVEL AND BECOMOS The FIGOROUS.

КОСТ МИТ БЛГТ В ДО / (Волгон 1/3- 05 рінь)





Site Data for Project: Mercer Island-SD-J3-2

| Site ID City | | | | Street | Date | Time | |
|---------------------------------------|-----------------|----|-------------|-------------------|-----------------|------------|-----------------|
| 4 | 4 MERCER ISLAND | | | 8259 W MERCER WAY | | | 08:34:50 PM |
| М. | H. Start | | M.H. : | Stop | M.H. Depth | n Starting | Dist Final Dist |
| · · · · · · · · · · · · · · · · · · · | 85 | | 8 | 7A | | 0 | 59.8 |
| Type of Pipe Pipe Size(in) | | | Sec. Igth | Direction | Surface Con | dition | Operator |
| Concret | te | 18 | 3 | Away-U | Wooded Hillside | Jerry H | lyatt |
| | | | Comment | | | | |
| AGAINS | | | ST THE FLOW | STORM DRAINAG | E-MAP SHEET J3 | | · |
| | | | | • | | | |

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 • | 0 | | Other | Downstream CB | | | | | | | |
| 2 | 59.8 | | Other | Buried CB | | | | | | | |

ЪС



Site Data for Project: Mercer Island-SD-J3-2

| Site ID | | | | Street | Date | Time | |
|------------|--------------------------|------|------------|----------------|--------------|-----------------|-------------|
| 5 | 5 MERCER ISLAN | | | 8259 W MERC | ER WAY | 01/08/2006 | 08:38:29 PM |
| M.H | M.H. Start | | | Stop | M.H. Depth | Dist Final Dist | |
| L | 87A | | | 87 |][| 0 | 156.8 |
| Type of Pi | Type of Pipe Pipe Size(i | | | Direction | Surface Con | dition (| Operator |
| CMP | CMP 18 | | | Away-U | Jerry Hy | att | |
| | | | | Comment | | | |
| L | | WITH | THE FLOW-S | TORM DRAINAGE- | MAP SHEET J3 | | |
| | _ | | | | | | |

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidiD | TapeCnt |
|--------|-------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | | Other | Downstream CB | | | | | | | |
| 2 | 156.8 | | Other | Upstream CB | | | | | | | |
| | | | | | ····· | | | | | | |

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Site Data for Project: Mercer Island-SD-J3-2

| Site ID | | City | • | Street | t | Date | Time |
|---------|------------|---------------|---------------|--------------------------------------|-----------------|------------|--|
| 6 | N | IERCER ISLAND | | 8259 W MERC | CER WAY | 01/08/2006 | 08:46:55 PM |
| 1 | M.H. Start | | M.H. S | top | M.H. Depth | n Starting | Dist Final Dist |
| | 87 | | 88 | 8 |][| 0 | 4.0 |
| Type of | Pipe | Pipe Size(in) | Sec. Igth | ec. Igth Direction Surface Cor | | | Operator |
| CM | P | 18 | 20 | Away-U | Wooded Hillside | Jerry Hy | /att |
| | | · · | Comment | | | | • |
| | | AGAIN | ST THE FLOW-S | THE FLOW-STORM DRAINAGE-MAP SHEET J3 | | | |
| | | | | | | | ······································ |

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|--------|-----|-------|------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | • | Other · | Downstream CB | | | | | | | d |
| 2 | 4.0 | | Other | CAN'T COMPLETE | | | | | | | |
| 3 | 4.0 | · | Other | GRADE TO STEEP | | | | | | | 11 |
| ./ | | | | | | | | | | | |





Site Data for Project: Mercer Island-SD-J3-2

| Site ID | | City | | Street | t | Date | Time |
|-----------|--------------------------|------|-----------|--------------------------------------|-----------------|------------|-------------------|
| 7. | 7 MERCER ISLA | | | 8259 W MERC | CER WAY | 01/08/2006 | 08:50:50 PM |
| M | .H. Start | | M.H. S | top | M.H. Depth | n Startin | g Dist Final Dist |
| L | 85 | | 84 | 1 |] | 0 | 62.4 |
| Type of I | Type of Pipe Pipe Size(i | | Sec. Igth | Direction | Surface Cond | dition | Operator |
| CMP | , · | 18 | 20 | Away-D | Wooded Hillside | Jerry | Hyatt |
| | | | | Comment | | | |
| | WIT | | | THE FLOW-STORM DRAINAGE-MAP SHEET J3 | | | |
| | | | | | | | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt | |
|---|--------|------|-------|------------|------------------|----------|---------|--------|----------|---------|-------|---------|---|
| | 1 | 0 | | Other | Upstream CB | | | | | | | | |
| | 2 | 62.4 | | Other | Downstream CB | | | | | | | 1. | ł |
| ~ | | | | | | • | | L | <u> </u> | | | | |

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Site Data for Project: Mercer Island-SD-J3-2

| | Site ID City | | | | Street | Date | Time | |
|---|---------------------------|-----|---------------|--------------------------------------|-------------|-----------------|------------|-----------------|
| | 8 | MEI | RCER ISLAND | | 8259 W MERC | ER WAY | 01/08/2006 | 08:52:54 PM |
| | M.H. Start | | | м.н. s | Stop | M.H. Dept | n Starting | Dist Final Dist |
| | 84 | | | | 13 | | 0 | 28.2 |
| | Type of Pipe Pipe Size(in | | Pipe Size(in) | Sec. Igth Direction | | Surface Con | dition | Operator |
| | CMP 18 | | | 20 | Away-D | Wooded Hillside | Jerry H | yatt |
| | | | | Comment | | | | |
| | | • | WITH | THE FLOW-STORM DRAINAGE-MAP SHEET J3 | | | · · · · | |
| L | | | | | · | | | |

Observation Data

| | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VcliplD | VidID | TapeCnt |
|---|--------|------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| • | 1 | o | | Other | Upstream CB | | | | | | | |
| | 2 | 28.2 | | Other | Downstream CB | · | | | | | | |



Site Data for Project: Mercer Island-SD-J3-2

| Site ID | | City | | Street | Date | Time | |
|---------|---------------------------|---------------|--------------------------------------|---------------------------|--------------|------------|-----------------|
| 9 | | MERCER ISLAND | | 8259 W MERC | CER WAY | 01/08/2006 | 08:54:43 PM |
| | M.H. Start | | M.H. S | top | M.H. Depth | Starting | Dist Final Dist |
| L | 83 | | 8 | 2 | | 0 | 48.7 |
| Type of | Type of Pipe Pipe Size(in | | | Direction | Surface Conc | lition | Operator |
| CM | CMP 18 | | | 20 Away-D Wooded Hillside | | | yatt |
| | | | | Comment | | | |
| [| | WITH | THE FLOW-STORM DRAINAGE-MAP SHEET J3 | | | | |
| | | | | • | | | |

| ٠ | Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|----|--------|------|-------|------------|------------------|--------------|---------|--------|--------|---------|-------|---------|
| | 1 | 0 | | Other | Upstream CB | | | | | | | |
| .1 | 2 | 48.7 | | Other | Downstream CB | | | | | | | |
| | | | | | | فير <u> </u> | | | 1 | | | ll |



Site Data for Project: Mercer Island-SD-J3-2

| Site ID | | City | | Stree | t | Date | Time |
|-----------|----------|---------------|-------------|--------------|-----------------|------------|-----------------|
| 10 | ME | RCER ISLAND | | 8259 W MER | CER WAY | 01/08/2006 | 08:58:11 PM |
| M.I | H. Start | | M.H. S | top | M.H. Dept | n Starting | Dist Final Dist |
| | 82 | | 81 | · · · · · |] | 0 | 192.2 |
| Type of P | ipe l | Pipe Size(in) | Sec. Igth | Direction | Surface Con | dition | Operator |
| CMP | | 18 | 20 | Away-D | Wooded Hillside | Jerry H | lyatt |
| | | | | Comment | | | |
| | | WITH | THE FLOW-ST | ORM DRAINAGE | -MAP SHEFT J3 | · | |

Observation Data

| Obs ID | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidiD | TapeÇnt |
|--------|-------|-------|---------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | 0 | | Other | Upstream CB | | | | | | | 1 |
| 2 | 30.4 | | Other | PIPE CURVES RT | | | | | · | | |
| 3 | 39.2 | | Joint Problem | OFFSET | | MEDIUM | | | | | |
|) | 68.8 | | Root Problem | begin roots | | MEDIUM | | | | | |
| 5 | 85.0 | | Other | PIPE CURVES LT | | | | · . | | | |
| 6 | 149.6 | | Root Problem | end roots | | | | | | | |
| 7 | 192.2 | | Other | Downstream CB | | | | | | | |

50' ROOTS

MODUM



140

PRO-VAC 6622 112th ST E Puyallup, WA 98373 Cell#206-423-2445 Office#253-435-4328

Site Data for Project: Mercer Island-SD-J3-2

| Site ID | | City | | Stree | t | Date | Time |
|-----------|----------|---------------|-------------|--------------|-----------------|------------|-----------------|
| 11 | M | ERCER ISLAND | | 8259 W MER | CER WAY | 01/08/2006 | 09:11:19 PM |
| M.I | H. Start | _ | М.Н. 8 | Stop | M.H. Depth | Starting | Dist Final Dist |
| L | 81 | | | 0 | | 0 | 81.4 |
| Type of P | ipe | Pipe Size(in) | Sec. Igth | Direction | Surface Cond | dition (| Operator |
| | | 18 | 20 | Away-D | Wooded Hillside | Jerry Hy | |
| | | | | Comment | | dl | |
| L | | WITH | THE FLOW-ST | ORM DRAINAGE | MAP SHEET J3 | ····· | |
| | | | | | | ····· | |

| Obs ID: | Ft | Lat F | t Category | Category Details | ClockPos | Sevr Lv | Ph1 ID | Ph2 ID | VclipID | VidID | TapeCnt |
|-----------|------|-------|------------|------------------|----------|---------|--------|--------|---------|-------|---------|
| 1 | þ | | Other | Upstream CB | | | | | | | |
| 2 | 60.7 | | Other | PIPE CURVES RT | | | | | | | |
| 3 | 81.4 | | Other | Downstream CB | | | | | | | |

Appendix G PROJECT SUMMARIES (BY SUBBASIN)



PROJECT SUMMARY SHEET

| Basin No.: | 4 |
|-------------------------|--|
| Project No: | 4.1 |
| Project Title: | 40 Feet of Channel Stabilization Northwest of Gallager Hill Road |
| Problem Description: | Headcut is moving upstream creating a 30-foot long incised channel into glacial till that is up to 7 feet deep. Contributing area is small. Located in undeveloped open space Northwest of Gallager Hill Road and SE 36 th Street. See Appendix E for a field sketch of the problem area. |
| Project Description: | Channel stabilization along about 40 feet of creek. |
| Related Projects | None |
| Estimated Project Cost: | \$45,000 |



Looking Upstream 9/24/2005



Project Location Map

| OJEC. | | CHECKED BY | | | | | |
|-------|--|-------------------|-------------|--------|----------|---------|--------|
| | | DATE: | 5/23/200 | 6 | | | |
| | CHANNEL STABILIZATION BID ITEM | QUANTITY | UNIT | | IT PRICE | 1 | AMOUNT |
| | | QUANTITY | UNIT | UN | II PRICE | | AMOUNT |
| | CLEARING AND GRUBBING | 30 | LF | ¢ | 10 | \$ | 30 |
| | CUTTING LARGE TREES | 30 1 | EA | \$ | | ъ \$ | |
| | | | | \$ | 1,000 | | 84 |
| | REMOVE/DISPOSE MISC DEBRIS | 30 | LF | \$ | 2 | \$ | |
| | EXCAVATION | 30 | CY | \$ | 50 | \$ | 1,5 |
| | BOULDERS | 12 | TON | \$ | 100 | \$ | 1,20 |
| | STREAMBED GRAVEL AND COBBLES | 8 | TON | \$ | 80 | \$ | 64 |
| | LOGS | 2 | EA | \$ | 1,500 | \$ | 2,2 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1,0 |
| | ACCESS (10' WIDE) | 200 | LF | \$ | 10 | \$ | 2,0 |
| | ACCESS RESTORATION | 200 | LF | \$ | 10 | \$ | 2,0 |
| | RIPARIAN PLANTING AND SEEDING | 30 | LF | \$ | 30 | \$ | 9 |
| | | | | | Subtotal | \$ | 12,6 |
| | SPECIAL ACCESS/CONSTRUCTION | 5% | | | | \$ | 6 |
| | MISC | 10% | | | | \$ | 1,2 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 1,2 |
| | TRAFFIC CONTROL | 5% | | | | \$ | (|
| | | | | | Subtotal | \$ | 16,4 |
| | MOBILIZATION | 10% | | | | \$ | 1,6 |
| | | | | | Subtotal | | 18,0 |
| | CONTINGENCY | 30% | | | | \$ | 5,4 |
| | | | | | Subtotal | \$ | 23,4 |
| | STATE SALES TAX | 8.80% | | | | \$ | 2,0 |
| | | Total Estimated C | onstruction | Cost (| Rounded) | \$ | 29,0 |
| | INDIRECT COSTS | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 7,2 |
| | PERMITTING | 10% | | | | \$ | 2,9 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 5,8 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | \$ | |

Notes:

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.

2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

PROJECT SUMMARY SHEET

| Basin No.: | 4 |
|-------------------------|---|
| Project No: | 4.2 |
| Project Title: | Bypass Pipes along west side of Gallager Hill Road |
| Problem Description: | Downstream of storm drain outlet, flow is scouring and undercutting toe of large, mapped slide. This is long term risk to Gallager Hill Road as well. Two other storm drain outlets contribute flow. See Appendix E for a field sketch of the problem area. |
| Project Description: | The preferred approach based upon the field reconnaissance includes installing manholes, anchor blocks, and 12-inch butt- fused HDPE pipes along 100 feet of water course and 40 feet at two side drainage systems to stop erosion of slide toe. Additional investigations are recommended for this problem with considerations of other alternatives and seeking input from WDFW. Two other options could be considered. The first is to re-route the drainage system in the road so that the majority of flow is directed to the downstream side drainage and then extend this pipe system to the channel at the toe of the slope. The system could be designed to allow low flows from the upper side drainage to continue to discharge down its side drainage. The second option is channel stabilization of the channel and only piping the side drainages down the steep slope. The cost estimate is based on the bypass pipes with 12-inch pipe. |
| Related Projects | None |
| Estimated Project Cost: | \$198,000 |



Looking Downstream at Outlet 9/24/2005



Project Location Map

| ROJEC | T: 4.2 | CHECKED BY | : msg | | | | |
|-------|--|-------------------|--------------|----------|----------|----------|--------|
| Y: | jcb | DATE: | 5/23/200 | 6 | | | |
| | BYPASS PIPE | OUANTITY | UNIT | | | r | AMOUNT |
| | BID ITEM | QUANTITY | UNIT | UN | T PRICE | | AMOUNT |
| | | 000 | 0)/ | ^ | 10 | ~ | 0.00 |
| | CLEARING AND GRUBBING | 200 | SY | \$ | | \$ | 2,00 |
| | | 10 | CY | \$ | 40 | \$ | 40 |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 5 | CY | \$ | 120 | \$ | 60 |
| | PIPE ANCHORS | 6 | EA | \$ | 800 | \$ | 4,80 |
| | 12" BUTT FUSED HDPE PIPE | 200 | LF | \$ | 75 | \$ | 15,00 |
| | ANCHOR BLOCK AND SPECIAL FITTINGS | 1 | EA | \$ | 5,000 | \$ | 5,00 |
| | MANHOLES/CB | 4 | EA | \$ | 3,500 | \$ | 14,00 |
| | UTILITY RELOCATIONS | 1 | EA | \$ | 8,000 | \$ | 8,00 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1,00 |
| | ACCESS (10' WIDE) | 75 | LF | \$ | 10 | \$ | 75 |
| | RESTORATION OF ACCESS AND AREA | 290 | SY | \$ | 15 | \$ | 4,35 |
| | | | | | Subtotal | \$ | 55,90 |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - |
| | MISC | 10% | | | | \$ | 5,59 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 5,59 |
| | TRAFFIC CONTROL | 10% | | | | \$ | 5,59 |
| | | | | | Subtotal | \$ | 72,67 |
| | MOBILIZATION | 10% | | | | \$ | 7,26 |
| | | | | | Subtotal | \$ | 80,00 |
| | CONTINGENCY | 30% | | | | \$ | 24,00 |
| | | | | | Subtotal | \$ | 104,00 |
| | STATE SALES TAX | 8.80% | | | | \$ | 9,15 |
| | | Total Estimated C | Construction | Cost (| Rounded) | \$ | 128,00 |
| | INDIRECT COSTS | | | ` | , | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 32,00 |
| | PERMITTING | 10% | | | | \$ | 12,80 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 25,60 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ | - |

Notes:

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.

The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

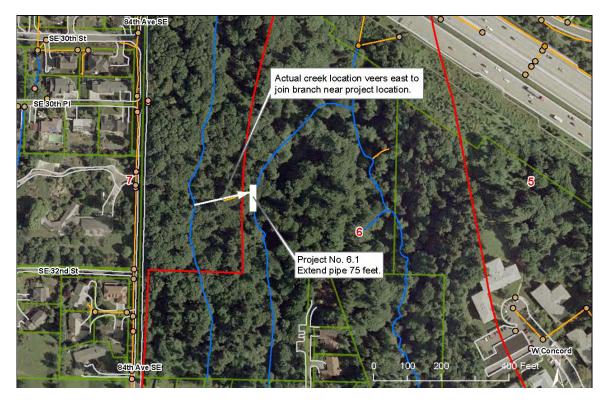
PROJECT SUMMARY SHEET

| Basin No.: | 6 |
|-------------------------|--|
| Project No: | 6.1 |
| Project Title: | Extend Surface Pipe in Ravine east of 84 th Avenue SE |
| Problem Description: | 30 feet downstream of surface storm drain outlet, flow is scouring and undercutting toe of small slide within an undeveloped ravine. This generates sandy sediment downstream. See Appendix E for a field sketch of the problem area. |
| Project Description: | Extend 18-inch surface CPEP previously installed by city crews 75 feet past slide. |
| Related Projects | None |
| Estimated Project Cost: | \$87,000 |



Looking Upstream at 18" Corrugated PE Pipe Outlet 9/28/2005

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



Project Location Map

| COJECT: 6.1 SYPASS PIPE BYPASS PIPE BID ITEM CONSTRUCTION COSTS CLEARING AND GRUBBING EXCAVATION RIPRAP/BOULDERS/QUARRY SPALLS PIPE ANCHORS 18" CPEP PIPE COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY STATE SALES TAX | CHECKED BY DATE: 75 10 5 8 75 4 0 0 1 350 306 0% 10% 10% 10% 0% | SY CY CY EA LF EA EA EA EA SY | | 40 120 800 75 500 3,500 | **** | AMOUNT 750 400 600 5,625 2,000 - - 3,000 3,500 4,583 26,858 - 2,686 |
|--|--|--|----------------------------------|---|---|--|
| BID ITEM CONSTRUCTION COSTS CLEARING AND GRUBBING EXCAVATION RIPRAP/BOULDERS/QUARRY SPALLS PIPE ANCHORS 18" CPEP PIPE COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 75 10 5 8 75 4 0 0 1 350 306 0% 10% | SY CY EA LF EA EA EA LS LS | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 10 40 120 800 75 500 3,500 3,500 3,000 3,000 10 15 | **** | 75(400 6,400 5,622 2,000 - 3,000 3,500 4,583 26,858 |
| CONSTRUCTION COSTS CLEARING AND GRUBBING EXCAVATION RIPRAP/BOULDERS/QUARRY SPALLS PIPE ANCHORS 18" CPEP PIPE COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 75 10 5 8 75 4 0 0 1 350 306 0% 10% | SY CY EA LF EA EA EA LS LS | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 10 40 120 800 75 500 3,500 3,500 3,000 3,000 10 15 | **** | 750 400 6,400 5,622 2,000 - 3,000 3,500 4,583 26,858 |
| CLEARING AND GRUBBING EXCAVATION RIPRAP/BOULDERS/QUARRY SPALLS PIPE ANCHORS 18" CPEP PIPE COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 10 5 8 75 4 0 0 1 350 306 0% 10% 10% | CY CY EA LF EA EA LS LF | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 40 120 800 75 500 3,500 8,000 3,000 10 15 | • | 400 600 5,625 2,000 3,000 3,500 4,583 26,858 |
| EXCAVATION RIPRAP/BOULDERS/QUARRY SPALLS PIPE ANCHORS 18" CPEP PIPE COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 10 5 8 75 4 0 0 1 350 306 0% 10% 10% | CY CY EA LF EA EA LS LF | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 40 120 800 75 500 3,500 8,000 3,000 10 15 | • | 400 600 5,625 2,000 3,000 3,500 4,583 26,858 |
| RIPRAP/BOULDERS/QUARRY SPALLS PIPE ANCHORS 18" CPEP PIPE COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 5 8 75 4 0 0 1 350 306 0% 10% 10% | CY EA EA EA EA LS LF | * \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 120 800 75 500 3,500 8,000 3,000 10 15 | • | 600 6,400 5,625 2,000 - 3,000 3,500 4,583 26,858 |
| PIPE ANCHORS 18" CPEP PIPE COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 8 75 4 0 1 350 306 0% 10% 10% | EA LF EA EA LS LF | \$\$\$\$\$ | 800 75 500 3,500 8,000 3,000 10 15 | • | 6,400 5,629 2,000 3,000 3,500 4,583 26,858 |
| 18" CPEP PIPE COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 75 4 0 1 350 306 0% 10% 10% | LF EA EA LS LF | \$\$\$\$\$ | 75 500 3,500 8,000 3,000 10 15 | • \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 5,625 2,000 - 3,000 3,500 4,583 26,858 |
| COUPLINGS-THRUST RESISTANT MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 4 0 1 350 306 0% 10% | EA EA LS LF | \$ \$ \$ \$ | 500 3,500 8,000 3,000 10 15 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 2,000 - - 3,000 3,500 4,583 26,858 |
| MANHOLES/CB UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 0 0 1 350 306 0% 10% | EA EA LS LF | \$ \$ \$ \$ | 3,500 8,000 3,000 10 15 | • \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 3,000 3,500 4,583 26,858 |
| UTILITY RELOCATIONS TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 0 1 350 306 0% 10% | EA LS LF | \$ \$ \$ | 8,000 3,000 10 15 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 3,500 4,583 26,858 |
| TEMPORARY BYPASS ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 1 350 306 0% 10% 10% | LS LF | \$ \$ | 3,000 10 15 | \$ \$ \$ \$ \$ | 3,500 4,583 26,858 |
| ACCESS (10' WIDE) RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 350 306 0% 10% 10% | LF | \$ | 10 15 | \$ \$ \$ \$ | 3,500 4,583 26,858 |
| RESTORATION OF ACCESS AND AREA SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 306 0% 10% 10% | | | 15 | \$ \$ \$ \$ | 4,583 26,858 - |
| SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 0% 10% 10% | SY | \$ | - | \$ \$ \$ | 26,858 |
| MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 10% 10% | | | Subtotal | \$ \$ | - |
| MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 10% 10% | | | | \$ | - 2,68 |
| EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL MOBILIZATION CONTINGENCY | 10% | | | | | 2,68 |
| TRAFFIC CONTROL MOBILIZATION CONTINGENCY | | | | | | |
| MOBILIZATION | 0% | | | | \$ | 2,68 |
| CONTINGENCY | | | | | \$ | - |
| CONTINGENCY | | | | Subtotal | \$ | 32,23 |
| | 10% | | | | \$ | 3,22 |
| | | | | Subtotal | * | 35,00 |
| STATE SALES TAX | 30% | | | - | \$ | 10,50 |
| STATE SALES TAX | | | | Subtotal | • | 45,50 |
| | 8.80% | | | - | \$ | 4,004 |
| | otal Estimated C | Construction | Cost (| Rounded) | \$ | 56,00 |
| INDIRECT COSTS | | | | | | |
| SURVEYING AND DESIGN | 25% | | | | \$ | 14,00 |
| PERMITTING | 10% | | | | \$ | 5,60 |
| CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 11,20 |
| EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | \$ | 50 |

Notes:

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.

The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 9 |
|-------------------------|---|
| Project No: | D9.3 |
| Project Title: | 80th Ave SE at house #2227 |
| Problem Description: | Pipe is partially collapsed, is offset in several locations, and has root intrusion and debris within the pipe. |
| Project Description: | Replace approximately 40 feet of 12-inch-diameter concrete pipe. |
| Related Projects | None |
| Estimated Project Cost: | \$44,000 |

- No Photo Available - See Appendix F for detailed TV inspection.



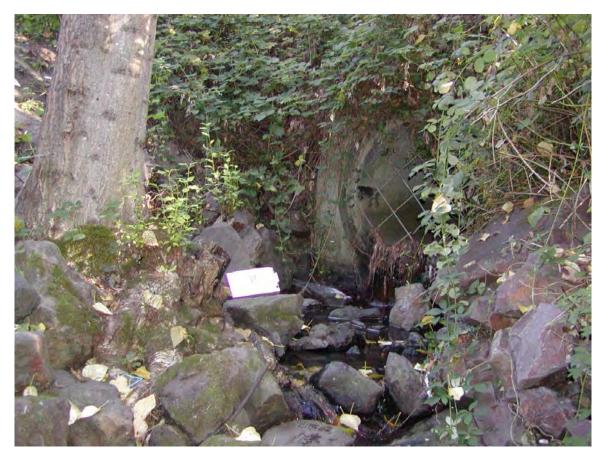
Project Location Map

| CT: <u>D9.3</u> | CHECKED BY | | | | | |
|--|-----------------|--------------|------|-----------|--------|--------|
| jig STORM DRAINAGE RIPES | DATE: | 5/10/200 |)6 | | | |
| STORM DRAINAGE PIPES BID ITEM | QUANTITY | UNIT | | | 1 | AMOUNT |
| CONSTRUCTION COSTS | QUANTIT | UNIT | | IIT PRICE | | AMOUNT |
| | 0 | | ¢ | 10 | ¢ | |
| ACCESS (10' WIDE) | 0 | LF | \$ | 10 | \$ | |
| ACESS RESTORATION | 0 | SY | \$ | 5 | \$ | |
| CLEARING AND GRUBBING | 10 | SY | \$ | 20 | \$ | |
| SAWCUTTING | 50 | LF | \$ | 8 | \$ | |
| REMOVE PAVEMENT | 19 | SY | \$ | 20 | \$ | |
| REMOVE PIPE | 40 | LF | \$ | 15 | \$ | |
| REMOVE CATCH BASIN | 2 | EA | \$ | 300 | \$ | |
| 12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) | 40 | LF | \$ | 175 | \$ | 7. |
| 18" CONC PIPE | 0 | LF | \$ | 190 | Ŝ | - , |
| 24" CONC PIPE | 0 | LF | \$ | 210 | \$ | |
| RELACE 18" CONC PIPE WITH PIPE BURSTING | 0 | LF | \$ | 210 | ֆ Տ | |
| | | | | | | |
| PIPE BURSTING INSERTION/PULL PIT | 0 | EA | \$ | 15,000 | \$ | - |
| CATCH BASIN TYPE 1 | 2 | EA | \$ | 1,400 | \$ | 2 |
| MANHOLES/CB | 0 | EA | \$ | 3,500 | \$ | |
| PAVEMENT RESTORATION | 19 | SY | \$ | 20 | \$ | |
| ROADSIDE/LANDSCAPE RESTORATION | 1 | LS | \$ | 500 | \$ | |
| RIPRAP/BOULDERS/QUARRY SPALLS | 0 | CY | \$ | 40 | \$ | |
| UTILITY RELOCATIONS | 0 | EA | \$ | 8,000 | \$ | |
| TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1 |
| | | | | Subtotal | \$ | 13, |
| 1//20 | 100/ | | | | • | |
| MISC | 10% | | | | \$ | 1, |
| EROSION & SEDIMENTATION CONTROL | 5% | | | | \$ | |
| TRAFFIC CONTROL | 5% | | | | \$ | |
| | | | | Subtotal | \$ | 16 |
| MOBILIZATION | 10% | | | | \$ | 1 |
| | 2004 | | | Subtotal | | 18 |
| CONTINGENCY | 30% | | | 0 | \$ | 5, |
| | 0.000/ | | | Subtotal | | 23, |
| STATE SALES TAX | 8.80% | | • • | (D | \$ | 2, |
| | Total Estimated | Construction | Cost | (Rounded) | \$ | 29, |
| INDIRECT COSTS | | | | | ~ | |
| SURVEYING AND DESIGN | 25% | | | | \$ | 7 |
| PERMITTING | 5% | | | | \$ | 1 |
| CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 5 |
| EASEMENTS/LAND ACQUISITION ADMINISTRATION (See r | note 3) 0 | PARCEL | \$ | 500 | \$ | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 10 |
|-------------------------|---|
| Project No: | 10.4 |
| Project Title: | Additional Riprap downstream of I-90 and west of 77 th Avenue SE. |
| Problem Description: | Large subbasin from business district outlets in open channel lined with riprap. Riprap thickness is thin and material may be undersized. See Appendix E for a field sketch of the problem area. |
| Project Description: | Place 5 cy of large riprap at outlet of 60-inch pipe |
| Related Projects | None |
| Estimated Project Cost: | \$13,000 |



Looking Upstream at 60" Outlet 9/24/2005



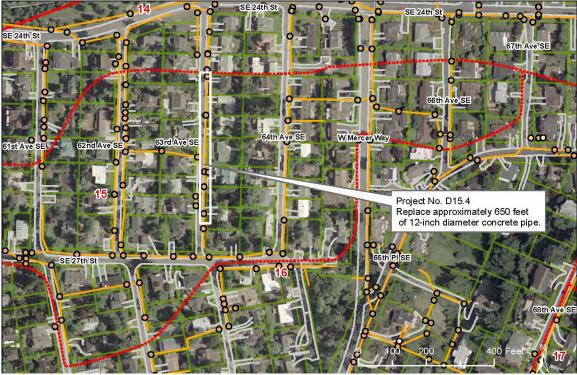
| EXCAVATIC RIPRAP/BO GEOTEXTIL UTILITY RE TEMPORAR ACCESS (10 RESTORAT SPECIAL AC MISC | BID ITEM CONSTRUCTION COSTS AND GRUBBING DN UULDERS E LOCATIONS RY BYPASS 0' WIDE) ION OF ACCESS AND AREA CCESS/CONSTRUCTION | DATE: QUANTITY 0 10 20 0 0 1 70 97 0% 10% | 5/23/200 UNIT SY CY CY SY EA LS LF SY | - | IT PRICE 10 40 80 1 8,000 - 10 10 Subtotal | ***** | AMOUNT - 400 1,600 - - - 700 972 3,672 |
|--|--|--|--|--|---|--|--|
| CLEARING EXCAVATIO RIPRAP/BO GEOTEXTIL UTILITY RE TEMPORAR ACCESS (10 RESTORAT SPECIAL AO MISC EROSION & TRAFFIC CO | BID ITEM CONSTRUCTION COSTS AND GRUBBING DN UULDERS E LOCATIONS RY BYPASS 0' WIDE) ION OF ACCESS AND AREA CCESS/CONSTRUCTION | 0 10 20 0 1 70 97 0% 10% | SY CY CY SY EA LS LF | \$ \$ \$ \$ \$ \$ | 10 40 80 1 8,000 - 10 10 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 400 1,600 - - 700 972 3,672 |
| EXCAVATIC RIPRAP/BO GEOTEXTIL UTILITY RE TEMPORAR ACCESS (10 RESTORAT SPECIAL AC MISC EROSION & TRAFFIC CO | CONSTRUCTION COSTS AND GRUBBING IN IULDERS LE LOCATIONS RY BYPASS 0' WIDE) ION OF ACCESS AND AREA CCESS/CONSTRUCTION | 0 10 20 0 1 70 97 0% 10% | SY CY CY SY EA LS LF | \$ \$ \$ \$ \$ \$ | 10 40 80 1 8,000 - 10 10 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | - 400 1,600 - - 700 972 3,672 |
| EXCAVATIC RIPRAP/BO GEOTEXTIL UTILITY RE TEMPORAR ACCESS (10 RESTORAT SPECIAL AC MISC EROSION & TRAFFIC CO | AND GRUBBING ON OULDERS LE LOCATIONS RY BYPASS 0' WIDE) 10N OF ACCESS AND AREA CCESS/CONSTRUCTION | 10 20 0 1 70 97 0% 10% | CY CY SY EA LS LF | \$ \$ \$ \$ \$ \$ \$ \$ | 40 80 1 8,000 - 10 10 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 400 1,600 - - 700 972 3,672 |
| EXCAVATIC RIPRAP/BO GEOTEXTIL UTILITY RE TEMPORAR ACCESS (10 RESTORAT SPECIAL AC MISC EROSION & TRAFFIC CO | ON OULDERS LE LOCATIONS RY BYPASS O' WIDE) TON OF ACCESS AND AREA CCESS/CONSTRUCTION | 10 20 0 1 70 97 0% 10% | CY CY SY EA LS LF | \$ \$ \$ \$ \$ \$ \$ \$ | 40 80 1 8,000 - 10 10 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 400 1,600 - - 700 972 3,672 |
| RIPRAP/BO GEOTEXTIL UTILITY RE TEMPORAR ACCESS (10 RESTORAT SPECIAL AO MISC EROSION & TRAFFIC CO | ULDERS LE LOCATIONS RY BYPASS 0' WIDE) 1'ON OF ACCESS AND AREA CCESS/CONSTRUCTION | 20 0 1 70 97 0% 10% | CY SY EA LS LF | \$ \$ \$ \$ \$ | 80 1 8,000 - 10 10 | \$\$\$\$\$\$ | 1,600 - - - 700 972 3,672 |
| GEOTEXTIL UTILITY RE TEMPORAR ACCESS (11 RESTORAT SPECIAL AC MISC EROSION & TRAFFIC CO MOBILIZATI | E LOCATIONS RY BYPASS 0' WIDE) TON OF ACCESS AND AREA CCESS/CONSTRUCTION | 0 0 1 70 97 0% 10% | SY EA LS LF | \$ \$ \$ \$ | 1 8,000 - 10 10 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | - - 700 972 3,672 |
| UTILITY RE TEMPORAR ACCESS (10 RESTORAT SPECIAL AC MISC EROSION & TRAFFIC CO MOBILIZATI | LOCATIONS RY BYPASS 0' WIDE) ION OF ACCESS AND AREA CCESS/CONSTRUCTION | 0 1 70 97 0% 10% | EA LS LF | \$ \$ \$ | 8,000 10 10 | \$ \$ \$ \$ \$ \$ \$ \$ | - 700 972 3,672 |
| TEMPORAR ACCESS (10 RESTORAT SPECIAL AC MISC EROSION & TRAFFIC CO MOBILIZATI | RY BYPASS 0' WIDE) ION OF ACCESS AND AREA CCESS/CONSTRUCTION | 1 70 97 0% 10% | LS LF | \$ \$ | - 10 10 | \$ \$ \$ \$ | - 700 972 3,672 |
| ACCESS (10 RESTORAT SPECIAL AC MISC EROSION & TRAFFIC CO MOBILIZATI | 0' WIDE) TON OF ACCESS AND AREA CCESS/CONSTRUCTION | 70 97 0% 10% | LF | \$ | 10 | \$ \$ \$ | 972 3,672 |
| RESTORAT SPECIAL AG MISC EROSION & TRAFFIC CG MOBILIZATI | TION OF ACCESS AND AREA | 97 0% 10% | | | 10 | \$ | 972 3,672 |
| SPECIAL AG MISC EROSION & TRAFFIC CG MOBILIZATI | CCESS/CONSTRUCTION | 0% 10% | SY | \$ | - | \$ | 3,672 |
| MISC EROSION & TRAFFIC CO MOBILIZATI | | 10% | | | Subtotal | • | , |
| MISC EROSION & TRAFFIC CO MOBILIZATI | | 10% | | | | \$ | |
| EROSION & TRAFFIC CO MOBILIZATI | | | | | | | - |
| TRAFFIC CO | | | | | | \$ | 367 |
| MOBILIZATI | SEDIMENTATION CONTROL | 10% | | | | \$ | 367 |
| | ONTROL | 0% | | | | \$ | - |
| | | | | | Subtotal | \$ | 4,407 |
| CONTINGE | ION | 10% | | | | \$ | 441 |
| CONTINGE | | | | | Subtotal | \$ | 5,000 |
| | NCY | 30% | | | | \$ | 1,500 |
| | | | | | Subtotal | \$ | 6,500 |
| STATE SAL | ES TAX | 8.80% | | | | \$ | 572 |
| | | Total Estimated C | onstruction | Cost (| (Rounded) | \$ | 8,000 |
| | INDIRECT COSTS | | | | . , | | |
| SURVEYING | G AND DESIGN | 25% | | | | \$ | 2,000 |
| PERMITTIN | | 10% | | | | \$ | 800 |
| | CTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 1,600 |
| | S/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | \$ | 500 |

Notes:

 The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

| Basin No.: | 15 |
|-------------------------|---|
| Project No: | D15.4 |
| Project Title: | 63rd Ave SE from SE 24th St to SE 27th St |
| Problem Description: | Severe pipe offsets along entire reach with the worst sections a 300-foot-long section of pipe. |
| Project Description: | Replace approximately 650 feet of 12-inch-diameter concrete pipe. |
| Related Projects | None |
| Estimated Project Cost: | \$585,000 |

- No Photo Available - See Appendix F for detailed TV inspection.



| CT: <u>D15.4</u> | CHECKED BY | | | | | |
|--|-------------------|-------------|---------|-------------|----------|--------|
| | DATE: | 5/10/200 |)6 | | | |
| STORM DRAINAGE PIPES | QUANTITY | | | | | AMOUNT |
| BID ITEM | QUANTITY | UNIT | UN | IIT PRICE | | AMOUNT |
| | | | • | 10 | ~ | |
| ACCESS (10' WIDE) | | LF | \$ | 10 | \$ | |
| ACESS RESTORATION | 0 | SY | \$ | 5 | \$ | |
| CLEARING AND GRUBBING | 50 | SY | \$ | 20 | \$ | 1, |
| SAWCUTTING | 1,300 | LF | \$ | 8 | \$ | 10, |
| REMOVE PAVEMENT | 512 | SY | \$ | 20 | \$ | 10 |
| REMOVE PIPE | 650 | LF | \$ | 15 | \$ | 9 |
| REMOVE CATCH BASIN | 6 | EA | \$ | 300 | \$ | 1 |
| 12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) | 650 | LF | \$ | 175 | \$ | 113 |
| 18" CONC PIPE | 000 | LF | \$ | 190 | \$ | 110 |
| 24" CONC PIPE | | LF | Ψ \$ | 210 | \$ | |
| | | | | | | |
| RELACE 18" CONC PIPE WITH PIPE BURSTING | | LF | \$ | 250 | \$ | |
| PIPE BURSTING INSERTION/PULL PIT | | EA | \$ | 15,000 | \$ | |
| CATCH BASIN TYPE 1 | 6 | EA | \$ | 1,400 | \$ | 8 |
| MANHOLES/CB | | EA | \$ | 3,500 | \$ | |
| PAVEMENT RESTORATION | 512 | SY | \$ | 20 | \$ | 10 |
| ROADSIDE/LANDSCAPE RESTORATION | 1 | LS | \$ | 1,000 | \$ | 1 |
| RIPRAP/BOULDERS/QUARRY SPALLS | 0 | CY | \$ | 40 | \$ | |
| UTILITY RELOCATIONS | 1 | EA | \$ | 8,000 | \$ | 8 |
| TEMPORARY BYPASS | 1 | LS | \$ | 3,000 | | 3 |
| | | | | - | | |
| | | | | Subtotal | \$ | 177 |
| MISC | 10% | | | | \$ | 17 |
| EROSION & SEDIMENTATION CONTROL | 5% | | | | \$ | 8 |
| TRAFFIC CONTROL | 10% | | | | \$ | |
| | 10% | | | | φ | 17 |
| | | | | Subtotal | \$ | 221 |
| MOBILIZATION | 10% | | | | \$ | 22 |
| | | | | Subtotal | \$ | 244 |
| CONTINGENCY | 30% | | | | \$ | 73 |
| | | | | Subtotal | \$ | 317 |
| STATE SALES TAX | 8.80% | | 0 | (Dennederd) | \$ | 27 |
| INDIRECT COSTS | Total Estimated (| onstruction | Cost (| (Rounded) | ф | 390, |
| SURVEYING AND DESIGN | 25% | | | | \$ | 97 |
| PERMITTING | | | | | | |
| - | 5% | | | | \$ | 19 |
| CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | - | | \$ | 78 |
| EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | S | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 18 |
|-------------------------|--|
| Project No: | D18c.1 |
| Project Title: | Pipe system along 70th Ave SE from SE 29th St to SE 32nd St |
| Problem Description: | Offsets and cracking along a 125-foot-long and a 50-foot-long section. |
| Project Description: | Replace approximately 175 feet of 12-inch-diameter concrete pipe. |
| Related Projects | None |
| Estimated Project Cost: | \$176,000 |

- No Photo Available - See Appendix F for detailed TV inspection.



Project Location Map

| CT: D18c.1 | | CHECKED BY | | | | | |
|---|------------------------------------|-------------------|--------------|----------|----------------|----------|--------|
| jig Storm Drainage Pipes | | DATE: | 5/10/200 |)6 | | | |
| STORM DRAINAGE PIPES | BID ITEM | QUANTITY | UNIT | | | 1 | AMOUNT |
| | DNSTRUCTION COSTS | QUANTIT | UNIT | UN | IT PRICE | | AWOUNT |
| | | 0 | LF | \$ | 10 | \$ | |
| ACCESS (10' WIDE) | | 0 | SY | | 5 | ъ \$ | |
| ACESS RESTORATION | | | - | \$ | | | |
| CLEARING AND GRUBBING | 3 | 50 | SY | \$ | 20 | \$ | 1, |
| SAWCUTTING | | 350 | LF | \$ | 8 | \$ | 2, |
| REMOVE PAVEMENT | | 142 | SY | \$ | 20 | \$ | 2, |
| REMOVE PIPE | | 175 | LF | \$ | 15 | \$ | 2, |
| REMOVE CATCH BASIN | | 4 | EA | \$ | 300 | \$ | 1, |
| 12" CONC PIPE (TRENCHIN | NG, BEDDING, PIPE, BACKFILL) | 175 | LF | \$ | 175 | \$ | 30, |
| 18" CONC PIPE | | 0 | LF | \$ | 190 | \$ | |
| 24" CONC PIPE | | 0 | LF | \$ | 210 | \$ | |
| RELACE 18" CONC PIPE W | ITH PIPE BURSTING | 0 | LF | \$ | 250 | \$ | |
| PIPE BURSTING INSERTIC | | 0 | EA | \$ | 15,000 | \$ | |
| CATCH BASIN TYPE 1 | | 4 | EA | \$ | 1,400 | \$ | 5 |
| MANHOLES/CB | | 0 | EA | \$ | 3,500 | \$ | 0 |
| PAVEMENT RESTORATION | | 142 | SY | \$ | 20 | \$ | 2 |
| ROADSIDE/LANDSCAPE R | | 142 | LS | φ \$ | 2,500 | φ \$ | |
| | | | - | | , | | 2 |
| RIPRAP/BOULDERS/QUAR | RY SPALLS | 0 | CY | \$ | 40 | \$ | |
| UTILITY RELOCATIONS TEMPORARY BYPASS | | 0 | EA LS | \$ \$ | 8,000 1,000 | \$ \$ | 1 |
| | | | | | | | |
| | | | | | Subtotal | \$ | 53, |
| MISC | | 10% | | | | \$ | 5. |
| EROSION & SEDIMENTATI | | 5% | | | | \$ | 2 |
| | ON CONTROL | | | | | | |
| TRAFFIC CONTROL | | 10% | | | | \$ | 5 |
| | | | | | Subtotal | ¢ | 66 |
| MOBILIZATION | | 10% | | | Subiolai | φ \$ | 6 |
| MOBILIZATION | | 10% | | | | φ | 0 |
| | | | | | Subtotal | | 73 |
| CONTINGENCY | | 30% | | | | \$ | 21 |
| | | | | | Subtotal | | 94, |
| STATE SALES TAX | | 8.80% | | | | \$ | 8, |
| | | Total Estimated (| Construction | Cost | (Rounded) | \$ | 117, |
| | INDIRECT COSTS | | | | | | |
| SURVEYING AND DESIGN | | 25% | | | | \$ | 29, |
| PERMITTING | | 5% | | | | \$ | 5 |
| CONSTRUCTION ENGINEE | RING AND ADMINISTRATION | 20% | | | | \$ | 23, |
| EASEMENTS/LAND ACQUI | SITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ | |

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs. 2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.

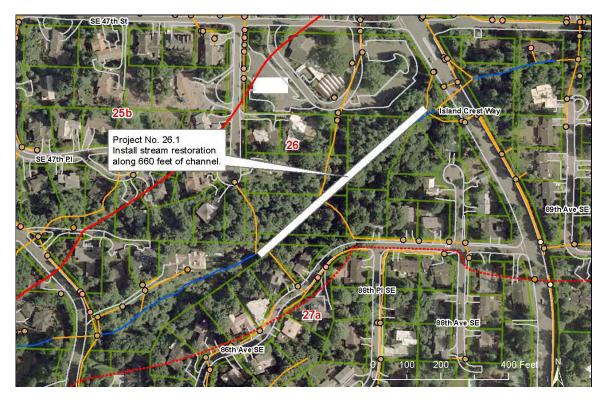
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 26 |
|-------------------------|--|
| Project No: | 26.1 |
| Project Title: | Stream Restoration Downstream of Island Crest Way in 4700 Block |
| Problem Description: | High streamflows in the subbasin have caused channel down- cutting in the reach between Island Crest Way and West Mercer Way. The channel erosion is largely confined to an approximate 600- to 700-foot reach immediately west of Island Crest Way, including a significant headcut (up to nine feet in height) that has the potential to travel upstream during high flows. |
| Project Description: | This project is already being designed and is at the 30-percent design stage. The project includes stream channel restoration for approximately 660 feet of channel length. The project will stabilize the stream channel through the application of bioengineering techniques including placement of woody debris, log weirs, coir fabric, natural streambed rock material, and riparian planting. |
| Related Projects: | None |
| Estimated Project Cost: | \$961,000 construction plus \$100,000 engineering for a total of \$1,061,000. (Note that this estimate was prepared by others as part of a 30-percent design. The estimate, attached, does not include the same permitting, design, and construction contingencies as other cost estimates developed for this Comprehensive Basin Review plan.) |



Looking Upstream at Headcut 1/5/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



CITY OF MERCER ISLAND UPPER BASIN 26 WATERCOURSE STABILIZATION PROJECT CLASS 3 COST OPINION (30 PERCENT DESIGN SUBMITTAL)

1

DATE: 6/5/2006 PROJECT NO.: 344328.16.03 ESTIMATE BY: C. Moore REVIEWED BY: J. Kapla

| ltem No. | Item Description | Plan Quantity | Unit | | nit Price (2007) | | Extended Amount |
|-----------------|--|------------------|------|---------|---------------------|--------|--------------------|
| | SECTION: 1 PREPARATION | | | | | | |
| 1 | MOBILIZATION | 1 | LS | \$ | 67,045 | | 67,045 |
| 2 | CONSTRUCTION SURVEYING | 1 | LS | \$ | 4,110 | | 4,110 |
| 3 | PREPARE TESC PLAN FOR STAGING AREA | 1 | LS | \$ | 690 | \$ | 690 |
| 4 | TEMPORARY ACCESS ROAD AND RESTORATION | 1 | LS | \$ | 42,030 | \$ | 42,030 |
| 5 | | 1 | LS | \$ | 11,680 | \$ | 11,680 |
| 6 | REMOVAL OF STRUCTURES AND OBSTRUCTIONS | 0 | LS | | | \$ | - |
| 7 | TREE REMOVAL 12-36 IN. DIAM. | 3 | EA | \$ | 218 | \$ | 654 |
| 8 | TEMPORARY STREAM DIVERSION | 1 | LS | \$ | 37,170 | \$ | 37,17 |
| 9 | CLEARING LIMITS FLAGGING | 1400 | LF | \$ | 1.60 | \$ | 2,24 |
| 10 | HIGH VISIBILITY CONSTRUCTION FENCING | 400 | LF | \$ | 6.00 | \$ | 2,40 |
| | SECTION: 2 GRADING | | | | | | |
| 11 | CHANNEL & EMBANKMENT EXCAVATION | 820 | CY | \$ | 57.00 | \$ | 46,74 |
| 12 | QUARRY SPALLS | 510 | TN | \$ | 82.00 | \$ | 41,82 |
| 13 | TILL | 1100 | TN | \$ | 45.00 | \$ | 49,50 |
| 14 [°] | ENGINEERED ORDERED OVEREXCAVATION | 100 | CY | \$ | 85.00 | \$ | 8,50 |
| | SECTION: 5 STORM SEWER | | | | | | |
| 15 | STORM SEWER PIPE 8" DIAM | 10 | LF | \$ | 27.00 | \$ | 27 |
| 16 | HDPE STORM SEWER PIPE 12" DIAM | 100 | LF | \$ | 43.00 | \$ | 4,30 |
| | SECTION: 17 EROSION CONTROL AND PLANTING | | | | | | |
| 17 | SILT FENCE | 500 | LF | \$ | 10.00 | \$ | 5,00 |
| | PLASTIC COVERING | 100 | SY | \$ | 2.70 | | 27 |
| 19 | STREET CLEANING | 156 | HR | \$ | 105 | | 16,38 |
| 20 | CONSTRUCTION GEOTEXTILE FOR SEPARATION | 900 | SY | \$ | 5.00 | | 4,50 |
| 21 | COCONUT FIBER BLANKET | 1100 | SY | \$ | 2.50 | \$ | 2,75 |
| 22 | STABILIZED CONSTRUCTION ENTRANCE | 60 | SY | \$ | 67.00 | | 4,02 |
| 23 | ROCK CHECK DAM | 2 | EA | \$ | 183 | \$ | 36 |
| 24 | TOPSOIL TYPE C | 165 | CY | \$ | 80.00 | | 13,20 |
| | PSIPE SALAL, 1 GAL | 396 | ËA | \$ | 18.00 | | 7,12 |
| | PSIPE SWORD FERN, 1 GAL | 396 | EA | \$ | 18.00 | | 7,12 |
| | PSIPE OREGON GRAPE, 1 GAL | 396 | EA | \$ | 18.00 | | 7,12 |
| | PSIPE HAZELNUT, 1 GAL | 108 | EA | ÷ \$ | 18.00 | \$ | 1,94 |
| 29 | PSIPE SNOWBERRY, 1 GAL | 108 | EA | ÷ \$ | 18.00 | \$ | 1,94 |
| | PSIPE VINE MAPLE, 1 GAL | 108 | EA | Գ \$ | 18.00 | - | 1,94 |
| 30 31 | PSIPE VINE MAPLE, I GAL PSIPE WESTERN RED CEDAR, 2 GAL | | EA | ъ \$ | 32.00 | | 1,94 |
| | PSIPE WESTERN RED CEDAR, 2 GAL PSIPE WESTERN HEMLOCK, 2 GAL | 30 30 | EA | | 32.00 | φ Φ | 96 |
| | PSIPE WESTERN HEMILOCK, 2 GAL PSIPE BIG LEAF MAPLE, 2 GAL | | | \$ ¢ | | ф Ф | |
| | | 21 | EA | \$ ¢ | 32.00 | \$ | 67 |
| | EROSION CONTROL SEED MIX | 0 | LS | \$ | - | \$ | - |
| | EROSION/WATER POLLUTION CONTROL | 1 | FA | \$ | 2,000 | | 2,000 |
| 36 | SEDIMENT TRAP | 1 | LS | \$ | 5,870 | \$ | 5,870 |

CITY OF MERCER ISLAND

UPPER BASIN 26 WATERCOURSE STABILIZATION PROJECT CLASS 3 COST OPINION (30 PERCENT DESIGN SUBMITTAL) DATE: 6/5/2006 PROJECT NO.: 344328.16.03 ESTIMATE BY: C. Moore REVIEWED BY: J. Kapla

| | | Dist | | | | Extended |
|------|------------------------------------|----------|------|---------------|-----|----------|
| Item | | Plan | 11 | nit Price | | |
| No. | Item Description | Quantity | Unit | (2007) | | Amount |
| 1 | SECTION: 18 TRAFFIC | | | | | |
| 37 | TRAFFIC CONTROL LABOR | 176 | HR | \$ 43.00 | 1 ' | 7,568 |
| 38 | TEMPORARY TRAFFIC CONTROL DEVICES | 1 | LS | \$ 975 | · · | 975 |
| 39 | COMMERCIAL HMA | 15 | Ton | \$ 160.00 | \$ | 2,400 |
| | SECTION: 19 OTHER ITEMS | | | | | |
| 40 | LOG WEIR | 17 | EA | \$ 5,495 | | 93,415 |
| 41 | ROOT WAD | 8 | EA | \$ 1,260 | | 10,080 |
| 42 | ROOT WAD DEFLECTOR | 5 | EA | \$ 1,260 | | 6,300 |
| 43 | LOG DEFLECTOR | 5 | EA | \$ 1,220 | | 6,100 |
| 44 | REMOVE AND RESET EXISTING LOG | 10 | EA | \$ 980 | | 9,800 |
| 45 | STREAM ROCK | 2025 | TN | \$ 66.00 | | 133,650 |
| 46 | SANDING MIX | 510 | TN | \$ 43.00 | | 21,930 |
| 47 | CHANNEL BOULDER | 67 | EA | \$ 91.00 | | 6,097 |
| 48 | STRUCTURAL BOULDER | 20 | EA | \$ 91.00 | | 1,820 |
| 49 | MISCELANEOUS PROPERTY RESTORATION | 1 | FA | \$ 3,000 | \$ | 3,000 |
| | SUBTOTAL (ROUNDED) | | | | \$ | 706,000 |
| | CONTINGENCY | | | 25% | \$ | 176,500 |
| | SUBTOTAL (ROUNDED) | | | | \$ | 883,000 |
| | SALES TAX | | | 8.8% | \$ | 77,704 |
| | TOTAL CONSTRUCTION COSTS (ROUNDED) | | | | \$ | 961,000 |
| | | | | | | |

NOTE: The above cost opinion is in June 2007 dollars and does not include escalation, construction management, financing, O&M or hazardous material mitigation costs. This Class 3 cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, actual site productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

| | PLANNING LEVEL CONSTRUCTION COST | | | | | | |
|-------|--|--------------------|-------------|---------|------------|---------|---------|
| JECT: | | CHECKED BY: | | | | | |
| | jcb STREAM RESTORATION | DATE: | 5/23/200 | 6 | | | |
| | BID ITEM | QUANTITY | UNIT | | IT PRICE | | AMOUNT |
| | CONSTRUCTION COSTS | QUANTIT | UNIT | UN | | | ANICONT |
| | CLEARING AND GRUBBING | 90 | LF | \$ | 10 | \$ | 900 |
| | REMOVE/DISPOSE MISC DEBRIS | 90 | LF | \$ | 2 | \$ | 180 |
| | EXCAVATION | 90 90 | CY | \$ | 50 | φ \$ | 4,500 |
| | BOULDERS | 36 | TON | у \$ | 100 | φ \$ | 3,600 |
| | STREAMBED GRAVEL MIX | 20 | TON | э \$ | 80 | ф \$ | 1,600 |
| | LOGS | 9 | EA | э \$ | 1,400 | | 12,600 |
| | ROOTWADS | 9 | EA | ъ \$ | , | | 2,430 |
| | | | | ծ Տ | 900 500 | \$ | , |
| | REUSE ONSITE LOGS | 1 | EA | + | | \$ | 450 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1,000 |
| | ACCESS (10' WIDE) | 250 | LF | \$ | 10 | \$ | 2,500 |
| | ACCESS RESTORATION | 250 | LF | \$ | 10 | \$ | 2,500 |
| | RIPARIAN PLANTING AND SEEDING | 90 | LF | \$ | 30 | \$ | 2,700 |
| | | | | | Subtotal | \$ | 34,96 |
| | SPECIAL ACCESS/CONSTRUCTION | 5% | | | | \$ | 1,74 |
| | MISC | 10% | | | | \$ | 3,496 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 3,49 |
| | TRAFFIC CONTROL | 0% | | | | \$ | - |
| | | | | | Subtotal | \$ | 43,70 |
| | MOBILIZATION | 10% | | | oustotui | \$ | 4,370 |
| | | | | | Subtotal | \$ | 48,00 |
| | CONTINGENCY | 30% | | | oustotal | \$ | 14,40 |
| | CONTINUENCI | 5070 | | | Subtotal | - | 62.40 |
| | STATE SALES TAX | 8.80% | | | Subiolai | φ \$ | 5,49 |
| | STATE SALES TAX | Total Estimated Co | netruction | Cost (| Doundod) | | 77,00 |
| | INDIRECT COSTS | Total Estimated Co | JISHUCHON | COSI (| Koundeu) | φ | 77,00 |
| | | 050/ | | | | ¢ | 40.05 |
| | | 25% | | | | \$ | 19,25 |
| | PERMITTING | 10% | | | | \$ | 7,700 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | • | | \$ | 15,40 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 2 | PARCEL | \$ | 500 | \$ | 1,00 |
| | | Total Estima | ted Project | Cost (| Rounded) | \$ | 120,00 |

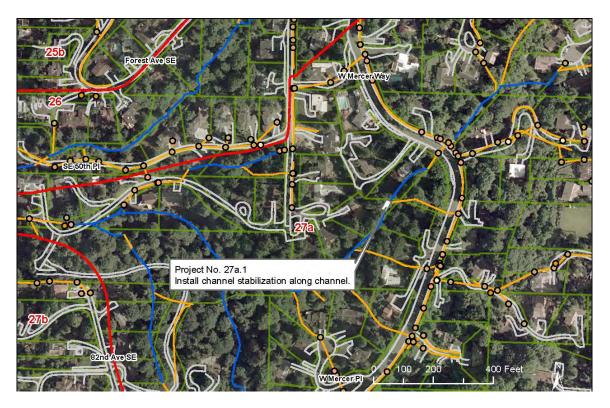
The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 27a |
|-------------------------|---|
| Project No: | 27a.1 |
| Project Title: | Channel Stabilization near 56 th and West Mercer Way |
| Problem Description: | Streambed and bank erosion with headcut formed by 6-foot drop over 30 feet of channel in soft material. Area is subject to long- term erosion and slope failures. Located behind homes in shallow, undeveloped ravine. |
| Project Description: | Install 30 feet of channel stabilization creating a rounded rock channel. |
| Related Projects | None |
| Estimated Project Cost: | \$34,000 |



Looking Upstream 9/28/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



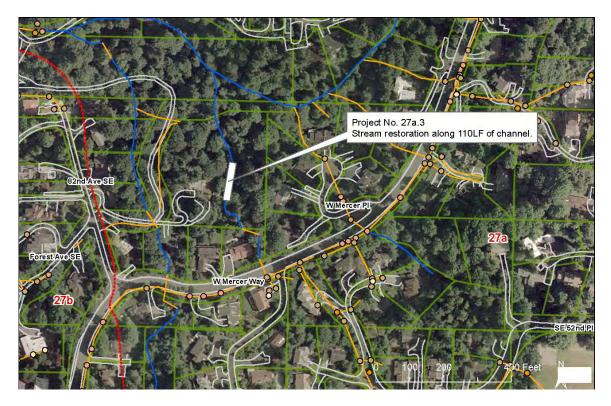
| CLEA REMM EXCA BOUL STRE LOGS TEMF ACCE | BID ITEM BID ITEM CONSTRUCTION COSTS RING AND GRUBBING DVE/DISPOSE MISC DEBRIS AVATION LDERS AMBED GRAVEL MIX PORARY BYPASS ESS (10' WIDE) ESS RESTORATION RIAN PLANTING AND SEEDING | DATE: QUANTITY 30 30 15 12 8 2 1 150 150 150 30 | 5/23/200 UNIT LF LF CY TON TON EA LS LF LF | | 10 2 40 100 80 1,400 | \$ \$ \$ \$ \$ | AMOUNT 300 600 1,200 600 2,100 |
|--|---|---|--|----------------------------------|-------------------------------------|----------------------|---|
| CLEA REMM EXCA BOUL STRE LOGS TEMF ACCE | BID ITEM CONSTRUCTION COSTS RING AND GRUBBING DVE/DISPOSE MISC DEBRIS AVATION DERS SAMBED GRAVEL MIX S PORARY BYPASS ESS (10' WIDE) ESS RESTORATION | 30 30 15 12 8 2 1 150 150 | LF LF CY TON TON EA LS LF | \$ \$ \$ \$ \$ \$ | 10 2 40 100 80 | \$ \$ \$ \$ | 300 60 600 1,200 600 |
| REMO EXCA BOUL STRE LOGS TEMF ACCE ACCE | CONSTRUCTION COSTS RING AND GRUBBING DVE/DISPOSE MISC DEBRIS VATION DERS SAMBED GRAVEL MIX S OCRARY BYPASS ESS (10' WIDE) ESS RESTORATION | 30 30 15 12 8 2 1 150 150 | LF LF CY TON TON EA LS LF | \$ \$ \$ \$ \$ \$ | 10 2 40 100 80 | \$ \$ \$ \$ | 300 60 600 1,200 600 |
| REMO EXCA BOUL STRE LOGS TEMF ACCE ACCE | RING AND GRUBBING DVE/DISPOSE MISC DEBRIS AVATION DERS EAMBED GRAVEL MIX PORARY BYPASS ESS (10' WIDE) ESS RESTORATION | 30 15 12 8 2 1 150 150 | LF CY TON EA LS LF | \$ \$ \$ \$ \$ | 2 40 100 80 | \$ \$ \$ \$ | 60 600 1,200 600 |
| REMO EXCA BOUL STRE LOGS TEMF ACCE ACCE | DVE/DISPOSE MISC DEBRIS AVATION DERS EAMBED GRAVEL MIX PORARY BYPASS ESS (10' WIDE) ESS RESTORATION | 30 15 12 8 2 1 150 150 | LF CY TON EA LS LF | \$ \$ \$ \$ \$ | 2 40 100 80 | \$ \$ \$ \$ | 60 600 1,200 600 |
| EXCA BOUL STRE LOGS TEMF ACCE ACCE | AVATION LDERS EAMBED GRAVEL MIX PORARY BYPASS ESS (10' WIDE) ESS RESTORATION | 15 12 8 2 1 150 150 | CY TON TON EA LS LF | \$ \$ \$ \$ \$ \$ | 40 100 80 | \$ \$ \$ | 600 1,200 600 |
| BOUL STRE LOGS TEMF ACCE ACCE | LDERS EAMBED GRAVEL MIX PORARY BYPASS ESS (10' WIDE) ESS RESTORATION | 12 8 2 1 150 150 | TON TON EA LS LF | \$ \$ \$ \$ | 100 80 | \$ \$ | 1,200 600 |
| STRE LOGS TEMF ACCE ACCE | AMBED GRAVEL MIX S PORARY BYPASS ESS (10' WIDE) ESS RESTORATION | 8 2 1 150 150 | TON EA LS LF | \$ \$ \$ | 80 | \$ | 60 |
| LOGS TEMF ACCE ACCE | S PORARY BYPASS ESS (10' WIDE) ESS RESTORATION | 2 1 150 150 | EA LS LF | \$ \$ | | - | |
| TEMF ACCE ACCE | PORARY BYPASS ESS (10' WIDE) ESS RESTORATION | 1 150 150 | LS LF | \$ | 1 400 | | 2 4 0 0 |
| ACCE ACCE | ESS (10' WIDE) ESS RESTORATION | 150 150 | LF | | 1,400 | \$ | ∠,100 |
| ACCE | ESS RESTORATION | 150 | | ¢ | 1,000 | \$ | 1,000 |
| | | | LF | Ψ | 10 | \$ | 1,500 |
| RIPA | RIAN PLANTING AND SEEDING | 30 | | \$ | 5 | \$ | 750 |
| | | | LF | \$ | 30 | \$ | 90 |
| | | | | | Subtotal | \$ | 9,01 |
| SPEC | CIAL ACCESS/CONSTRUCTION | 5% | | | | \$ | 45 ⁻ |
| MISC | | 10% | | | | \$ | 901 |
| EROS | SION & SEDIMENTATION CONTROL | 10% | | | | \$ | 90 |
| TRAF | FIC CONTROL | 5% | | | | \$ | 45 |
| | | | | | Subtotal | \$ | 11,71; |
| MOBI | LIZATION | 10% | | | | \$ | 1,17 |
| | | | | | Subtotal | \$ | 13,000 |
| CONT | TINGENCY | 30% | | | | \$ | 3,900 |
| | | | | | Subtotal | \$ | 16,900 |
| STAT | E SALES TAX | 8.80% | | | | \$ | 1,487 |
| | | Total Estimated | Construction | Cost (| (Rounded) | \$ | 21,000 |
| | INDIRECT COSTS | | | | | | |
| SUR\ | /EYING AND DESIGN | 25% | | | | \$ | 5,250 |
| PERM | <i>I</i> ITTING | 10% | | | | \$ | 2,10 |
| CONS | STRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 4,200 |
| EASE | MENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 2 | PARCEL | \$ | 500 | \$ | 1,000 |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 27a |
|-------------------------|--|
| Project No: | 27a.3 |
| Project Title: | Stream restoration of incised channel east of 52 nd Avenue SE and north of West Mercer Way. |
| Problem Description: | Small channel is deeply incised for about 110 feet. The channel has a bottom width of 3 to 4 feet, a depth of 4 to 7 feet and near vertical banks in till. Headcuts of 4 and 5 feet high also occur. The rate of erosion over time is moderate. See Appendix E for a field sketch of the problem area. |
| Project Description: | Stream restoration and lay back the top of the banks in undeveloped ravine area. |
| Related Projects | None |
| Estimated Project Cost: | \$120,000 |



Looking Downstream - 9/28/2006



| OJECT | | CHECKED BY | | | | | |
|-------|--|-------------------|--------------|------|-----------|---------|-------------|
| • | jcb STREAM RESTORATION | DATE: | 5/23/200 | 6 | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT |
| | CONSTRUCTION COSTS | | 4 | | | | |
| | CLEARING AND GRUBBING | 110 | LF | \$ | 10 | \$ | 1,1 |
| | REMOVE/DISPOSE MISC DEBRIS | 110 | LF | \$ | 2 | \$ | 2 |
| | EXCAVATION | 50 | CY | \$ | 50 | \$ | 2,4 |
| | BOULDERS | 44 | TON | \$ | 100 | \$ | 4,4 |
| | STREAMBED GRAVEL MIX | 28 | TON | \$ | 80 | \$ | 2,2 |
| | LOGS | 11 | EA | \$ | 1,400 | \$ | 15,4 |
| | ROOTWADS | 3 | EA | \$ | 900 | \$ | 2,9 |
| | REUSE ONSITE LOGS | 1 | EA | \$ | 500 | \$ | |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1,0 |
| | ACCESS (10' WIDE) | 150 | LF | \$ | 10 | \$ | 1,5 |
| | ACCESS RESTORATION | 150 | LF | \$ | 10 | \$ | 1,5 |
| | RIPARIAN PLANTING AND SEEDING | 110 | LF | \$ | 30 | \$ | 3,3 |
| | | | | | Subtotal | \$ | 36, |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | |
| | MISC | 10% | | | | \$ | 3, |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 3,6 |
| | TRAFFIC CONTROL | 0% | | | | \$ | |
| | | | | | Subtotal | \$ | 43,9 |
| | MOBILIZATION | 10% | | | | \$ | 4,3 |
| | | | | | Subtotal | \$ | 48, |
| | CONTINGENCY | 30% | | | - | \$ | 14,4 |
| | | | | | Subtotal | \$ | 62,4 |
| | STATE SALES TAX | 8.80% | | | | \$ | 5,4 |
| | INDIRECT COSTS | Total Estimated (| Construction | Cost | (Rounded) | \$ | 77,0 |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 19,3 |
| | PERMITTING | 10% | | | | э \$ | 7,7 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | э \$ | 7,1 15,4 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 20% | PARCEL | \$ | 500 | ъ \$ | 15,4 |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 27a |
|-------------------------|--|
| Project No: | 27a.6 |
| Project Title: | Boulder Cascade to Replace Timber Dam in 5200 Block north of West Mercer Way |
| Problem Description: | 4-foot high dam of 6 by 6 timbers and geotextile is falling over and will release about 20 to 50 cy of stored sediment. Sanitary sewer lies downstream of dam. |
| Project Description: | Construct 40 feet of boulder cascade. |
| Related Projects | None |
| Estimated Project Cost: | \$54,000 |



Looking Upstream at Failing Timber Dam 9/28/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| ROJECT | | CHECKED BY: msg | | | | | | |
|--------|--|-----------------|--------------|-----------|-----------|---------|--------|--|
| BY: | jcb | DATE: | 5/23/200 | 5/23/2006 | | | | |
| | CHANNEL STABILIZATION BID ITEM | QUANTITY | UNIT | 1.161 | IT PRICE | | AMOUNT | |
| | | QUANTIT | UNIT | UN | | | AWOUNT | |
| | CLEARING AND GRUBBING | 40 | LF | \$ | 10 | \$ | 400 | |
| | REMOVE/DISPOSE MISC DEBRIS | 40 | LF | \$ | 2 | գ Տ | 400 | |
| | EXCAVATION | 18 | CY | э \$ | 40 | φ \$ | 720 | |
| | BOULDERS | 16 | TON | э \$ | 100 | э \$ | 1,600 | |
| | STREAMBED GRAVEL MIX | 10 | TON | э \$ | 80 | э \$ | 800 | |
| | LOGS | 2 | EA | | | - | | |
| | | | | \$ | 1,500 | | 3,000 | |
| | TEMPORARY BYPASS | 1 | LS | \$ | 3,000 | | 3,000 | |
| | ACCESS (10' WIDE) | 250 | LF | \$ | 10 | | 2,500 | |
| | ACCESS RESTORATION | 250 | LF | \$ | 10 | \$ | 2,500 | |
| | RIPARIAN PLANTING AND SEEDING | 40 | LF | \$ | 30 | \$ | 1,20 | |
| | | | | | Subtotal | \$ | 15,80 | |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - | |
| | MISC | 10% | | | | \$ | 1,580 | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 1,58 | |
| | TRAFFIC CONTROL | 0% | | | | \$ | - | |
| | | | | | Subtotal | \$ | 18,96 | |
| | MOBILIZATION | 10% | | | | \$ | 1,896 | |
| | | | | | Subtotal | \$ | 21,00 | |
| | CONTINGENCY | 30% | | | | \$ | 6,30 | |
| | | | | | Subtotal | \$ | 27,300 | |
| | STATE SALES TAX | 8.80% | | | | \$ | 2,402 | |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ | 34,000 | |
| | INDIRECT COSTS | | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 8,500 | |
| | PERMITTING | 10% | | | | \$ | 3,400 | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 6,80 | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 3 | PARCEL | \$ | 500 | \$ | 1,50 | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 29 |
|-------------------------|--|
| Project No: | 29.1 |
| Project Title: | Stream Restoration downstream of West Mercer Way at 6200 block |
| Problem Description: | Drop at culvert outlet at West Mercer Way and severe bank erosion and down cutting along approximately 600 feet of stream below West Mercer Way. Slope instability is being created such that slides have occurred along much of the Reach. In addition, there is also some less severe downcutting in the channel at some locations downstream of this 600 foot section before it enters a culvert crossing at 77 th Ave SE. |
| Project Description: | This project is already being designed and is at the 90-percent design stage. The project includes a combination of stream highflow bypass and channel regrading and restoration for the upper approximately 530 feet of channel. The highflow bypass includes a 24-inch diameter HDPE pipeline buried below the restored channel bottom. The highflow bypass will carry high stream flows to reduce ongoing channel erosion. Channel restoration includes raising the grade of the stream, installation of rock revetments, placement of larger woody debris, and plantings. In addition, the project includes minor channel armoring using log deflectors and rock placement at select locations downstream of the highflow bypass. |
| Related Projects: | None |
| Estimated Project Cost: | \$864,000 construction plus \$95,000 engineering for a total of \$959,000 (Note that this estimate was prepared by others as part of 90-percent design. The estimate, attached, does not include the same permitting, design, and construction contingencies as other cost estimates developed for this Comprehensive Basin Review plan.) |



Looking Downstream at Sandbagged Bank 1/5/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



CITY OF MERCER ISLAND

BASIN 29 HIGH FLOW BYPASS PIPELINE AND STREAM RESTORATION CLASS 3 COST OPINION (EQUIVALENT 30 PERCENT DESIGN LEVEL) DATE: 6/8/2006 PROJECT NO.: 314888.08.01 ESTIMATE BY: C. Moore REVIEWED BY: J. Kapla

| ltem No. | Item Description | Plan Quantity | Unit | Unit Pr (2007 | | | Extended Amount |
|-------------|---|------------------|----------|--------------------|-----------|----------|--------------------|
| | SECTION: 1 PREPARATION | | | | | | |
| 1 | MOBILIZATION | 1 | LS | \$ 60,9 | | \$ | 60,950 |
| 2 | | | LS | | 10 | \$ | 4,110 |
| 3 | PREPARE TESC PLAN FOR STAGING AREA | | LS | | 90 | \$ | 690 |
| 4 | TEMPORARY ACCESS ROAD AND RESTORATION | | LS | \$ 43,3 | | \$ | 43,380 |
| 5 | TEMPORARY STREAM DIVERSION | | LS LS | \$ 35,0 \$ 11,6 | | \$ | 35,000 |
| 6 7 | CLEARING AND GROBBING | 1100 | LS | | .60 | \$ \$ | 11,680 1,760 |
| 1 | CLEARING LIMITS FLAGGING | | | φι | .00 | Ψ | 1,700 |
| | SECTION: 2 GRADING | | | | | | |
| 8 | LIGHT LOOSE RIP RAP | 255 | ΤN | \$ 94 | .00 | \$ | 23,970 |
| 9 | QUARRY SPALLS | 500 | TN | \$82 | .00 | \$ | 41,000 |
| 10 | CHANNEL & EMBANKMENT EXCAVATION | 655 | CY | | .00 | \$ | 31,440 |
| 11 | SHORING OR EXTRA EXCAVATION | 1 | LS | | 10 | \$ | 4,410 |
| 12 | IMPORTED TILL | 1750 | CY | | .00 | \$ | 108,500 |
| 13 | ENGINEERED ORDERED OVEREXCAVATION | 100 | CY | \$85 | .00 | \$ | 8,500 |
| | SECTION: 5 STORM SEWER | | | | | | |
| 14 | TEST STORM SEWER PIPE | 530 | LF | \$ 6 | .10 | \$ | 3,233 |
| 15 | HDPE STORM SEWER PIPE 12" DIAM | 50 | LF | | .00 | \$ | 2,350 |
| 16 | HDPE STORM SEWER PIPE 24" DIAM | 490 | LF | \$ 105 | | \$ | 51,450 |
| 17 | HDPE STORM SEWER PIPE 36" DIAM | 40 | LF | \$ 154 | | \$ | 6,160 |
| 18 | HDPE TRANSITION 36" TO 24" DIAM | 1 | LF | | 40 | \$ | 2,340 |
| 19 | CULVERT INLET | 2 | EA | | 70 | \$ | 11,740 |
| 20 | HIGH FLOW BYPASS STRUCTURE | 1 | LS | \$ 33,3 | | \$ | 33,320 |
| 21 | COLLECTOR STRUCTURE | 1 | EA | | 00 | \$ | 7,600 |
| 22 | ENERGY DISSIPATOR | 1 | EA | | 90 | \$ | 6,290 |
| | SECTION: 17 EROSION CONTROL AND PLANTING | | | | | | |
| 23 | SILT FENCE | 500 | LF | \$ 10 | .00 | \$ | 5,000 |
| 23 24 | SEDIMENT TRAP | 1 | LS | 1 ' | .00 70 | \$ | 5,870 |
| 24 25 | PLASTIC COVERING | 100 | SY | | .70 | \$ | 270 |
| 25 | STREET CLEANING | 156 | HR | | 05 | \$ | 16,380 |
| 27 | CONSTRUCTION GEOTEXTILE FOR EROSION CONTROL | 40 | SY | | .00 | \$ | 200 |
| 28 | EROSION WATER/POLLUTION CONTROL | 1 | FA | | 000 | \$ | 2,000 |
| 29 | TOPSOIL TYPE B | 260 | CY | | .00 | \$ | 15,600 |
| 30 | PSIPE SALAL, 1 GAL | 136 | EA | · · | .00 | \$ | 2,448 |
| 31 | PSIPE SWORD FERN, 1 GAL | 379 | EA | | .00 | | 6,822 |
| 32 | PSIPE KINNIKINNICK, 1 GAL | 379 | EA | | .00 | 1 | 6,822 |
| 33 | PSIPE NOOTKA ROSE, 1 GAL | 52 | EA | | .00 | \$ | 936 |
| | PSIPE VINE MAPLE, 1 GAL | 14 | EA | | .00 | | 252 |
| 35 | PSIPE THIMBLEBERRY, 1 GAL | 52 | EA | | .00 | \$ | 936 |
| 36 | PSIPE SALMONBERRY, 1 GAL | 29 | EA | | .00 | \$ | 522 |
| 37 | PSIPE GOOSEBERRY, 1 GAL | 24 | | | .00 | | 432 |

1 of 2

CITY OF MERCER ISLAND

BASIN 29 HIGH FLOW BYPASS PIPELINE AND STREAM RESTORATION CLASS 3 COST OPINION (EQUIVALENT 30 PERCENT DESIGN LEVEL) DATE: 6/8/2006 PROJECT NO.: 314888.08.01 ESTIMATE BY: C. Moore REVIEWED BY: J. Kapla

| ltem No. | Item Description | Plan Quantity | Unit | nit Price (2007) | Extended Amount |
|-------------|------------------------------------|------------------|------|---------------------|--------------------|
| 38 | PSIPE WESTERN RED CEDAR, 2 GAL | 4 | EA | \$ 32.00 | \$ 128 |
| 39 | PSIPE WESTERN HEMLOCK, 2 GAL | 6 | EA | \$ 32.00 | \$ 192 |
| 40 | PSIPE BIG LEAF MAPLE, 2 GAL | 6 | EA | \$ 32.00 | \$ 192 |
| 41 | PSIPE HAZELNUT, 2 GAL | 11 | EA | \$ 32.00 | \$ 352 |
| | SECTION: 18 TRAFFIC | | | | |
| 42 | TRAFFIC CONTROL LABOR | 200 | HR | \$ 43.00 | \$ 8,600 |
| 43 | TRAFFIC CONTROL SUPERVISOR | 25 | HR | \$ 55.00 | 1,375 |
| 44 | TEMPORARY TRAFFIC CONTROL DEVICES | 1 | LS | \$ 1,220 | \$ 1,220 |
| | SECTION: 19 OTHER ITEMS | | | | |
| 45 | ROADSIDE CLEANUP | 1 | LS | \$ 3,450 | \$ 3,450 |
| 46 | LOG DEFLECTOR | 3 | EA | \$ 1,400 | \$ 4,200 |
| 47 | ROOT WAD DEFLECTOR | 3 | EA | \$ 1,450 | \$ 4,350 |
| 48 | ROCK REVETMENT | 190 | TN | \$ 103.00 | \$ 19,570 |
| | STREAM ROCK | 380 | TN | \$ 66.00 | \$ 25,080 |
| 50 | SANDING MIX | 40 | ΤN | \$ 43.00 | \$ 1,720 |
| | SUBTOTAL (ROUNDED) | | | | \$ 635,000 |
| | CONTINGENCY | | | 25% | \$ 159,000 |
| | SUBTOTAL (ROUNDED) | | | | \$ 794,000 |
| | SALES TAX | | | 8.8% | \$ 69,872 |
| | TOTAL CONSTRUCTION COSTS (ROUNDED) | | | | \$ 864,000 |
| | | | | | |

NOTE: The above cost opinion is in June 2007 dollars and does not include escalation, construction management, financing, O&M or hazardous material mitigation costs. This Class 3 cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, actual site productivity, competitive market conditions, final project scope, final project schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

| Basin No.: | 29 |
|-------------------------|---|
| Project No: | 29.2 |
| Project Title: | 140 LF butt-fused HDPE pipe on west side of West Mercer Way in 6100 block |
| Problem Description: | Very steep channel has created a headcut and incised into the east bank of the main stem of the creek. The small, narrow channel is up to 12 feet deep and rapidly eroding. See Appendix E for a field sketch of the problem area. |
| Project Description: | Butt-fused HDPE bypass pipe from West Mercer Way down the steep bank to the ravine bottom, a distance of 140 feet. New manhole and anchor near the street. All flow will be conveyed in the pipe. |
| Related Projects | None |
| Estimated Project Cost: | \$115,000 |



Looking at 10' Incised channel 12/14/2005



| PROJECT: | | CHECKED BY | | | | | |
|----------|--|-----------------|--------------|---------|-----------|---------|---------|
| | jcb BYPASS PIPE | DATE: | 5/23/200 | 6 | | | |
| | BID ITEM | QUANTITY | UNIT | | IT PRICE | | AMOUNT |
| | | QUANTIT | UNIT | UN | | | AMOUNT |
| | CLEARING AND GRUBBING | 140 | SY | \$ | 20 | \$ | 2,800 |
| | EXCAVATION | 140 | CY | э \$ | 20 40 | э \$ | 2,800 |
| | | | | | | | |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 5 | CY | \$ | 120 | \$ | 600 |
| | PIPE ANCHORS | 2 | EA | \$ | 800 | \$ | 1,493 |
| | 12" BUTT FUSED HDPE PIPE | 140 | LF | \$ | 75 | \$ | 10,500 |
| | ANCHOR BLOCK AND SPECIAL FITTINGS | 1 | EA | \$ | 5,000 | | 5,000 |
| | MANHOLES/CB | 2 | EA | \$ | 3,500 | | 7,000 |
| | UTILITY RELOCATIONS | 0 | EA | \$ | 8,000 | | - |
| | TEMPORARY BYPASS | 1 | LS | \$ | , | \$ | 1,000 |
| | ACCESS (10' WIDE) | 25 | LF | \$ | 10 | \$ | 250 |
| | RESTORATION OF ACCESS AND AREA | 186 | SY | \$ | 15 | \$ | 2,796 |
| | | | | | Subtotal | \$ | 31,839 |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - |
| | MISC | 10% | | | | \$ | 3,184 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 3,184 |
| | TRAFFIC CONTROL | 10% | | | | \$ | 3,184 |
| | | | | | Subtotal | \$ | 41,392 |
| | MOBILIZATION | 10% | | | | \$ | 4,139 |
| | | | | | Subtotal | \$ | 46,000 |
| | CONTINGENCY | 30% | | | | \$ | 13,800 |
| | | | | | Subtotal | \$ | 59,800 |
| | STATE SALES TAX | 8.80% | | | | \$ | 5,262 |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ | 74,000 |
| | INDIRECT COSTS | | | | (| • | , |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 18,500 |
| | PERMITTING | 10% | | | | \$ | 7,400 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 14,800 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | \$ | 500 |
| | | Total Estim | ated Project | Cost | (Rounded) | \$ | 115,000 |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 29 |
|-------------------------|--|
| Project No: | D29.2 |
| Project Title: | SE 65th St between 80th Ave SE and 81st Ave SE |
| Problem Description: | The outlet end of the pipe discharging to the watercourse is collapsed and there is cracking along the 24-inch-diameter pipe. |
| Project Description: | Replace approximately 100 feet of 24-inch-diameter pipe from where the cracking starts to the outlet (further investigation may show that the entire length does not need to be replaced). |
| Related Projects | None |
| Estimated Project Cost: | \$92,000 |

- No Photo Available - See Appendix F for detailed TV inspection.



Project Location Map

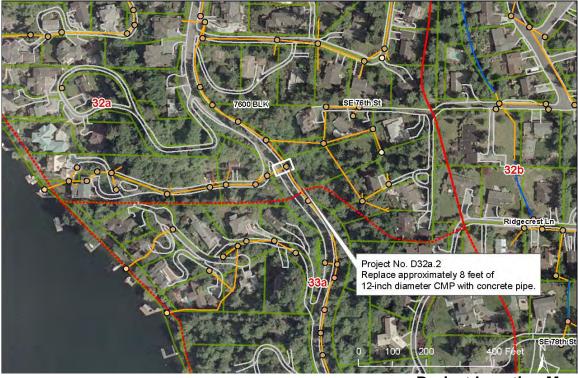
| STORM DRAINAGE PIPES BID ITEM QUANTITY UNIT UNIT PRICE AMOL ACCESS (10 WIDE) 200 LF \$ 10 \$ ACCESS (10 WIDE) 200 LF \$ 10 \$ ACCESS RESTORATION 122 SY \$ 5 \$ CLEARING AND GRUBBING 0 LF \$ \$ \$ SAWCUTTING 0 SY \$ 20 \$ REMOVE PAVEMENT 0 SY \$ 20 \$ REMOVE CATCH BASIN 0 LF \$ 15 \$ 13° CONC PIPE 100 LF \$ 100 \$ 13° CONC PIPE 100 LF \$ 120 \$ 24' CONC PIPE 100 LF \$ 120 \$ RELACE 18' CONC PIPE WITH PIPE BURSTING 0 EA \$ 1,600 \$ REALCE 18' CONC PIPE WITH PIPE BURSTING 0 EA \$ 1,600 \$ < | <u>D29.2</u> | CHECKED BY: msg | | | | | | |
|---|--------------------------------|-------------------|--------------|----------------------------|-----------|----|--------|--|
| BID ITEM QUANTITY UNIT UNIT PRICE AMOL ACCESS (10' WIDE) 200 LF \$ 10 \$ ACCESS RESTORATION 122 SY \$ 5 \$ CLEARING AND GRUBBING 225 SY \$ 20 \$ \$ SAWCUTTING 0 LF \$ 8 \$ \$ \$ REMOVE PAVEMENT 0 SY \$ 20 \$ <th></th> <th>DATE:</th> <th colspan="4">5/10/2006</th> <th></th> | | DATE: | 5/10/2006 | | | | | |
| CONSTRUCTION COSTS 200 LF \$ 10 \$ ACCESS (10' WIDE) 200 LF \$ 10 \$ ACCESS RESTORATION 122 SY \$ \$ \$ CLEARING AND GRUBBING 26 SY \$ \$ \$ \$ SAWCUTTING 0 LF \$ 8 \$ \$ \$ REMOVE PAVEMENT 0 SY \$ 20 \$ | | 0114117171 | | 1 | | | | |
| ACCESS (10' WIDE) 200 LF \$ 10 \$ ACESS RESTORATION 122 SY \$ 5 \$ CLEARING AND GRUBBING 25 SY \$ 20 \$ SAWCUTTING 0 LF \$ 8 \$ REMOVE PIPE 100 LF \$ 15 \$ REMOVE PIPE 100 LF \$ 15 \$ REMOVE CATCH BASIN 0 EA \$ 300 \$ 12" CONC PIPE 100 LF \$ 175 \$ 18" CONC PIPE 100 LF \$ 120 \$ RELACE 18" CONC PIPE 100 LF \$ 220 \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 1,000 \$ CATCH BASIN TYPE 1 0 EA \$ 1,000 \$ MANHOLESCAB 0 EA \$ 1,000 \$ PAVEMENT RESTORATION 1 <th></th> <th>QUANITIY</th> <th>UNIT</th> <th>UN</th> <th>IT PRICE</th> <th></th> <th>AMOUNT</th> | | QUANITIY | UNIT | UN | IT PRICE | | AMOUNT | |
| ACESS RESTORATION 122 SY \$ 5 CLEARING AND GRUBBING 25 SY \$ 20 \$ SAWCUTTING 0 LF \$ 8 \$ REMOVE PAVEMENT 0 SY \$ 20 \$ REMOVE CATCH BASIN 0 LF \$ 15 \$ REMOVE CATCH BASIN 0 LF \$ 175 \$ 12" CONC PIPE 00 LF \$ 175 \$ 18" CONC PIPE 0 LF \$ 190 \$ 24" CONC PIPE 00 LF \$ 190 \$ 24" CONC PIPE 0 EA \$ 1,500 \$ RELACE 18" CONC PIPE 0 EA \$ 1,500 \$ CATCH BASIN TYPE 1 0 EA \$ 1,400 \$ MANHOLES/CB 0 EA \$ 3,500 \$ READSIDE/LANDSCAPE RESTORATION 1 LS | | | . – | • | | | | |
| CLEARING AND GRUBBING 25 SY \$ 20 \$ SAWCUTTING 0 LF \$ 8 \$ REMOVE PAVEMENT 0 SY \$ 20 \$ REMOVE PAVEMENT 0 SY \$ 20 \$ REMOVE PAVEMENT 0 LF \$ 15 \$ REMOVE CATCH BASIN 0 LF \$ 175 \$ 12° CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 100 \$ 24° CONC PIPE WITH PIPE BURSTING 0 LF \$ 100 \$ RELACE 10° CONC PIPE WITH PIPE BURSTING 0 EA \$ 1,600 \$ CATCH BASIN TYPE 1 0 EA \$ 1,600 \$ \$ MANHOLES/CB 0 EA \$ 3,500 \$ \$ PAVEMENT RESTORATION 1 LS \$ 2,000 \$ \$ RIPRAPROULDERS/QUARRY SPALLS <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>2,0</td></td<> | | | | | | | 2,0 | |
| SAWCUTTING 0 LF \$ 8 \$ REMOVE PAVEMENT 0 SY \$ 20 \$ REMOVE PRET 100 LF \$ 15 \$ REMOVE CATCH BASIN 0 EA \$ 300 \$ 12° CONC PIPE 0 LF \$ 19 \$ \$ 18° CONC PIPE 0 LF \$ 190 \$ \$ 24' CONC PIPE 0 LF \$ 100 \$ \$ 24' CONC PIPE 100 LF \$ 120 \$ RELACE 18° CONC PIPE UTH PIPE BURSTING 0 EA \$ 14,00 \$ CATCH BASIN TYPE 1 0 EA \$ 3,500 \$ \$ PAVEMENT RESTORATION 1 LS \$ 2,000 \$ \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,000 \$ \$ UTILITY RELOCATIONS 0 < | | | - | | | | 6 | |
| REMOVE PAVEMENT 0 SY \$ 20 \$ REMOVE PAVEMENT 0 LF \$ 15 \$ REMOVE CATCH BASIN 0 LF \$ 175 \$ 12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 175 \$ 18" CONC PIPE 100 LF \$ 170 \$ 24" CONC PIPE 100 LF \$ 170 \$ 24" CONC PIPE 100 LF \$ 210 \$ RELACE 16" CONC PIPE WITH PIPE BURSTING 0 LF \$ 250 \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 1,400 \$ MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 0 SY \$ 20 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 20,000 \$ RIPRAP/BOULDER/OUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TRAFFIC CONTROL 5% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ | CLEARING AND GRUBBING | 25 | SY | | 20 | \$ | Ę | |
| REMOVE PIPE 100 LF \$ 15 \$ REMOVE CATCH BASIN 0 EA \$ 300 \$ 12' CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 19''' 5 18' CONC PIPE 100 LF \$ 19''' \$ 24' CONC PIPE 100 LF \$ 10''' \$ RELACE 18' CONC PIPE WITH PIPE BURSTING 0 LF \$ 25''' \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 15,000 \$ CATCH BASIN TYPE 1 0 EA \$ 3,600 \$ PAVEMENT RESTORATION 0 EA \$ 3,600 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4.0 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ MISC 10''' S \$ \$ <td>SAWCUTTING</td> <td>0</td> <td>LF</td> <td>\$</td> <td>8</td> <td>\$</td> <td></td> | SAWCUTTING | 0 | LF | \$ | 8 | \$ | | |
| REMOVE CATCH BASIN 0 EA \$ 300 \$ 12' CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 190 \$ 18'' CONC PIPE 0 LF \$ 190 \$ 24'' CONC PIPE 100 LF \$ 210 \$ RELACE 18'' CONC PIPE 0 LF \$ 210 \$ RELACE 18'' CONC PIPE 0 LF \$ 210 \$ RELACE 18'' CONC PIPE 0 LF \$ 250 \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 1,400 \$ MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 0 SY \$ 20 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY Y \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ MISC EROSION & SEDIMENTATION CONTROL 5% \$ \$ | REMOVE PAVEMENT | 0 | SY | \$ | 20 | \$ | | |
| 12° CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 175 \$ 18° CONC PIPE 100 LF \$ 190 \$ 24° CONC PIPE 100 LF \$ 210 \$ RELACE 18° CONC PIPE WITH PIPE BURSTING 0 LF \$ 250 \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 15,000 \$ CATCH BASIN TYPE 1 0 EA \$ 14,000 \$ MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 1 LS \$ 2,000 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 1 LS \$ 8,000 \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ | REMOVE PIPE | 100 | LF | \$ | 15 | \$ | 1, | |
| 12° CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 175 \$ 18° CONC PIPE 100 LF \$ 190 \$ 24° CONC PIPE 100 LF \$ 210 \$ RELACE 18° CONC PIPE WITH PIPE BURSTING 0 LF \$ 250 \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 15,000 \$ CATCH BASIN TYPE 1 0 EA \$ 14,000 \$ MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 1 LS \$ 2,000 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 1 LS \$ 8,000 \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ | REMOVE CATCH BASIN | 0 | EA | \$ | 300 | \$ | | |
| 18" CONC PIPE 0 LF \$ 190 \$ 24" CONC PIPE 100 LF \$ 210 \$ RELACE 18" CONC PIPE WITH PIPE BURSTING 0 LF \$ 250 \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 15.000 \$ CATCH BASIN TYPE 1 0 EA \$ 3.500 \$ MANHOLES/CB 0 EA \$ 3.500 \$ PAVEMENT RESTORATION 0 SY \$ 20 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ MISC EROSION & SEDIMENTATION CONTROL 5% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<> | | | | | | | | |
| 24" CONC PIPE 100 LF \$ 210 \$ RELACE 18" CONC PIPE WITH PIPE BURSTING 0 LF \$ 250 \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 1,400 \$ CATCH BASIN TYPE 1 0 EA \$ 1,400 \$ MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 0 SY \$ 20 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ MOBILIZATION | | | | | | | | |
| RELACE 18" CONC PIPE WITH PIPE BURSTING 0 LF \$ 250 \$ PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 15,000 \$ CATCH BASIN TYPE 1 0 EA \$ 1,400 \$ MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 0 SY \$ 2.00 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 10% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ MOBILIZATION <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>21,</td></t<> | | | | | | | 21, | |
| PIPE BURSTING INSERTION/PULL PIT 0 EA \$ 15,000 \$ CATCH BASIN TYPE 1 0 EA \$ 1,400 \$ MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 0 SY \$ 20 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | | | | | | | 21, | |
| CATCH BASIN TYPE 1 0 EA \$ 1,400 \$ MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 0 SY \$ 2.00 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4.0 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 10% \$ \$ \$ \$ EROSION & SEDIMENTATION CONTROL 5% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ CONTINGENCY 30% \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ INDIRECT COSTS \$ \$ \$ \$ PE | | | | | | | | |
| MANHOLES/CB 0 EA \$ 3,500 \$ PAVEMENT RESTORATION 0 SY \$ 20 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MOBILIZATION 5% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ CONTINGENCY 30% \$ \$ \$ \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ \$ \$ \$ <tr< td=""><td></td><td></td><td></td><td></td><td>,</td><td></td><td></td></tr<> | | | | | , | | | |
| PAVEMENT RESTORATION 0 SY \$ 20 \$ ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 1 LS \$ 1,000 \$ EROSION & SEDIMENTATION CONTROL 5% \$ \$ MOBILIZATION 10% \$ \$ MOBILIZATION 10% \$ \$ CONTINGENCY 30% \$ \$ STATE SALES TAX 8.80% \$ \$ INDIRECT COSTS \$ \$ \$ \$ SURVEYING AND DESIGN 25% \$ \$ \$ | | | | • | , | | | |
| ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2,000 \$ RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 1 LS \$ 1,000 \$ EROSION & SEDIMENTATION CONTROL 5% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ CONTINGENCY 30% \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ INDIRECT COSTS 25% \$ \$ \$ | | - | | • | 3,500 | | | |
| RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 40 \$ UTILITY RELOCATIONS 0 EA \$ 8,000 \$ TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ TRAFFIC CONTROL 5% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ MOBILIZATION 10% \$ | PAVEMENT RESTORATION | 0 | SY | \$ | 20 | \$ | | |
| UTILITY RELOCATIONS TEMPORARY BYPASS 1 LS \$ 8,000 \$ 1 LS \$ 1,000 \$ Subtotal \$ Subtotal \$ S Subtotal \$ S CONTINGENCY 30% Subtotal \$ STATE SALES TAX 8.80% S SUBVERYING AND DESIGN 25% S SURVEYING AND DESIGN 25% S | ROADSIDE/LANDSCAPE RESTORATION | 1 | LS | \$ | 2,000 | \$ | 2, | |
| TEMPORARY BYPASS 1 LS \$ 1,000 \$ MISC 10% \$ \$ EROSION & SEDIMENTATION CONTROL 5% \$ TRAFFIC CONTROL 5% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ INDIRECT COSTS \$ \$ SURVEYING AND DESIGN 25% \$ | RIPRAP/BOULDERS/QUARRY SPALLS | 5 | CY | \$ | 40 | \$ | | |
| TEMPORARY BYPASS1LS\$1,000\$Subtotal\$MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL10%\$\$MOBILIZATION5%\$\$\$MOBILIZATION10%\$\$\$MOBILIZATION10%\$\$\$MOBILIZATION10%\$\$\$MOBILIZATION10%\$\$\$MOBILIZATION10%\$\$\$MOBILIZATION10%\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION10%\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION10%\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION\$\$\$\$MOBILIZATION <td>UTILITY RELOCATIONS</td> <td>0</td> <td>EA</td> <td>\$</td> <td>8,000</td> <td>\$</td> <td></td> | UTILITY RELOCATIONS | 0 | EA | \$ | 8,000 | \$ | | |
| MISC 10% \$ EROSION & SEDIMENTATION CONTROL 5% \$ TRAFFIC CONTROL 5% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ SURVEYING AND DESIGN 25% \$ PERMITTING 5% \$ | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1, | |
| EROSION & SEDIMENTATION CONTROL 5% \$ TRAFFIC CONTROL 5% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) SURVEYING AND DESIGN 25% \$ PERMITTING 5% \$ | | | | | Subtotal | \$ | 28,8 | |
| EROSION & SEDIMENTATION CONTROL 5% \$ TRAFFIC CONTROL 5% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) SURVEYING AND DESIGN 25% \$ PERMITTING 5% \$ | NIGO | 100/ | | | | • | | |
| TRAFFIC CONTROL 5% \$ MOBILIZATION 10% \$ 10% \$ \$ CONTINGENCY 30% \$ STATE SALES TAX \$ \$ NDIRECT COSTS SURVEYING AND DESIGN PERMITTING 25% \$ SURVEYING AND DESIGN PERMITTING 25% \$ | | | | | | | 2, | |
| MOBILIZATION 10% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ MOBILIZATION \$ MOBILIZATION 10% \$ MOBILIZATION \$ MOBIL | | | | | | | 1, | |
| MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX \$ \$ STATE SALES TAX 8.80% \$ INDIRECT COSTS Total Estimated Construction Cost (Rounded) \$ SURVEYING AND DESIGN 25% \$ PERMITTING 5% \$ | TRAFFIC CONTROL | 5% | | | | \$ | 1, | |
| CONTINGENCY 30% \$ CONTINGENCY 30% \$ State sales tax 8.80% \$ Construction Cost (Rounded) \$ SURVEYING AND DESIGN 25% \$ PERMITTING 25% \$ | | | | | Subtotal | \$ | 34, | |
| CONTINGENCY 30% \$ STATE SALES TAX Subtotal \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 5% \$ | MOBILIZATION | 10% | | | | \$ | 3, | |
| STATE SALES TAX STATE SALES TAX STATE SALES TAX SALES TA | | | | | Subtotal | | 38, | |
| STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 5% \$ | CONTINGENCY | 30% | | | | | 11, | |
| Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 5% \$ | | | | | Subtotal | \$ | 49, | |
| INDIRECT COSTSSURVEYING AND DESIGN25%\$PERMITTING5%\$ | STATE SALES TAX | 8.80% | | | | \$ | 4, | |
| SURVEYING AND DESIGN25%\$PERMITTING5%\$ | | Total Estimated C | Construction | Cost (| (Rounded) | \$ | 61,0 | |
| PERMITTING 5% \$ | INDIRECT COSTS | | | | | | | |
| PERMITTING 5% \$ | SURVEYING AND DESIGN | 25% | | | | \$ | 15,3 | |
| | | | | | | | 3, | |
| | - | | | | | | 12, | |
| EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) 1 PARCEL \$ 500 \$ | | | PARCEL | \$ | 500 | | 12, | |
| | | Tatal Fatier | | ted Project Cost (Rounded) | | | | |

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs. 2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 32 |
|-------------------------|--|
| Project No: | D32a.2 |
| Project Title: | West Mercer Way Near House #7625 |
| Problem Description: | Pipe material varies from CMP to concrete and many connections are poor. |
| Project Description: | Replace approximately 8 feet of 12-inch-diameter concrete pipe in the lower section of the 60-foot-long reach. Additional investigations are necessary to determine if any other sections of the reach need to be replaced. |
| Related Projects | None |
| Estimated Project Cost: | \$25,000 |

- No Photo Available - See Appendix F for detailed TV inspection.



Project Location Map

| CT: <u>D32a.2</u> | | CHECKED BY: msg | | | | | |
|---|----------------------------|-----------------|---------|-----------|----|-----------|--|
| jlg | DATE: | 5/10/2006 | | | | | |
| STORM DRAINAGE PIPES | | | | | r | AMOUNT | |
| BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | |
| | <u>_</u> | . – | • | | • | | |
| ACCESS (10' WIDE) | 0 | LF | \$ | 10 | \$ | | |
| ACESS RESTORATION | 0 | SY | \$ | 5 | \$ | | |
| CLEARING AND GRUBBING | 25 | SY | \$ | 20 | \$ | | |
| SAWCUTTING | 80 | LF | \$ | 8 | \$ | | |
| REMOVE PAVEMENT | 14 | SY | \$ | 20 | \$ | | |
| REMOVE PIPE | 8 | LF | \$ | 15 | \$ | | |
| REMOVE CATCH BASIN | 1 | EA | \$ | 300 | \$ | | |
| 12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) | 8 | LF | \$ | 175 | \$ | 1, | |
| 18" CONC PIPE | 0 | LF | \$ | 190 | \$ | ۰, | |
| 24" CONC PIPE | 0 | LF | φ \$ | | | | |
| | - | | | 210 | \$ | | |
| RELACE 18" CONC PIPE WITH PIPE BURSTING | 0 | LF | \$ | 250 | \$ | | |
| PIPE BURSTING INSERTION/PULL PIT | 0 | EA | \$ | 15,000 | \$ | | |
| CATCH BASIN TYPE 1 | 1 | EA | \$ | 1,400 | \$ | 1 | |
| MANHOLES/CB | 0 | EA | \$ | 3,500 | \$ | | |
| PAVEMENT RESTORATION | 14 | SY | \$ | 20 | \$ | | |
| ROADSIDE/LANDSCAPE RESTORATION | 1 | LS | \$ | 2,000 | \$ | 2 | |
| RIPRAP/BOULDERS/QUARRY SPALLS | 0 | CY | \$ | 40 | \$ | | |
| UTILITY RELOCATIONS | 0 | EA | \$ | 8,000 | \$ | | |
| TEMPORARY BYPASS | 1 | LS | \$ | 500 | \$ | | |
| | | | | | | | |
| | | | | Subtotal | \$ | 7, | |
| MISC | 10% | | | | \$ | | |
| EROSION & SEDIMENTATION CONTROL | 5% | | | | \$ | | |
| | | | | | | | |
| TRAFFIC CONTROL | 5% | | | | \$ | | |
| | | | | Subtotal | \$ | 8 | |
| MOBILIZATION | 10% | | | - | \$ | | |
| | | | | Subtotal | | 10 | |
| CONTINGENCY | 30% | | | | \$ | 3 | |
| | 0.000/ | | | Subtotal | \$ | 13, | |
| STATE SALES TAX | 8.80% Total Estimated (| Construction | Cont | (Doundod) | \$ | 1, 16. | |
| INDIRECT COSTS | | Sonstruction | COSL | Rounded) | φ | 10, | |
| SURVEYING AND DESIGN | 25% | | | | \$ | 4, | |
| PERMITTING | 25% 5% | | | | \$ | | |
| - | | | | | | 2 | |
| CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | B4805 | • | | \$ | 3, | |
| EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3 |) 1 | PARCEL | \$ | 500 | \$ | | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.

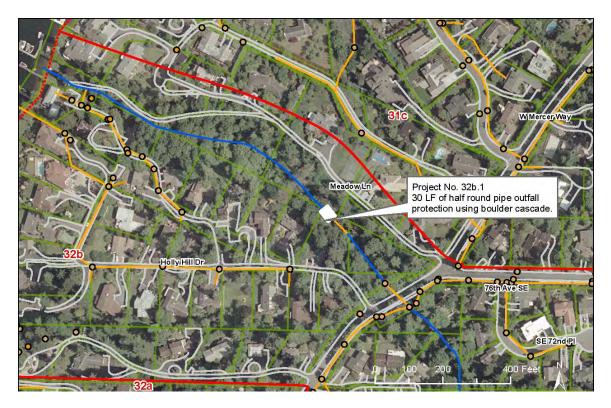
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 32 |
|-------------------------|--|
| Project No: | 32b.1 |
| Project Title: | 30 LF of Boulder Cascade as outfall protection for half round pipe south of Meadow Lane, and west of West Mercer Way |
| Problem Description: | Below the outlet of a 48 inch diameter, half round CMP conveyance pipe, the channel is scoured and drops 3 to 5 vertical feet over 15 to 20 linear feet. Channel is also scouring horizontally below culvert outlet. Water is also flowing along the underside of the half round pipe. Banks are steep, unvegetated, composed of very dense silt and retreating. Channel bottom lacks any substrate and consists of smooth, very dense silt. |
| Project Description: | Construct approximately 30 linear feet of boulder cascade for outfall protection below half round pipe outlet. |
| Related Projects | 32b.2 (located downstream) |
| Estimated Project Cost: | \$38,000 |



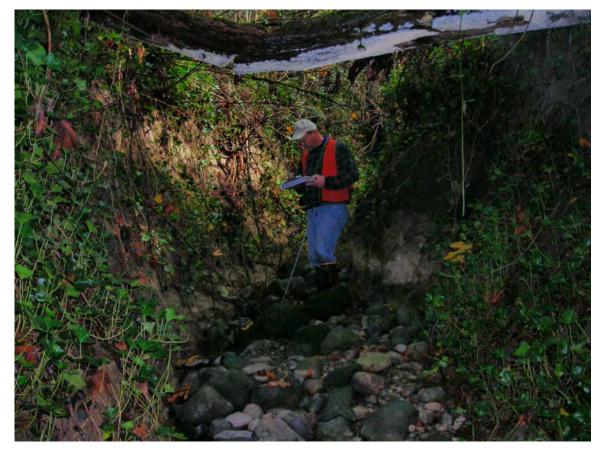
Looking Upstream 10/20/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



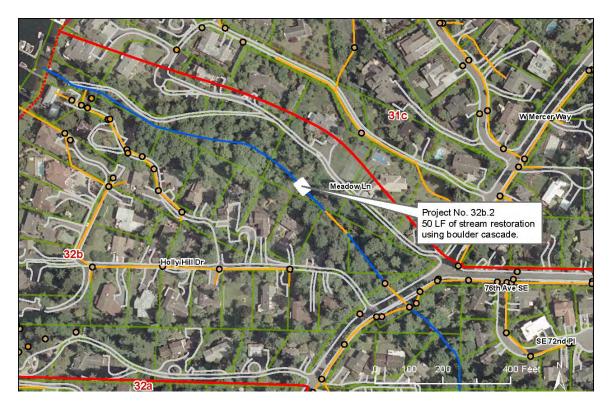
| PROJECT | | CHECKED B | | _ | | | |
|---------|--|-----------------|--------------|---------|-----------|---------|--------|
| BY: | Sb OUTLET PROTECTION | DATE: | 11/30/200 | 6 | | | |
| | BID ITEM | QUANTITY | UNIT | LIN | IT PRICE | | AMOUNT |
| | | QUANTIT | UNIT | UN | | | AWOUNT |
| | CLEARING AND GRUBBING | 30 | LF | \$ | 10 | \$ | 30 |
| | REMOVE/DISPOSE MISC DEBRIS | 30 | LF | э \$ | 2 | ф \$ | 50 |
| | EXCAVATION | 30 10 | CY | э \$ | 2 50 | э \$ | 50 |
| | BOULDERS | 36 | TON | ъ \$ | 50 100 | ծ \$ | 3,60 |
| | | | TON | ծ Տ | 80 | | , |
| | STREAMBED GRAVEL MIX | 5 | | | | \$ | 40 |
| | LOGS | 2 | EA | \$ | 1,400 | \$ | 2,80 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1,00 |
| | ACCESS (10' WIDE) | 50 | LF | \$ | 10 | \$ | 50 |
| | ACCESS RESTORATION | 50 | LF | \$ | 10 | \$ | 50 |
| | RIPARIAN PLANTING AND SEEDING | 30 | LF | \$ | 30 | \$ | 90 |
| | | | | | Subtotal | \$ | 10,56 |
| | SPECIAL ACCESS/CONSTRUCTION | 5% | | | | \$ | 52 |
| | MISC | 10% | | | | \$ | 1,05 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 1,05 |
| | TRAFFIC CONTROL | 0% | | | | \$ | - |
| | | | | | Subtotal | \$ | 13,20 |
| | MOBILIZATION | 10% | | | | \$ | 1,32 |
| | | | | | Subtotal | \$ | 15,00 |
| | CONTINGENCY | 30% | | | | \$ | 4,50 |
| | | | | | Subtotal | \$ | 19,50 |
| | STATE SALES TAX | 8.80% | | | | \$ | 1,71 |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ | 24,00 |
| | INDIRECT COSTS | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 6,00 |
| | PERMITTING | 10% | | | | \$ | 2,40 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 4,80 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 2 | PARCEL | \$ | 500 | \$ | 1,00 |

| Basin No.: | 32 |
|-------------------------|--|
| Project No: | 32b.2 |
| Project Title: | Boulder cascade at headcut in incised stream channel south of Meadow Lane and west of West Mercer Way |
| Problem Description: | Approximately 5 to 7 foot deep headcut through very dense silt. Below headcut channel is highly incised with vertical, unvegetated banks. Channel bottom has little loose substrate, and consists of very dense silt. |
| Project Description: | Construct approximately 50 linear feet of boulder cascade, regrade upper banks and replace invasive plants with native vegetation. |
| Related Projects | 32b.1 (located upstream) |
| Estimated Project Cost: | \$55,000 |



Looking Upstream 10/20/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| ROJECT: | 32b.2 CHECKED BY: jcb | | | | | | | |
|---------|--|-----------------|--------------|------|-----------|----|--------|--|
| Y: | bs | DATE: | 11/30/200 | 6 | | | | |
| | STREAM RESTORATION | | - | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | |
| | CONSTRUCTION COSTS | | | | | | | |
| | CLEARING AND GRUBBING | 50 | LF | \$ | 10 | \$ | 50 | |
| | REMOVE/DISPOSE MISC DEBRIS | 50 | LF | \$ | 2 | \$ | 10 | |
| | EXCAVATION | 20 | CY | \$ | 50 | \$ | 1,00 | |
| | BOULDERS | 60 | TON | \$ | 100 | \$ | 6,00 | |
| | STREAMBED GRAVEL MIX | 5 | TON | \$ | 80 | \$ | 40 | |
| | LOGS | 3 | EA | \$ | 1,400 | \$ | 4,20 | |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1,00 | |
| | ACCESS (10' WIDE) | 75 | LF | \$ | 10 | \$ | 75 | |
| | ACCESS RESTORATION | 75 | LF | \$ | 10 | \$ | 75 | |
| | RIPARIAN PLANTING AND SEEDING | 50 | LF | \$ | 30 | \$ | 1,50 | |
| | | | | | Subtotal | \$ | 16,20 | |
| | SPECIAL ACCESS/CONSTRUCTION | 5% | | | | \$ | 81 | |
| | MISC | 10% | | | | \$ | 1,62 | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 1,62 | |
| | TRAFFIC CONTROL | 0% | | | | \$ | - | |
| | | | | | Subtotal | \$ | 20,25 | |
| | MOBILIZATION | 10% | | | | \$ | 2,02 | |
| | | | | | Subtotal | \$ | 22,00 | |
| | CONTINGENCY | 30% | | | | \$ | 6,60 | |
| | | | | | Subtotal | \$ | 28,60 | |
| | STATE SALES TAX | 8.80% | | | | \$ | 2,51 | |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ | 35,00 | |
| | INDIRECT COSTS | | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 8,75 | |
| | PERMITTING | 10% | | | | \$ | 3,50 | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 7,00 | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | \$ | 50 | |

| Basin No.: | 37b |
|-------------------------|---|
| Project No: | 37b.1 |
| Project Title: | Catch basin and pipe at 8020 Block of East Mercer Way |
| Problem Description: | Outfall erosion from 8-foot high drop and erosion from street runoff is threatening driveway |
| Project Description: | Install a deep type 2 catch basin in street shoulder with an outlet pipe 8 feet lower at the level of the downstream channel. Catch basin would also allow collection of problematic street drainage. Temporary access could be accomplished from the private drive. |
| Related Projects | Solution being designed by homeowner's engineer |
| Estimated Project Cost: | \$64,000 |



Flow from Pipe Outlet 3/3/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring

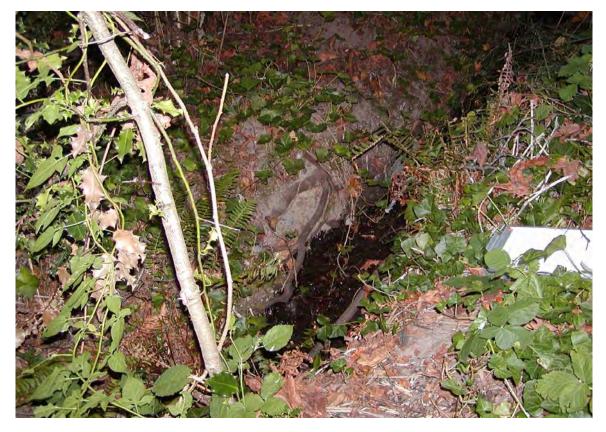


| | T: <u>37b1</u> | CHECKED BY | | | | | |
|---|--|-------------------|--------------|---------|----------------|---------|--------|
| : | jcb STORM DRAINAGE PIPES | DATE: | 5/23/200 | 6 | | | |
| | BID ITEM | QUANTITY | UNIT | | T PRICE | | AMOUNT |
| | CONSTRUCTION COSTS | QUANTIT | UNIT | | | | AMOONT |
| | CLEARING AND GRUBBING | 20 | SY | \$ | 20 | \$ | 40 |
| | EXCAVATION | 20 | CY | \$ | 40 | \$ | 80 |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 10 | CY | \$ | 80 | \$ | 80 |
| | PAVEMENT RESTORATION | 10 | LS | \$ | 2,000 | * | 2,00 |
| | 24" CPEP PIPE | 20 | LU | φ \$ | 2,000 | \$ | 1,20 |
| | ANCHOR BLOCK AND SPECIAL FITTINGS | 0 | EA | φ \$ | 5,000 | | 1,20 |
| | MANHOLES/CB | 1 | EA | φ \$ | 3,500 | | 3,50 |
| | UTILITY RELOCATIONS | 1 | EA | φ \$ | 3,300 8,000 | | 8,00 |
| | TEMPORARY BYPASS | 1 | | э \$ | | | |
| | | | LS LF | | 1,000 | * | 1,00 |
| | ACCESS (10' WIDE) | 0 | | \$ | 10 | \$ | - |
| | RESTORATION OF ACCESS AND AREA | 24 | SY | \$ | 15 | \$ | 3 |
| | | | | | Subtotal | \$ | 18,0 |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - |
| | MISC | 10% | | | | \$ | 1,8 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 1,8 |
| | TRAFFIC CONTROL | 10% | | | | \$ | 1,8 |
| | | | | | Subtotal | \$ | 23,4 |
| | MOBILIZATION | 10% | | | | \$ | 2,3 |
| | | | | | Subtotal | | 26,0 |
| | CONTINGENCY | 30% | | | | \$ | 7,8 |
| | | | | | Subtotal | \$ | 33,8 |
| | STATE SALES TAX | 8.80% | | | | \$ | 2,9 |
| | INDIRECT COSTS | Total Estimated (| Construction | Cost (| Rounded) | \$ | 42,0 |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 10,5 |
| | PERMITTING | 5% | | | | \$ | 2,1 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 8,4 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | φ \$ | 5 |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 39a |
|-------------------------|---|
| Project No: | 39a.1 |
| Project Title: | Channel Stabilization Downstream of SE 76th Street |
| Problem Description: | Downcutting of the channel along 40 feet of channel that is 6 inches to 2 feet deep and slopes 10 to 30%. The downcutting is not related to the culvert outlet. The contributing drainage area is small and there is no threat to any structures. The problem is relatively minor. The project site is located east of 7523 East Mercer Way. See Appendix E for a field sketch of the problem area. |
| Project Description: | Install channel stabilization along the reach. These would be located on private property, so easements will be required. Temporary access could be accomplished from the private drive. |
| Related Projects | None |
| Estimated Project Cost: | \$28,000 |



Looking Upstream 9/28/2005



| OJECT: | 39a.1 CHECKED BY: msg | | | | | | | |
|--------|---|-----------------|--------------|------|-----------|----------|--------|--|
| | jcb | DATE: | 5/23/200 | 6 | | | | |
| | CHANNEL STABILIZATION | | - | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | |
| | CONSTRUCTION COSTS | | | | | | | |
| | CLEARING AND GRUBBING | 40 | LF | \$ | 10 | \$ | 4 | |
| | REMOVE/DISPOSE MISC DEBRIS | 40 | LF | \$ | 2 | \$ | | |
| | EXCAVATION | 18 | CY | \$ | 40 | \$ | 7 | |
| | SIDE ROOF LEADER EXTENSION | 0 | EA | \$ | 500 | \$ | 2 | |
| | BOULDERS | 16 | TON | \$ | 100 | \$ | 1,6 | |
| | STREAMBED GRAVEL MIX | 10 | TON | \$ | 80 | \$ | 8 | |
| | LOGS | 2 | EA | \$ | 1,400 | \$ | 2,8 | |
| | TEMPORARY BYPASS | 1 | LS | \$ | - | \$ | | |
| | ACCESS (10' WIDE) | 10 | LF | \$ | 10 | \$ | 1 | |
| | ACCESS RESTORATION | 10 | LF | \$ | 10 | \$ | | |
| | RIPARIAN PLANTING AND SEEDING | 40 | LF | \$ | 30 | \$ | 1,2 | |
| | | | | | Subtotal | \$ | 8, | |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | | |
| | MISC | 10% | | | | \$ | 1 | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | | |
| | TRAFFIC CONTROL | 0% | | | | \$ | | |
| | | | | | Subtotal | \$ | 9, | |
| | MOBILIZATION | 10% | | | | \$ | : | |
| | | | | | Subtotal | | 11, | |
| | CONTINGENCY | 30% | | | | \$ | 3, | |
| | | | | | Subtotal | | 14,3 | |
| | STATE SALES TAX | 8.80% | | | | \$ | 1,2 | |
| | INDIRECT COSTS | Total Estimated | Construction | Cost | (Rounded) | \$ | 18, | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 4,5 | |
| | | 25% 10% | | | | | , | |
| | PERMITTING | | | | | \$ | 1,8 | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 20% 1 | PARCEL | \$ | 500 | \$ \$ | 3, | |

| Basin No.: | 42 |
|-------------------------|--|
| Project No: | 42.1 |
| Project Title: | Replace about 12 sandbag check dams with rock check dams or rock vortex weirs. Also install large woody debris for bank protection. |
| Problem Description: | Sandbag and geotextile check dams were installed at 20 to 100 feet spacing for temporary protection of this 600-foot reach. The dams are up to 4 feet high and are beginning to fail. Some bank erosion is also occurring. There is a large amount of fine grained sand behind the dams and in the channel. South bank appears to be slide material. Much of the riparian area would be considered wetlands. Not mapped by the Watershed Company as having potential fish use. |
| Project Description: | Replace about 12 sandbag check dams with rock check dams or rock vortex weirs. Check dams are less expensive but rock vortex weirs may be needed to provide fish passage. Also install logs/large woody debris for bank protection. |
| Related Projects | None |
| Estimated Project Cost: | \$200,000 |



Looking Upstream at 3' High Sandbag and Geotextile Dam 9/28/2005



| ROJECT: | | CHECKED BY | | | | |
|---------|--|-----------------|--------------|------|-----------|-------------|
| : | jcb check dam | DATE: | 5/23/200 | 6 | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | AMOUNT |
| | CONSTRUCTION COSTS | domini | 0.111 | 011 | | / |
| | CLEARING AND GRUBBING | 600 | LF | \$ | 10 | \$ 6,00 |
| | REMOVE/DISPOSE MISC DEBRIS | 600 | LF | \$ | 2 | \$ 1,20 |
| | EXCAVATION | 18 | CY | \$ | 50 | \$ 90 |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 9 | CY | \$ | 200 | 1,80 |
| | BANK REGRADING | 1 | LS | \$ | 10,000 | 10,00 |
| | LOGS | 10 | EA | \$ | 1,400 | 14,00 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 7,000 | 7,00 |
| | ACCESS (10' WIDE) | 650 | LF | \$ | 10 | \$ 6,50 |
| | ACCESS RESTORATION | 650 | LF | \$ | 10 | \$ 6,50 |
| | RIPARIAN PLANTING AND SEEDING | 200 | LF | \$ | 20 | \$ 4,00 |
| | | | | | Subtotal | \$ 57.9 |
| | | | | | ousioiai | - ,- |
| | SPECIAL ACCESS/CONSTRUCTION | 5% | | | | \$ 2,8 |
| | MISC | 10% | | | | \$ 5,7 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ 5,7 |
| | TRAFFIC CONTROL | 0% | | | | \$ - |
| | | | | | Subtotal | 72,3 |
| | MOBILIZATION | 10% | | | | \$ 7,2 |
| | | | | | Subtotal | \$ 80,0 |
| | CONTINGENCY | 30% | | | | \$ 24,0 |
| | | | | | Subtotal | \$ 104,0 |
| | STATE SALES TAX | 8.80% | | | | \$ 9,1 |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ 128,0 |
| | INDIRECT COSTS | | | | . , | |
| | SURVEYING AND DESIGN | 25% | | | | \$ 32,0 |
| | PERMITTING | 10% | | | | \$ 12,8 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ 25,6 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 3 | PARCEL | \$ | 500 | \$ 1,5 |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

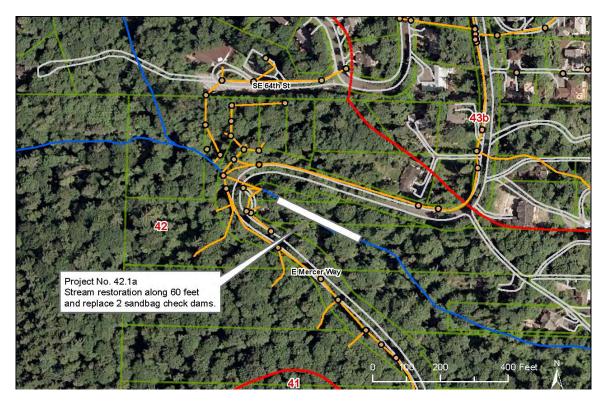
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 42 |
|-------------------------|---|
| Project No: | 42.1A |
| Project Title: | Replace 2 sandbag check dams with rock weirs and provide bank protection and stream restoration along about 60 feet of bank. |
| Problem Description: | Two sandbag and geotextile check dams and sandbag and geotextile bank protection were temporarily installed for protection of this reach. These are beginning to fail. Some bank erosion is also occurring on the south bank. Not mapped by the Watershed Company as having potential fish use. |
| Project Description: | Replace sandbag check dams with rock check dams or rock vortex weirs. Check dams are less expensive but rock vortex weirs may be needed to provide fish passage. Also provide bank protection and stream restoration along about 60 feet of bank. Stream restoration would include logs/large woody debris, boulders, bank regrading and planting. |
| Related Projects | None |
| Estimated Project Cost: | \$122,000 |



Looking Upstream 3/3/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| CONSTRUCTION COSTS Image: Construction Costs CLEARING AND GRUBBING 100 LF \$ 10 \$ REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 10 \$ EXCAVATION 20 CY \$ 50 \$ BOULDERS 24 TON \$ 100 \$ STREAMBED GRAVEL MIX 15 TON \$ 90 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ ACCESS (0' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 10% \$ \$ \$ MISC 100 LF \$ 20 \$ MO | Check dam BID ITEM QUANTITY UNIT UNIT PRICE AMOUNT CILEARING AND GRUBBING REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 1.00 REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 1.00 \$ 1.00 BOULDERS 20 CY \$ 5.0 \$ 1.00 BOULDERS 24 TON \$ 100 \$ 2.43 LOGS 24 TON \$ 100 \$ 9.40 REAMABED GRAVEL MIX 15 TON \$ 900 \$ 1.35 LOGS 6 EA \$ 1.400 \$ 8.40 ROOTWADS 2 EA \$ 900 \$ 1.65 BAIK REGRADING 1 LS \$ 5.000 \$ 7.000 TEMPORARY BYPASS 1 LS \$ 7.000 \$ 7.000 ACCESS (10' WIDE) 300 LF \$ 10 \$ 3.59 | JEC | T: 42.1A | CHECKED BY | : msg | | | | |
|--|--|-----|-----------------------------|-----------------|--------------|------|-----------|----|--------|
| BID ITEM QUANTITY UNIT UNIT PRICE AMIC CONSTRUCTION COSTS 100 LF \$ 10 \$ REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 10 \$ EXCAVATION 20 CY \$ 50 \$ BOULDERS 20 CY \$ 50 \$ STREAMBED GRAVEL MIX 15 TON \$ 90 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ BANK REGRADING 1 LS \$ 7,000 \$ ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ \$ MISC 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ | BID ITEM QUANTITY UNIT UNIT PRICE AMOUNT CONSTRUCTION COSTS 100 LF \$ 1 0 \$ 1 0 1 \$ 1 0 1 \$ 1 0 1 \$ \$ 1 0 \$ \$ 2 \$ 2 0 \$ \$ 1 0 \$ \$ 2 \$ 0 \$ \$ 1 \$ \$ 1 \$ \$ 1 \$ \$ \$ 1 \$ | | jcb | DATE: | 5/23/200 | 6 | | | |
| CONSTRUCTION COSTS Image: Construction Costs CLEARING AND GRUBBING 100 LF \$ 10 \$ REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 10 \$ EXCAVATION 20 CY \$ 50 \$ BOULDERS 24 TON \$ 100 \$ STREAMBED GRAVEL MIX 15 TON \$ 90 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ ACCESS (0' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 10% \$ \$ \$ MISC 100 LF \$ 20 \$ MO | CONSTRUCTION COSTS 100 LF 5 100 LF 5 100 S 1,00 REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 100 LF \$ 2 20 20 CY \$ 50 \$ 1,00 BOULDERS 20 CY \$ 50 \$ 1,00 \$ 2,40 70N \$ 100 \$ 2,40 70N \$ 100 \$ 2,40 \$ 8,40 \$ 2,40 \$ 8,40 \$ 8,40 \$ 8,40 \$ 8,40 \$ \$ \$ 8,40 \$ | | | | | | | | |
| CLEARING AND GRUBBING 100 LF \$ 10 \$ REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 2 \$ EXCAVATION 20 CY \$ 50 \$ BOULDERS 24 TON \$ 100 \$ STREAMBED GRAVEL MIX 15 TON \$ 90 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ BANK REGRADING 1 LS \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 7,000 \$ ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ MISC 100 LF \$ 10 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ \$ MOBILIZATION 10% \$ \$ | CLEARING AND GRUBBING 100 LF \$ 1,00 REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 1,00 EXCAVATION 20 CY \$ 50 \$ BOULDERS 24 TON \$ 100 \$ 2,44 STREAMBED GRAVEL MIX 15 TON \$ 90 \$ 1,84 LOGS 6 EA \$ 1,400 \$ 8,44 ROOTWADS 2 EA \$ 900 \$ 1,65 BANK REGRADING 1 LS \$ 5,000 \$ 7,000 TEMPORARY BYPASS 1 LS \$ 7,000 \$ 7,000 ACCESS (10' WIDE) 300 LF \$ 10 \$ 3,000 RIPARIAN PLANTING AND SEEDING 100 LF \$ 100 \$ 3,55 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,79 \$ 3,55 TRAFFIC CONTROL 10% <th></th> <th></th> <th>QUANTITY</th> <th>UNIT</th> <th>UN</th> <th>IT PRICE</th> <th></th> <th>AMOUNT</th> | | | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT |
| REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 2 \$ EXCAVATION 20 CY \$ 50 \$ BOULDERS 24 TON \$ 100 \$ STREAMBED GRAVEL MIX 15 TON \$ 90 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ BANK REGRADING 1 LS \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 5,000 \$ ACCESS RESTORATION 300 LF \$ 100 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 10 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ \$ MISC 10% \$ \$ \$ TRAFFIC CONTROL 10% \$ \$ MOBILIZATION 10% \$ \$ MOBILIZATION 30% \$ \$ STATE SALES TAX 8.80% \$ \$ INDIRECT COSTS 25% \$ \$ SURVEY | REMOVE/DISPOSE MISC DEBRIS 100 LF \$ 2 \$ 20 EXCAVATION 20 CY \$ 50 \$ 1,00 BOULDERS 24 TON \$ 100 \$ 2,44 STREAMBED GRAVEL MIX 15 TON \$ 90 \$ 1,33 LOGS 6 EA \$ 1,400 \$ 8,44 ROOTWADS 2 EA \$ 900 \$ 1,62 BANK REGRADING 1 LS \$ 7,00 \$ 7,00 ACCESS (10° WIDE) 300 LF \$ 10 \$ 3,00 ACCESS (10° WIDE) 300 LF \$ 10 \$ 3,00 ACCESS (10° WIDE) 300 LF \$ 10 \$ 3,00 REACHARCES/CONSTRUCTION 5% \$ 1,70 \$ 3,55 \$ MOBILIZATION 5% \$ 1,40% \$ \$ | | | | | • | | | |
| EXCAVATION 20 CY \$ 50 \$ BOULDERS 24 TON \$ 100 \$ STREAMBED GRAVEL MIX 15 TON \$ 900 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ BANK REGRADING 1 LS \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 7,000 \$ ACCESS RESTORATION 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ MISC 10% \$ \$ TRAFFIC CONTROL 0% \$ \$ MOBILIZATION 10% \$ \$ MOBILIZATION 10% \$ \$ STATE SALES TAX 8.80% \$ \$ SURVEYING AND DESIGN 25% \$ \$ PERMITTING 10% \$ \$ | EXCAVATION 20 CY \$ 50 \$ 1,00 BOULDERS 24 TON \$ 100 \$ 2,4 ISTREAMBED GRAVEL MIX 15 TON \$ 900 \$ 1,33 LOGS 6 EA \$ 1,400 \$ 8,44 ROOTWADS 2 EA \$ 900 \$ 1,60 BANK REGRADING 1 LS \$ 5,000 \$ 5,000 TEMPORARY BYPASS 1 LS \$ 7,000 \$ 7,000 ACCESS RESTORATION 300 LF \$ 10 \$ 3,00 RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ 2,00 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,77 \$ 3,56 \$ 1,77 MISC SUbtotal \$ 9,00 \$ 3,56 \$ 1,76 MOBILIZATION 5% \$ 1,7 | | | | | | | | |
| BOULDERS 24 TON \$ 100 \$ STREAMBED GRAVEL MIX 15 TON \$ 90 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 5,000 \$ BANK REGRADING 1 LS \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 7,000 \$ ACCESS (10' WIDE) 300 LF \$ 100 \$ ACCESS RESTORATION 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 10 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ MISC 10% \$ \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ MISC 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ STATE SALES TAX 8.80% \$ \$ SURVEYING | BOULDERS 24 TON \$ 100 \$ 2,4 STREAMBED GRAVEL MIX 15 TON \$ 90 \$ 1,3 LOGS 6 EA \$ 1,400 \$ 8,44 ROOTWADS 2 EA \$ 900 \$ 1,63 BANK REGRADING 1 LS \$ 5,000 \$ 5,00 TEMPORARY BYPASS 1 LS \$ 7,000 \$ 7,00 ACCESS (10' WIDE) 300 LF \$ 10 \$ 3,00 RIPARIAN PLANTING AND SEEDING 100 LF \$ 10 \$ 3,00 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,71 \$ 3,55 \$ 3,55 TRAFFIC CONTROL 5% \$ \$ 3,55 \$ 3,55 MOBILIZATION 5% \$ \$ 3,55 \$ 1,71 MOBILIZATION 5% \$ \$ 3,55 | | | | | | | | |
| STREAMBED GRAVEL MIX 15 TON \$ 90 \$ LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ BANK REGRADING 1 LS \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 7,000 \$ ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ \$ MISC 10% \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ MOBILIZATION 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ SURVEYING AND DESIGN 25% \$ | STREAMBED GRAVEL MIX 15 TON \$ 90 \$ 1,3 LOGS 6 EA \$ 1,40 \$ 8,44 ROOTWADS 2 EA \$ 900 \$ 1,6 BANK REGRADING 1 LS \$ 5,000 \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 7,000 \$ 7,00 ACCESS RESTORATION 300 LF \$ 10 \$ 3,00 ACCESS RESTORATION 300 LF \$ 10 \$ 3,00 RIPARIAN PLANTING AND SEEDING 300 LF \$ 10 \$ 3,00 SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ 1,77 \$ \$ 3,57 SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ 1,77 \$ \$ 3,57 SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ 1,77 \$ \$ 3,57 TRAFFIC CONTROL 0% \$ \$ \$ 3,57 \$ \$ 4 | | | | | | | | , |
| LOGS 6 EA \$ 1,400 \$ ROOTWADS 2 EA \$ 900 \$ BANK REGRADING 1 LS \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 7,000 \$ ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 10 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MOBILIZATION 5% \$ \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | LOGS 6 EA \$ 1,400 \$ 8,44 ROOTWADS 2 EA \$ 900 \$ 1,60 BANK REGRADING 1 LS \$ 5,000 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ 5,00 \$ \$ 3,00 LF \$ 1,0 \$ 3,00 ACCESS (10'WIDE) 300 LF \$ 100 \$ 3,00 \$ \$ 3,00 \$ \$ 3,00 \$ \$ \$ 3,00 \$ | | | = - | | | | | |
| ROOTWADS 2 EA \$ 900 \$ BANK REGRADING 1 LS \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 7,000 \$ ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ MISC 100 LF \$ 20 \$ MISC 10% \$ \$ \$ TRAFFIC CONTROL 10% \$ \$ MOBILIZATION 10% \$ \$ MOBILIZATION 10% \$ \$ STATE SALES TAX 8.80% \$ \$ INDIRECT COSTS \$ \$ \$ | ROOTWADS 2 EA \$ 900 \$ 1.6 BANK REGRADING 1 LS \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 5,000 \$ 7,000 \$ 7,000 \$ 3,00 ACCESS (10' WIDE) 300 LF \$ 10 \$ 3,00 ACCESS (10' WIDE) 300 LF \$ 100 \$ \$ 3,00 RIPARIAN PLANTING AND SEEDING 100 LF \$ 100 \$ \$ 3,00 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7'' \$ \$ 3,5: \$ 1,7'' \$ \$ 3,5: \$ 1,7'' \$ \$ 3,5: \$ \$ | | STREAMBED GRAVEL MIX | 15 | TON | | 90 | \$ | 1,3 |
| BANK REGRADING 1 LS \$ 5,000 \$ TEMPORARY BYPASS 1 LS \$ 7,000 \$ ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS S(10' WIDE) 300 LF \$ 10 \$ ACCESS SESTORATION 300 LF \$ 20 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ \$ MISC 10% \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ MOBILIZATION 10% \$ <td>BANK REGRADING 1 LS \$ 5,000 \$ 5,000 TEMPORARY BYPASS 1 LS \$ 7,000 \$ 7,000 ACCESS (10' WIDE) 300 LF \$ 10 \$ 3,000 ACCESS RESTORATION 300 LF \$ 10 \$ 3,000 RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ 2,000 SPECIAL ACCESS/CONSTRUCTION 5% . 1,79 </td> <td></td> <td>LOGS</td> <td>6</td> <td>EA</td> <td>\$</td> <td>1,400</td> <td>\$</td> <td>8,40</td> | BANK REGRADING 1 LS \$ 5,000 \$ 5,000 TEMPORARY BYPASS 1 LS \$ 7,000 \$ 7,000 ACCESS (10' WIDE) 300 LF \$ 10 \$ 3,000 ACCESS RESTORATION 300 LF \$ 10 \$ 3,000 RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ 2,000 SPECIAL ACCESS/CONSTRUCTION 5% . 1,79 | | LOGS | 6 | EA | \$ | 1,400 | \$ | 8,40 |
| TEMPORARY BYPASS 1 LS \$ 7,000 \$ ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ \$ \$ MISC 10% \$ | TEMPORARY BYPASS 1 LS \$ 7,00 \$ 7,00 ACCESS (10' WIDE) 300 LF \$ 10 \$ 3,00 ACCESS RESTORATION 300 LF \$ 10 \$ 3,00 RIPARIAN PLANTING AND SEEDING 100 LF \$ 10 \$ 3,00 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,71 \$ \$ 3,55 SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ 3,55 \$ \$ 3,55 SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ 3,55 \$ \$ \$ 3,55 SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ 3,55 \$ \$ \$ \$ \$ MSC 10% \$ | | ROOTWADS | 2 | EA | \$ | 900 | \$ | 1,6 |
| ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ Subtotal \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ MISC 10% \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ \$ MOBILIZATION 0% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ MOBILIZATION 10% \$ | ACCESS (10' WIDE) 300 LF \$ 10 \$ 3,00 ACCESS RESTORATION 300 LF \$ 10 \$ 3,00 RIPARIAN PLANTING AND SEEDING 100 LF \$ 10 \$ 3,00 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,70 \$ 3,55 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,70 \$ 3,55 EROSION & SEDIMENTATION CONTROL 10% \$ 3,55 \$ 3,55 TRAFFIC CONTROL 0% \$ 3,55 \$ 3,55 MOBILIZATION 5% \$ 1,74 \$ 3,55 MOBILIZATION 0% \$ \$ 3,55 CONTINGENCY 30% \$ \$ 44,90 STATE SALES TAX \$ \$ \$ \$ 44,90 NDIRECT COSTS \$ | | BANK REGRADING | 1 | LS | \$ | 5,000 | \$ | 5,00 |
| ACCESS (10' WIDE) 300 LF \$ 10 \$ ACCESS RESTORATION 300 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ \$ \$ MISC 10% \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ \$ MOBILIZATION 0% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ \$ CONTINGENCY 30% \$ | ACCESS (10' WIDE) 300 LF \$ 10 \$ 3,0 ACCESS RESTORATION 300 LF \$ 10 \$ 3,0 RIPARIAN PLANTING AND SEEDING 100 LF \$ 10 \$ 3,0 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 \$ 3,5 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 MISC 10% \$ 3,5 EROSION & SEDIMENTATION CONTROL 10% \$ 3,5 TRAFFIC CONTROL 0% \$ - MOBILIZATION \$ 44,9 \$ CONTINGENCY 30% \$ 44,9 STATE SALES TAX \$ 8.80% \$ 44,9 SURVEYING AND DESIGN \$ 8.80% \$ 5,6 SURVEYING AND DESIGN 25% \$ 5 5,6 SURVEYING AND DESIGN 25% \$ 19,5 7,8,0 SURVEYING AND DESIGN 25% \$ 7,8,0 \$ 7,8,0 SURVEYING AND DESIGN 20% \$ <td< td=""><td></td><td>TEMPORARY BYPASS</td><td>1</td><td>LS</td><td>\$</td><td>7,000</td><td>\$</td><td>7,0</td></td<> | | TEMPORARY BYPASS | 1 | LS | \$ | 7,000 | \$ | 7,0 |
| ACCESS RESTORATION RIPARIAN PLANTING AND SEEDING 300 LF \$ 10 \$ SUBtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ SPECIAL ACCESS/CONSTRUCTION MISC EROSION & SEDIMENTATION CONTROL 10% SEROSION & SEDIMENTATION CONTROL 10% S TRAFFIC CONTROL 0% SUBtotal \$ SUBtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ SUBTOTAL S | ACCESS RESTORATION 300 LF \$ 10 \$ 3,0 RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ 2,0 SUBTORATION 100 LF \$ 20 \$ 2,0 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 \$ 35,9 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 \$ 3,5 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 \$ 3,5 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 \$ 3,5 TRAFFIC CONTROL 10% \$ 3,5 \$ - MOBILIZATION 10% \$ \$ 44,9 \$ CONTINGENCY 30% \$ \$ 44,9 \$ \$ 44,9 \$ \$ 44,9 \$ \$ \$ 44,9 \$ | | ACCESS (10' WIDE) | 300 | LF | | 10 | \$ | 3.0 |
| RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ SPECIAL ACCESS/CONSTRUCTION 5% \$ <td< td=""><td>RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ 2,0 Subtotal \$ 35,9 Subtotal \$ 35,9 Subtotal \$ 35,9 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 MISC 10% \$ 3,5 EROSION & SEDIMENTATION CONTROL 10% \$ 3,5 TRAFFIC CONTROL 0% \$ 3,5 MOBILIZATION 0% \$ 44,9 CONTINGENCY 30% \$ 14,7 STATE SALES TAX \$ 8.80% \$ 5,6 Total Estimated Construction Cost (Rounded) \$ 7,8,0 \$ 5,6 SURVEYING AND DESIGN 25% \$ 19,5 7,8,0 PERMITTING 20% \$ 19,5 7,8,0</td><td></td><td></td><td></td><td>I F</td><td></td><td></td><td></td><td>,</td></td<> | RIPARIAN PLANTING AND SEEDING 100 LF \$ 20 \$ 2,0 Subtotal \$ 35,9 Subtotal \$ 35,9 Subtotal \$ 35,9 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 MISC 10% \$ 3,5 EROSION & SEDIMENTATION CONTROL 10% \$ 3,5 TRAFFIC CONTROL 0% \$ 3,5 MOBILIZATION 0% \$ 44,9 CONTINGENCY 30% \$ 14,7 STATE SALES TAX \$ 8.80% \$ 5,6 Total Estimated Construction Cost (Rounded) \$ 7,8,0 \$ 5,6 SURVEYING AND DESIGN 25% \$ 19,5 7,8,0 PERMITTING 20% \$ 19,5 7,8,0 | | | | I F | | | | , |
| SPECIAL ACCESS/CONSTRUCTION 5% \$ MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 0% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX \$ \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | Subtotal \$ 35,9 SPECIAL ACCESS/CONSTRUCTION 5% \$ 1,7 MISC 10% \$ 3,5 EROSION & SEDIMENTATION CONTROL 10% \$ 3,5 TRAFFIC CONTROL 0% \$ - MOBILIZATION 0% \$ - MOBILIZATION 10% \$ 44,9 CONTINGENCY 30% \$ 44,7 SUbtotal \$ 49,0 \$ STATE SALES TAX \$ 8.80% \$ 63,7 SURVEYING AND DESIGN 25% \$ 19,5 PERMITTING 10% \$ 78,0 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | | | | | | | |
| SPECIAL ACCESS/CONSTRUCTION 5% \$ MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 0% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX \$ \$ INDIRECT COSTS \$ \$ SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | SPECIAL ACCESS/CONSTRUCTION 5% 1,7 MISC 10% 3,5 EROSION & SEDIMENTATION CONTROL 10% 3,5 TRAFFIC CONTROL 0% \$ MOBILIZATION 0% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX \$ 5,6 INDIRECT COSTS \$ 5,6 SURVEYING AND DESIGN \$ 5,6 PERMITTING 25% \$ 19,5 PERMITTING 25% \$ 19,5 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | | | | | Cubbetal | ¢ | 05.0 |
| MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ Subtotal \$ S CONTINGENCY 30% \$ Subtotal \$ S SUBVEYING AND DESIGN \$ SUBVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | MISC 10% \$ 3,5 EROSION & SEDIMENTATION CONTROL 10% \$ 3,5 TRAFFIC CONTROL 0% \$ 3,5 MOBILIZATION 0% \$ 44,5 MOBILIZATION 10% \$ 44,5 CONTINGENCY 30% \$ 14,7 STATE SALES TAX \$ 8.80% \$ 5,6 INDIRECT COSTS \$ 5,6 SURVEYING AND DESIGN \$ 5,6 PERMITTING 25% \$ 19,5 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | | | | | Subtotal | \$ | 35,9 |
| MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ | MISC 10% \$ 3,5 EROSION & SEDIMENTATION CONTROL 10% \$ 3,5 TRAFFIC CONTROL 0% \$ 3,5 MOBILIZATION 0% \$ 44,9 MOBILIZATION 10% \$ 44,9 CONTINGENCY 30% \$ 14,7 STATE SALES TAX \$ 8.80% \$ 5,6 INDIRECT COSTS \$ 5,6 7,8,0 SURVEYING AND DESIGN 25% \$ 19,5 PERMITTING 10% \$ 7,8,0 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | SPECIAL ACCESS/CONSTRUCTION | 5% | | | | \$ | 1.7 |
| EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | EROSION & SEDIMENTATION CONTROL 10% \$ 3,5 TRAFFIC CONTROL 0% \$ | | MISC | 10% | | | | | |
| TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX \$ \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | TRAFFIC CONTROL 0% \$ 44,5 MOBILIZATION 10% \$ 44,6 CONTINGENCY 10% \$ 49,0 STATE SALES TAX \$ 14,7 \$ INDIRECT COSTS \$ 63,7 \$ SUBVEYING AND DESIGN \$ 5 5,6 PERMITTING 25% \$ 19,5 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | | | | | | | , |
| MOBILIZATION Subtotal \$ 10% \$ \$ CONTINGENCY 30% \$ STATE SALES TAX \$ \$ INDIRECT COSTS \$ \$ SURVEYING AND DESIGN PERMITTING 25% \$ 10% \$ \$ | Subtotal \$ 44,9 MOBILIZATION 10% \$ 44,9 CONTINGENCY 30% \$ 14,7 STATE SALES TAX \$ 63,7 STATE SALES TAX \$ 63,7 INDIRECT COSTS \$ 5,66 SURVEYING AND DESIGN \$ 78,0 PERMITTING 25% \$ 19,5 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,60 | | | | | | | | , |
| MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS 25% \$ PERMITTING 10% \$ | MOBILIZATION 10% \$ 4,4 CONTINGENCY 30% \$ 14,7 STATE SALES TAX \$ 03,7 \$ 14,7 STATE SALES TAX \$ 03,7 \$ 03,7 INDIRECT COSTS \$ 03,7 \$ 03,7 SURVEYING AND DESIGN \$ 7,8 PERMITTING 10% \$ 7,8 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | | 076 | | | | φ | |
| CONTINGENCY CONTINGENCY SUBDECT CONTINGENCY SUBDECT COSTS SURVEYING AND DESIGN PERMITTING SUBDECT SURVEYING SUBDECT SURVEYING SUBDECT | Subtoal \$ 49,0 CONTINGENCY 30% \$ 14,7 STATE SALES TAX \$ 63,7 STATE SALES TAX 8.80% \$ 5,6 Total Estimated Construction Cost (Rounded) \$ 78,0 SURVEYING AND DESIGN \$ 5,7,6 PERMITTING 10% \$ 7,6 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | | | | | Subtotal | \$ | 44,9 |
| CONTINGENCY 30% \$ STATE SALES TAX Subtotal \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | CONTINGENCY 30% \$ 14,7 STATE SALES TAX Subtotal \$ 63,7 STATE SALES TAX 8.80% \$ 5,6 Total Estimated Construction Cost (Rounded) SURVEYING AND DESIGN \$ 19,5 PERMITTING 10% \$ 7,5 CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | MOBILIZATION | 10% | | | | \$ | 4,4 |
| STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | STATE SALES TAX STATE SALES TAX NDIRECT COSTS SURVEYING AND DESIGN PERMITTING CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% SUBUCTION ENGINEERING AND ADMINISTRATION SUBUCTION ENGINEERING AND ADMINISTRATION 20% SUBUCTION ENGINEERING AND ADMINISTRATION SUBUCTION ENGINE AND ADMINISTRATION ENGINEERING AND ADMINIST | | | | | | Subtotal | \$ | 49,0 |
| STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | STATE SALES TAX8.80%\$5.6Total Estimated Construction Cost (Rounded)\$78.0INDIRECT COSTSSURVEYING AND DESIGN25%\$19.5PERMITTING10%\$7,8CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$15,6 | | CONTINGENCY | 30% | | | - | Ŧ | 14,7 |
| Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | Total Estimated Construction Cost (Rounded)78,0INDIRECT COSTSSURVEYING AND DESIGN25%19,5PERMITTING10%7,8CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$15,6 | | | | | | Subtotal | \$ | 63,7 |
| INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ | INDIRECT COSTSSURVEYING AND DESIGN25%\$ 19,5PERMITTING10%\$ 7,8CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$ 15,6 | | STATE SALES TAX | 8.80% | | | | \$ | 5,6 |
| SURVEYING AND DESIGN25%\$PERMITTING10%\$ | SURVEYING AND DESIGN25%\$ 19,5PERMITTING10%\$ 7,8CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$ 15,6 | | | Total Estimated | Construction | Cost | (Rounded) | \$ | 78,0 |
| PERMITTING 10% \$ | PERMITTING10%57,CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$15,6 | | INDIRECT COSTS | | | | | | |
| PERMITTING 10% \$ | PERMITTING10%\$7,CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$15,6 | | SURVEYING AND DESIGN | 25% | | | | \$ | 19.5 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ 15,6 | | | | | | | | , |
| | | | - | | | | | | , |
| | | | | | PARCEL | \$ | 500 | | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

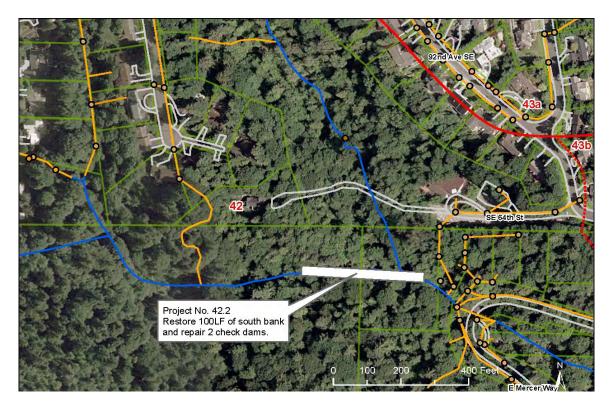
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 42 |
|-------------------------|--|
| Project No: | 42.2 |
| Project Title: | 100 feet of stream restoration/bank protection and repairs to two rock check dams. |
| Problem Description: | About 100 feet of the south bank of this 300-foot reach is experiencing erosion and needs bank protection and restoration. Two large rock check dams need repairs. |
| Project Description: | 100 feet of stream restoration/bank protection and repairs to two rock check dams. |
| Related Projects | None |
| Estimated Project Cost: | \$116,000 |



Looking Upstream 3/3/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| ROJECT | : 42.2 | CHECKED BY: msg | | | | | | | |
|--------|--|-----------------|--------------|------|-----------|---------|--------|--|--|
| SY: | jcb | DATE: | 5/23/200 | 6 | | | | | |
| | check dam | | · · · · · | | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | | |
| | CONSTRUCTION COSTS | 400 | | • | 10 | • | 4.00 | | |
| | | 100 | LF LF | \$ | | \$ | 1,000 | | |
| | REMOVE/DISPOSE MISC DEBRIS | 100 | | \$ | | \$ | 20 | | |
| | EXCAVATION | 5 | CY | \$ | | \$ | 250 | | |
| | BOULDERS | 50 | TON | \$ | | \$ | 5,00 | | |
| | STREAMBED GRAVEL MIX | 15 | TON | \$ | | \$ | 1,20 | | |
| | LOGS | 10 | EA | \$ | 1,400 | \$ | 14,00 | | |
| | ROOTWADS | 3 | EA | \$ | 900 | \$ | 2,70 | | |
| | BANK REGRADING | 1 | LS | \$ | 1,000 | \$ | 1,000 | | |
| | TEMPORARY BYPASS | 1 | LS | \$ | 7,000 | \$ | 7,00 | | |
| | ACCESS (10' WIDE) | 50 | LF | \$ | 10 | \$ | 50 | | |
| | ACCESS RESTORATION | 50 | LF | \$ | 10 | \$ | 50 | | |
| | RIPARIAN PLANTING AND SEEDING | 100 | L F | \$ | | \$ | 2,00 | | |
| | | | | | Subtotal | \$ | 35,35 | | |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - | | |
| | MISC | 10% | | | | \$ | 3,53 | | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 3,53 | | |
| | TRAFFIC CONTROL | 0% | | | | \$ | - | | |
| | | 0% | | | | φ | - | | |
| | | | | | Subtotal | \$ | 42,42 | | |
| | MOBILIZATION | 10% | | | | \$ | 4,24 | | |
| | | | | | Subtotal | \$ | 47,00 | | |
| | CONTINGENCY | 30% | | | _ | \$ | 14,10 | | |
| | | | | | Subtotal | \$ | 61,10 | | |
| | STATE SALES TAX | 8.80% | | | | \$ | 5,37 | | |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ | 75,00 | | |
| | INDIRECT COSTS | | | | , | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 18,75 | | |
| | PERMITTING | 10% | | | | \$ | 7,50 | | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 15,00 | | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | φ \$ | 13,00 | | |
| | LAGENIEN OF AND ACQUISTION ADMINISTRATION (SEE NOLE 3) | 0 | ANOLL | φ | 500 | φ | - | | |

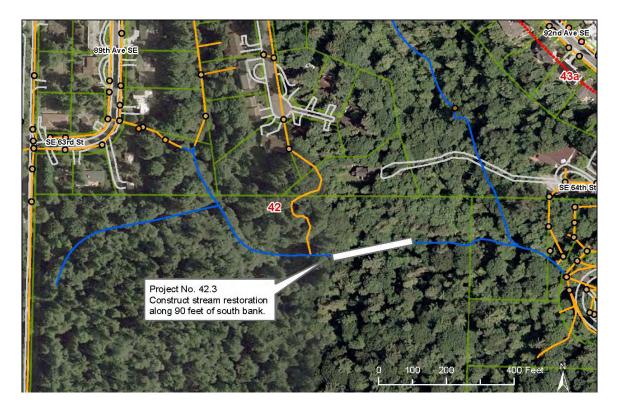
The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 42 |
|-------------------------|--|
| Project No: | 42.3 |
| Project Title: | Stream restoration to increase bank stability along about 90 feet of the south bank |
| Problem Description: | South bank is a landslide area and consists of soft, wet material that is subject to loss by flowing water and by spring sapping. About 90 feet of this 270-foot reach has problematic erosion. |
| Project Description: | Stream restoration to increase bank stability along about 90 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles. |
| Related Projects | None |
| Estimated Project Cost: | \$91,000 |



Looking Upstream 3/3/2006



| OJECT | : 42.3 | CHECKED BY | : msg | | | |
|-------|--|-----------------|--------------|------|-----------|-------------|
| Y: | jcb | DATE: | 5/23/200 | 6 | | |
| | STREAM RESTORATION | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | AMOUNT |
| | CONSTRUCTION COSTS | | | | | |
| | CLEARING AND GRUBBING | 90 | LF | \$ | 10 | \$ 90 |
| | REMOVE/DISPOSE MISC DEBRIS | 90 | LF | \$ | 2 | \$ 18 |
| | EXCAVATION | 5 | CY | \$ | 50 | \$ 25 |
| | BOULDERS | 30 | TON | \$ | 100 | \$ 3,00 |
| | STREAMBED GRAVEL MIX | 20 | TON | \$ | 80 | \$ 1,60 |
| | LOGS | 9 | EA | \$ | 1,400 | \$ 12,60 |
| | ROOTWADS | 3 | EA | \$ | 900 | \$ 2,43 |
| | REUSE ONSITE LOGS | 1 | EA | \$ | 500 | \$ 45 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 3,000 | \$ 3,00 |
| | ACCESS (10' WIDE) | 50 | LF | \$ | , | \$ 50 |
| | ACCESS RESTORATION | 50 | LF | \$ | 10 | \$ 50 |
| | RIPARIAN PLANTING AND SEEDING | 90 | LF | \$ | | \$ 2,70 |
| | | | | | Subtotal | \$ 28,1 |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ - |
| | MISC | 10% | | | | \$ 2,8 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ 2,81 |
| | TRAFFIC CONTROL | 0% | | | | \$ - |
| | | | | | Subtotal | \$ 33,73 |
| | MOBILIZATION | 10% | | | | \$ 3,37 |
| | | | | | Subtotal | \$ 37,00 |
| | CONTINGENCY | 30% | | | | \$ 11,10 |
| | | | | | Subtotal | \$ 48,10 |
| | STATE SALES TAX | 8.80% | | | | \$ 4,23 |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ 59,00 |
| | INDIRECT COSTS | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ 14,75 |
| | PERMITTING | 10% | | | | \$ 5,90 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ 11,80 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ · - |

| Basin No.: | 42 |
|-------------------------|---|
| Project No: | 42.4 |
| Project Title: | Stream restoration to increase bank stability along about 130 feet of the south bank. Also place riprap on creekside of sanitary sewer manhole. |
| Problem Description: | Bank sloughing and spring sapping exists along about one-third of the south bank of this 400-foot reach. Previous restoration work done but additional work is needed. On the north bank the creek runs adjacent to sanitary sewer manhole and is armored with quarry spalls which may be too small in size for adequate protection. |
| Project Description: | Stream restoration to increase bank stability along about 130 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles. Also place riprap on creekside of sanitary sewer manhole. |
| Related Projects | None |
| Estimated Project Cost: | \$136,000 |



Looking Upstream 3/3/2006



Project Location Map

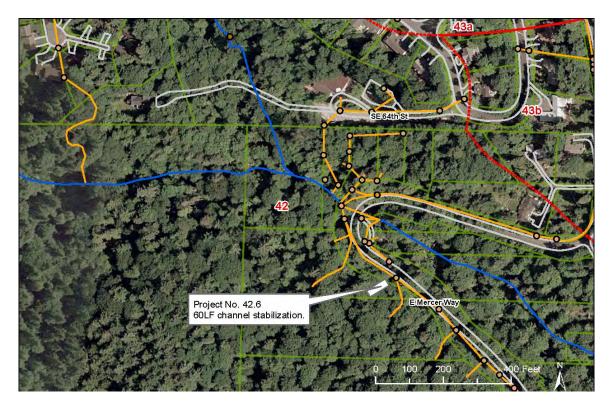
| DJECT: | : 42.4 jcb STREAM RESTORATION | CHECKED BY DATE: | : <u>msg</u> <u>5/23/200</u> | 6 | | | |
|--------|--|---------------------|---------------------------------|---------|-----------|---------|--------|
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT |
| | CONSTRUCTION COSTS | QUAITIT | - Ontil | | | | Alloon |
| | CLEARING AND GRUBBING | 130 | LF | \$ | 10 | \$ | 1,3 |
| | REMOVE/DISPOSE MISC DEBRIS | 130 | LF | \$ | 2 | \$ | 2 |
| | EXCAVATION | 5 | CY | \$ | 50 | \$ | 2 |
| | BOULDERS | 65 | TON | φ \$ | 100 | Ψ \$ | 6,5 |
| | STREAMBED GRAVEL MIX | 30 | TON | φ \$ | 80 | φ \$ | 2,4 |
| | | | | | | | , |
| | LOGS | 13 | EA | \$ | 1,400 | \$ | 18,2 |
| | ROOTWADS | 4 | EA | \$ | 900 | \$ | 3, |
| | REUSE ONSITE LOGS | 1 | EA | \$ | 500 | \$ | (|
| | TEMPORARY BYPASS | 1 | LS | \$ | 3,000 | \$ | 3, |
| | ACCESS (10' WIDE) | 100 | LF | \$ | 10 | \$ | 1,0 |
| | ACCESS RESTORATION | 100 | LF | \$ | 10 | \$ | 1,0 |
| | RIPARIAN PLANTING AND SEEDING | 130 | LF | \$ | 30 | \$ | 3, |
| | | | | | Subtotal | \$ | 41, |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | |
| | MISC | 10% | | | | \$ | 4, |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 4, |
| | TRAFFIC CONTROL | 0% | | | | \$ | , |
| | | | | | Subtotal | \$ | 50, |
| | MOBILIZATION | 10% | | | | \$ | 5,0 |
| | | | | | Subtotal | \$ | 55, |
| | CONTINGENCY | 30% | | | | \$ | 16, |
| | | | | | Subtotal | \$ | 71, |
| | STATE SALES TAX | 8.80% | | | | \$ | 6,3 |
| | | Total Estimated (| Construction | Cost (| (Rounded) | \$ | 88, |
| | INDIRECT COSTS | | | | , | | , |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 22, |
| | PERMITTING | 10% | | | | \$ | 8, |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 17, |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ | , |

| Basin No.: | 42 |
|-------------------------|--|
| Project No: | 42.6 |
| Project Title: | 60 of channel stabilization |
| Problem Description: | Erosion and headcutting of soft bed and banks in small steep water course with undeveloped drainage area. Site is off East Mercer Way. |
| Project Description: | 60 of channel stabilization |
| Related Projects | None |
| Estimated Project Cost: | \$65,000 |



Looking Upstream from East Mercer Way 3/3/2006

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring

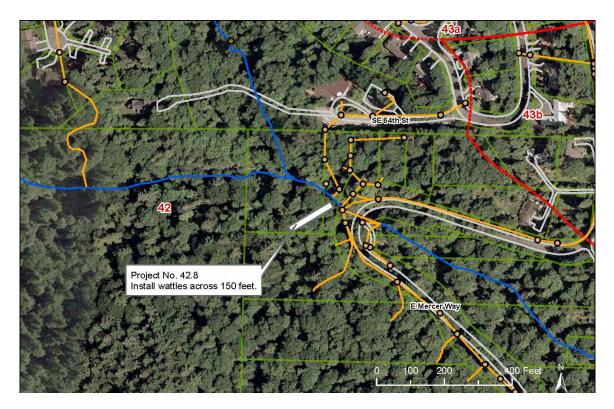


| ROJECT | | CHECKED BY: msg | | | | | | |
|--------|--|-----------------|--------------|-------|-----------|---------|--------|--|
| Y: | jcb | DATE: | 5/23/200 | 6 | | | | |
| | CHANNEL STABILIZATION BID ITEM | OUANTITY | UNIT | 1.151 | | | AMOUNT | |
| | | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | |
| | CLEARING AND GRUBBING | 100 | LF | ¢ | 10 | \$ | 1,000 | |
| | REMOVE/DISPOSE MISC DEBRIS | 100 | LF | \$ | 2 | ъ \$ | 20 | |
| | | | | \$ | | | | |
| | EXCAVATION | 50 | CY | \$ | 50 | \$ | 2,50 | |
| | BOULDERS | 35 | TON | \$ | 100 | \$ | 3,50 | |
| | STREAMBED GRAVEL MIX | 20 | TON | \$ | 80 | \$ | 1,600 | |
| | LOGS | 4 | EA | \$ | 1,400 | \$ | 5,600 | |
| | TEMPORARY BYPASS | 1 | LS | \$ | - | \$ | - | |
| | ACCESS (10' WIDE) | 50 | LF | \$ | 10 | \$ | 500 | |
| | ACCESS RESTORATION | 60 | LF | \$ | 10 | \$ | 60 | |
| | RIPARIAN PLANTING AND SEEDING | 100 | LF | \$ | 30 | \$ | 3,00 | |
| | | | | | Subtotal | \$ | 18,50 | |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - | |
| | MISC | 10% | | | | \$ | 1,85 | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 1,85 | |
| | TRAFFIC CONTROL | 10% | | | | \$ | 1,85 | |
| | | | | | Subtotal | \$ | 24,05 | |
| | MOBILIZATION | 10% | | | | \$ | 2,40 | |
| | | | | | Subtotal | \$ | 26,00 | |
| | CONTINGENCY | 30% | | | | \$ | 7,80 | |
| | | | | | Subtotal | \$ | 33,80 | |
| | STATE SALES TAX | 8.80% | | | | \$ | 2,97 | |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ | 42,00 | |
| | INDIRECT COSTS | | | | . , | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 10,500 | |
| | PERMITTING | 10% | | | | \$ | 4,20 | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | Ŝ | 8,400 | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ | - | |

| Basin No.: | 42 |
|-------------------------|--|
| Project No: | 42.8 |
| Project Title: | Install Wattles across 150 feet of channel west of East Mercer Way in 6500 block. |
| Problem Description: | Erosion or soil movement in very small channel with limited drainage area, 40 percent gradient and erodible soil which is mapped as slide material. Significant seepage in channel and adjacent to channel suggests that spring sapping may also be contributing. Channel bed has little material sorting or armoring which also suggests spring sapping is more significant than flowing water. |
| Project Description: | Install wattles of willows or shade-tolerant plants such as Pacific ninebark perpendicular to the channel. Each wattle dam should be 4 to 8 feet wide. Space wattles 6 feet apart. All work would be manual. |
| Related Projects | None |
| Estimated Project Cost: | \$28,000 |



Looking across ravine at water course poorly defined watercourse 3/3/06

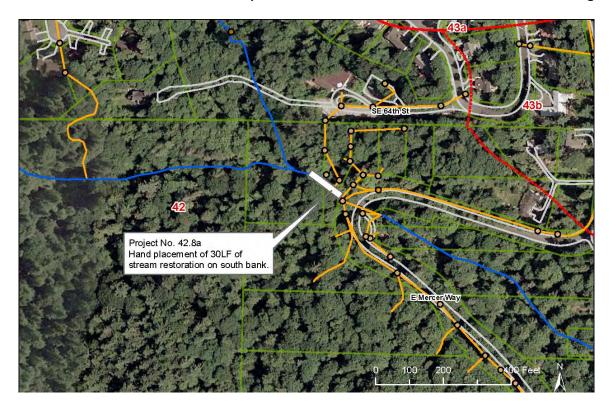


| JJECI: | 42.8 | CHECKED BY: msg | | | | | | | |
|--------|--|-----------------|--------------|------|-----------|----|--------|--|--|
| | jcb | DATE: | 5/23/200 | 6 | | | | | |
| | HAND LABOR STREAM RESTORATION | | | | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | | |
| | CONSTRUCTION COSTS | | | | | | | | |
| | CLEARING AND GRUBBING | 150 | LF | \$ | 10 | \$ | 1,500 | | |
| | REMOVE/DISPOSE MISC DEBRIS | 0 | LF | \$ | 1 | \$ | - | | |
| | HAND EXCAVATION | 5 | CY | \$ | 500 | \$ | 2,500 | | |
| | SMALL BOULDERS | 0 | TON | \$ | 250 | \$ | - | | |
| | STREAMBED GRAVEL MIX | 2 | TON | \$ | 150 | \$ | 300 | | |
| | WATTLES | 200 | LF | \$ | 20 | \$ | 4,000 | | |
| | MANUFACTURED LOGS | 0 | EA | \$ | 5,000 | \$ | - | | |
| | ROOTWADS | 0 | EA | \$ | 900 | \$ | - | | |
| | REUSE ONSITE LOGS | 0 | EA | \$ | 1,000 | \$ | - | | |
| | TEMPORARY BYPASS | 0 | LS | \$ | - | \$ | - | | |
| | ACCESS (10' WIDE) | 0 | LF | \$ | 10 | \$ | - | | |
| | ACCESS RESTORATION | 0 | LF | \$ | 5 | \$ | - | | |
| | RIPARIAN PLANTING AND SEEDING | 0 | LF | \$ | 25 | \$ | - | | |
| | | 0 | L1 | Ψ | 20 | Ψ | | | |
| | | | | | Subtotal | \$ | 8,30 | | |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - | | |
| | MISC | 10% | | | | \$ | 830 | | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 830 | | |
| | TRAFFIC CONTROL | 0% | | | | \$ | - | | |
| | | 0% | | | | Φ | - | | |
| | | | | | Subtotal | \$ | 9,960 | | |
| | MOBILIZATION | 10% | | | | \$ | 996 | | |
| | | | | | Subtotal | \$ | 11,000 | | |
| | CONTINGENCY | 30% | | | | \$ | 3,300 | | |
| | | | | | Subtotal | \$ | 14,300 | | |
| | STATE SALES TAX | 8.80% | | | | \$ | 1,258 | | |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ | 18,000 | | |
| | INDIRECT COSTS | | | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 4,500 | | |
| | PERMITTING | 10% | | | | \$ | 1,80 | | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 3,60 | | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ | | | |
| | | 0 | TAROLL | Ψ | 000 | Ψ | | | |
| | | | | | | | | | |

| Basin No.: | 42 |
|-------------------------|--|
| Project No: | 42.8A |
| Project Title: | Stream restoration to increase bank stability along about 30 feet of the south bank. |
| Problem Description: | About 30 feet of the south bank is experiencing erosion and spring sapping. North bank composed of large rock to protect sanitary sewer main and no erosion is evident. Total reach length is about 140 feet. Large rock check dams are also okay. |
| Project Description: | Stream restoration to increase bank stability along about 30 feet of the south bank. Work will include placement of boulders and logs as well as planting of water-loving, shade-tolerant plants such as salmonberry. Planting may be as individuals or as wattles. |
| Related Projects | None |
| Estimated Project Cost: | \$45,000 |



Looking Upstream. Rock Protection on left. 3/3/2006



| BY: jcb HAND LABOR STREAM RESTORATION | ROJECT: | 42.8A | CHECKED BY: msg | | | | | | | |
|--|---------|---------------------------------|-----------------|--------------|------|-----------|----|--------|--|--|
| BID ITEM QUANTITY UNIT UNIT PRICE AMOL CONSTRUCTION COSTS 30 LF \$ 10 \$ REMOVE/DISPOSE MISC DEBRIS 0 LF \$ 1 \$ HAND EXCAVATION 5 CY \$ 150 \$ SMALL BOULDERS 1 TON \$ 250 \$ STREAMBED GRAVEL MIX 1 TON \$ 150 \$ WATTLES 90 LF \$ 20 \$ MANUFACTURED LOGS 2 EA \$ 5,000 \$ REUSE ONSITE LOGS 0 EA \$ 1,000 \$ ACCESS IG' WIDE) 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 10 \$ MOBILIZATION 0% LF \$ 5 \$ MOBILIZATION 0% \$ \$ \$ \$ MOBILIZATION 10% \$ <td< th=""><th></th><th></th><th></th><th></th><th>)6</th><th></th><th></th><th></th></td<> | | | | |)6 | | | | | |
| CONSTRUCTION COSTS Image: Construction costs CLEARING AND GRUBBING 30 LF \$ 10 \$ REMOVE/DISPOSE MISC DEBRIS 0 LF \$ 1 \$ \$ HAND EXCAVATION 5 CY \$ 150 \$ SMALL BOULDERS 1 TON \$ 150 \$ STREAMBED GRAVEL MIX 1 TON \$ 150 \$ WATTLES 90 LF \$ 20 \$ MANUFACTURED LOGS 2 EA \$ 5000 \$ REUSE ONSITE LOGS 0 EA \$ 900 \$ \$ ACCESS RESTORATION 0 LF \$ 100 \$ \$ ACCESS RESTORATION 0 LF \$ 10 \$ \$ MOBILIZATION 0% \$ \$ \$ \$ \$ MOBILIZATION 0% \$ \$ \$ \$ \$ <t< th=""><th></th><th></th><th></th><th>-</th><th></th><th></th><th></th><th></th></t<> | | | | - | | | | | | |
| CLEARING AND GRUBBING 30 LF \$ 10 \$ REMOVE/DISPOSE MISC DEBRIS 0 LF \$ 1 \$ HAND EXCAVATION 5 C/Y \$ 10 \$ SMALL BOULDERS 1 TON \$ 250 \$ STREAMBED GRAVEL MIX 1 TON \$ 250 \$ WATTLES 90 LF \$ 20 \$ MANUFACTURED LOGS 2 EA \$ 5,000 \$ ROOTWADS 0 EA \$ 900 \$ REUSE ONSITE LOGS 0 EA \$ 1,000 \$ REUSE ONSITE LOGS 0 LF \$ 10 \$ ACCESS (10'WIDE) 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 5 \$ RISC 10% \$ \$ \$ \$ SPECIAL ACCESS/CONSTRUCTION 0% \$ \$ MISC 10% \$ \$ \$ MOBILIZATION 0% \$ \$ MOBILIZATION 0% \$ \$ STATE SALES TAX 8.80% \$ <tr< th=""><th></th><th></th><th>QUANTITY</th><th>UNIT</th><th>UN</th><th>IT PRICE</th><th></th><th>AMOUNT</th></tr<> | | | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | | |
| REMOVE/DISPOSE MISC DEBRIS 0 LF \$ 1 \$ HAND EXCAVATION 5 CY \$ 150 \$ SMALL BOULDERS 1 TON \$ 250 \$ STREAMBED GRAVEL MIX 1 TON \$ 150 \$ WATTLES 90 LF \$ 20 \$ MANUFACTURED LOGS 2 EA \$ 5,000 \$ ROOTWADS 0 EA \$ 900 \$ REUSE ONSITE LOGS 0 EA \$ 900 \$ REUSE ONSITE LOGS 0 EA \$ 1,000 \$ ACCESS (10' WIDE) 0 LF \$ 1,00 \$ ACCESS (10' WIDE) 0 LF \$ 25 \$ MISC 10% \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ MOBILIZATION 0% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ | | | | | | | | | | |
| HAND EXCAVATION 5 CY \$ 150 \$ SMALL BOULDERS 1 TON \$ 150 \$ STREAMBED CRAVEL MIX 1 TON \$ 150 \$ WATTLES 90 LF \$ 20 \$ MANUFACTURED LOGS 2 EA \$ 5000 \$ ROOTWADS 0 EA \$ 900 \$ REUSE ONSITE LOGS 0 EA \$ 900 \$ ACCESS (10 WIDE) 0 LF \$ 100 \$ ACCESS RESTORATION 0 LF \$ 5 \$ RIPARIAN PLANTING AND SEEDING 0% LF \$ 5 \$ SPECIAL ACCESS/CONSTRUCTION 0% \$ \$ \$ \$ MISC 10% \$ | | | | | | | | 300 | | |
| SMALL BOULDERS 1 TON \$ 250 \$ STREAMBED GRAVEL MIX 1 TON \$ 150 \$ WATTLES 90 LF \$ 20 \$ MANUFACTURED LOGS 2 EA \$ 5,000 \$ ROOTWADS 0 EA \$ 9,000 \$ REUSE ONSITE LOGS 0 EA \$ 1,000 \$ TEMPORARY BYPASS 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 5 \$ RIPARIAN PLANTING AND SEEDING 0% LF \$ 25 \$ SPECIAL ACCESS/CONSTRUCTION 0% LF \$ \$ \$ MISC 10% \$ \$ \$ \$ \$ MOBILIZATION 0% \$ | | REMOVE/DISPOSE MISC DEBRIS | | LF | | 1 | \$ | - | | |
| STREAMBED GRAVEL MIX 1 TON \$ 150 \$ WATTLES 90 LF \$ 20 \$ MANUFACTURED LOGS 2 EA \$ 5,000 \$ ROOTWADS 0 EA \$ 900 \$ REUSE ONSITE LOGS 0 EA \$ 900 \$ TEMPORARY BYPASS 0 LS \$ 1,000 \$ ACCESS (10' WIDE) 0 LF \$ 5 \$ ACCESS RESTORATION 0 LF \$ 5 \$ RIPARIAN PLANTING AND SEEDING 0% LF \$ 25 \$ SPECIAL ACCESS/CONSTRUCTION 0% LF \$ 25 \$ MSC 10% \$ \$ \$ \$ \$ MOBILIZATION 0% \$ | | HAND EXCAVATION | - | CY | | 150 | \$ | 75 | | |
| WATTLES 90 LF \$ 20 \$ MANUFACTURED LOGS 2 EA \$ 5,000 \$ ROOTWADS 0 EA \$ 9000 \$ REUSE ONSITE LOGS 0 EA \$ 9000 \$ TEMPORARY BYPASS 0 LF \$ 1,000 \$ ACCESS RESTORATION 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 25 \$ RIPARIAN PLANTING AND SEEDING 0% LF \$ 25 \$ SPECIAL ACCESS/CONSTRUCTION 0% \$ \$ \$ \$ \$ MISC 10% \$ \$ \$ \$ \$ \$ \$ MISC 10% \$ | | SMALL BOULDERS | 1 | TON | | 250 | \$ | 25 | | |
| MANUFACTURED LOGS 2 EA \$ 5,000 \$ ROOTWADS 0 EA \$ 900 \$ REUSE ONSITE LOGS 0 EA \$ 1,000 \$ TEMPORARY BYPASS 0 LS \$ 1,000 \$ ACCESS (10' WIDE) 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 10 \$ RIPARIAN PLANTING AND SEEDING 0 LF \$ 25 \$ SPECIAL ACCESS/CONSTRUCTION 0% \$ \$ \$ MISC 10% \$ \$ \$ \$ REDSION & SEDIMENTATION CONTROL 10% \$ \$ \$ \$ MOBILIZATION 0% \$ | | STREAMBED GRAVEL MIX | 1 | TON | \$ | 150 | \$ | 90 | | |
| ROOTWADS 0 EA \$ 900 \$ REUSE ONSITE LOGS 0 EA \$ 1,000 \$ TEMPORARY BYPASS 0 LS \$ 1,000 \$ ACCESS (10 WIDE) 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 5 \$ RIPARIAN PLANTING AND SEEDING 0 LF \$ 5 \$ SPECIAL ACCESS/CONSTRUCTION 0% LF \$ 5 \$ MISC 10% \$ \$ \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ \$ \$ MOBILIZATION 0% \$ \$ \$ \$ \$ CONTINGENCY 30% \$ \$ \$ \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ \$ \$ \$ \$ SURVEYING AND DESIGN 25% \$ | | WATTLES | 90 | LF | \$ | 20 | \$ | 1,80 | | |
| REUSE ONSITE LOGS 0 EA \$ 1,000 \$ TEMPORARY BYPASS 0 LS \$ 1,000 \$ ACCESS (10' WIDE) 0 LF \$ 10 \$ ACCESS S(10' WIDE) 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 5 RIPARIAN PLANTING AND SEEDING 30 LF \$ 25 SPECIAL ACCESS/CONSTRUCTION 0% \$ \$ MISC 10% \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ \$ MOBILIZATION 0% \$ \$ \$ MOBILIZATION 10% \$ \$ \$ CONTINGENCY 30% \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ INDIRECT COSTS \$ \$ \$ \$ SURVEYING AND DESIGN 25% \$ \$ \$ PERMITTING 10% \$ \$ \$ \$ | | MANUFACTURED LOGS | 2 | EA | \$ | 5,000 | \$ | 10,00 | | |
| REUSE ONSITE LOGS 0 EA \$ 1,000 \$ TEMPORARY BYPASS 0 LS \$ 1,000 \$ ACCESS (10' WIDE) 0 LF \$ 10 \$ ACCESS (10' WIDE) 0 LF \$ 10 \$ ACCESS (10' WIDE) 0 LF \$ 10 \$ ACCESS (10' WIDE) 0 LF \$ 25 \$ RIPARIAN PLANTING AND SEEDING 0 LF \$ 25 \$ SPECIAL ACCESS/CONSTRUCTION 0% \$ \$ \$ MISC 10% \$ \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ \$ MOBILIZATION 0% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ CONTINGENCY 30% \$ \$ \$ \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ \$ \$ \$ \$ \$ | | ROOTWADS | 0 | EA | \$ | 900 | \$ | - | | |
| TEMPORARY BYPASS 0 LS \$ 1,000 \$ ACCESS (10' WIDE) 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 25 \$ RIPARIAN PLANTING AND SEEDING 0 LF \$ 25 \$ SPECIAL ACCESS/CONSTRUCTION 0% LF \$ 25 \$ MISC 10% \$ \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ \$ MOBILIZATION 0% \$ \$ \$ \$ MOBILIZATION 10% \$ \$ \$ \$ \$ CONTINGENCY 30% \$ | | REUSE ONSITE LOGS | 0 | EA | | 1.000 | \$ | - | | |
| ACCESS (10' WIDE) 0 LF \$ 10 \$ ACCESS RESTORATION 0 LF \$ 5 \$ RIPARIAN PLANTING AND SEEDING 30 LF \$ 25 \$ SPECIAL ACCESS/CONSTRUCTION 0% \$ \$ \$ MISC 10% \$ \$ \$ EROSION & SEDIMENTATION CONTROL 10% \$ \$ \$ TRAFFIC CONTROL 0% \$ \$ \$ MOBILIZATION 0% \$ \$ \$ CONTINGENCY 30% \$ \$ \$ STATE SALES TAX 8.80% \$ \$ \$ SURVEYING AND DESIGN 25% \$ \$ \$ SURVEYING AND DESIGN 25% \$ \$ \$ PERMITTING 10% \$ \$ \$ OONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ \$ | | | | | | | | - | | |
| ACCESS RESTORATION 0 LF \$ 5 \$ RIPARIAN PLANTING AND SEEDING 30 LF \$ 5 \$ SPECIAL ACCESS/CONSTRUCTION 0% MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ Subtotal \$ SUBTOR \$ S | | | 0 | - | | , | | - | | |
| RIPARIAN PLANTING AND SEEDING 30 LF \$ 25 \$ SPECIAL ACCESS/CONSTRUCTION 0% \$ | | | - | | | | * | - | | |
| SPECIAL ACCESS/CONSTRUCTION 0% \$ MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 0% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ INDIRECT COSTS \$ \$ SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | | - | | | | | 75 | | |
| SPECIAL ACCESS/CONSTRUCTION 0% \$ MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ Subtotal \$ Sub | | | 00 | L 1 | Ψ | 20 | Ψ | 10 | | |
| MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 0% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | | | | | Subtotal | \$ | 13,94 | | |
| MISC 10% \$ EROSION & SEDIMENTATION CONTROL 10% \$ TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ INDIRECT COSTS 5 \$ SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - | | |
| TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | MISC | 10% | | | | \$ | 1,39 | | |
| TRAFFIC CONTROL 0% \$ MOBILIZATION 10% \$ MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 1,39 | | |
| MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | TRAFFIC CONTROL | | | | | | - | | |
| MOBILIZATION 10% \$ CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | | | | | Subtotal | \$ | 16,72 | | |
| CONTINGENCY 30% \$ STATE SALES TAX 8.80% \$ STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | MOBILIZATION | 10% | | | | | 1,67 | | |
| STATE SALES TAX 8.80% \$ STATE SALES TAX 8.80% \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | | | | | Subtotal | \$ | 18,00 | | |
| STATE SALES TAX 8.80% \$ Total Estimated Construction Cost (Rounded) \$ INDIRECT COSTS SURVEYING AND DESIGN 25% \$ PERMITTING 10% \$ CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | CONTINGENCY | 30% | | | | \$ | 5,40 | | |
| Total Estimated Construction Cost (Rounded) \$INDIRECT COSTSSURVEYING AND DESIGN25%PERMITTING10%CONSTRUCTION ENGINEERING AND ADMINISTRATION20% | | | | | | Subtotal | \$ | 23,40 | | |
| INDIRECT COSTSSURVEYING AND DESIGN25%\$PERMITTING10%\$CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$ | | STATE SALES TAX | 8.80% | | | | \$ | 2,05 | | |
| INDIRECT COSTSSURVEYING AND DESIGN25%\$PERMITTING10%\$CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$ | | | Total Estimated | Construction | Cost | (Rounded) | \$ | 29,00 | | |
| PERMITTING10%\$CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$ | | INDIRECT COSTS | | | | . , | | | | |
| PERMITTING10%\$CONSTRUCTION ENGINEERING AND ADMINISTRATION20%\$ | | | 25% | | | | \$ | 7,25 | | |
| CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% \$ | | | | | | | | 2,90 | | |
| ······································ | | - | | | | | | 5,80 | | |
| | | | | PARCE | \$ | 500 | Ψ | - 5,00 | | |
| | | | v | | Ψ | 000 | Ψ | | | |

| Basin No.: Project No: | 42 42.9 |
|---------------------------|--|
| Project Title: | Culvert Outlet Protection and 30 feet of Stream Restoration west of 92 nd Avenue SE. |
| Problem Description: | There are two erosion problems at this site;1) a 5-foot drop from the 18-inch CMP culvert under a private driveway which is undergoing moderate erosion and 2) 30 feet of channel downcutting located 100 feet downstream of the culvert. The soft, wet east bank has wetland characteristics. Site is located in undeveloped ravine. Work may need to be done primarily by hand due to site conditions. |
| Project Description: | Install culvert outlet protection and 30 feet of stream restoration. |
| Related Projects | None |
| Estimated Project Cost: | \$79,000 |



Looking Upstream at Culvert Outlet 3/3/2006



| ROJECT: Y: | jcb | CHECKED BY: DATE: | msg 5/23/2006 | | | | | | |
|---------------|--|----------------------|------------------|---------|-----------|---------|--------|--|--|
| | HAND LABOR STREAM RESTORATION | | | | | | | | |
| | BID ITEM CONSTRUCTION COSTS | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | | |
| | CLEARING AND GRUBBING | 1 | LS | \$ | 1,000 | ¢ | 1,00 | | |
| | HAND EXCAVATION | 10 | CY | э \$ | , | э \$ | 1,00 | | |
| | SMALL BOULDERS | 10 | TON | э \$ | | э \$ | 30 | | |
| | STREAMBED GRAVEL MIX | 1 | TON | | | ֆ Տ | 30 | | |
| | | | | \$ | | | | | |
| | MANUFACTURED LOGS | 3 | EA | \$ | , | \$ | 15,00 | | |
| | ROOTWADS | 0 | EA | \$ | | \$ | - | | |
| | EXCAVATION | 5 | CY | \$ | | \$ | 10 | | |
| | RIPRAP/BOULDERS | 10 | CY | \$ | | \$ | 40 | | |
| | GEOTEXTILE | 15 | SY | \$ | | \$ | 1 | | |
| | REUSE ONSITE LOGS | 1 | EA | \$ | , | \$ | 1,00 | | |
| | TEMPORARY BYPASS | 1 | LS | \$ | 3,000 | \$ | 3,00 | | |
| | ACCESS (10' WIDE) | 0 | LF | \$ | 10 | \$ | - | | |
| | ACCESS RESTORATION | 0 | LF | \$ | 10 | \$ | - | | |
| | RIPARIAN PLANTING AND SEEDING | 20 | LF | \$ | 30 | \$ | 60 | | |
| | | | | | Subtotal | \$ | 23,21 | | |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - | | |
| | MISC | 10% | | | | \$ | 2,32 | | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 2,32 | | |
| | TRAFFIC CONTROL | 0% | | | | \$ | - | | |
| | | | | | Subtotal | \$ | 27,85 | | |
| | MOBILIZATION | 10% | | | | \$ | 2,78 | | |
| | | | | | Subtotal | \$ | 31,00 | | |
| | CONTINGENCY | 30% | | | | \$ | 9,30 | | |
| | | | | | Subtotal | \$ | 40,30 | | |
| | STATE SALES TAX | 8.80% | | | | \$ | 3,54 | | |
| | | Total Estimated C | Construction | Cost | (Rounded) | \$ | 50,00 | | |
| | INDIRECT COSTS | | | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 12,50 | | |
| | PERMITTING | 10% | | | | \$ | 5,00 | | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 10,00 | | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 2 | PARCEL | \$ | 500 | \$ | 1,00 | | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
2. The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 42 |
|-------------------------|--|
| Project No: | 42.10 |
| Project Title: | Remove half round pipe, install manhole and 30 feet of 24- inch pipe and fill. |
| Problem Description: | Existing public drainage system consists of a manhole with a sound CMP outlet pipe on top of the ravine about 50 feet long, about 30 feet of half round CMP, an above ground transition from the half-round pipe to a 24-inch corrugated polyethylene pipe and 80 feet of corrugated polyethylene pipe which lies on the ground in the bottom of the small ravine. The system conveys flow to the main water course. Only one of the corrugated polyethylene pipe joints is capable of handling thrust. There is considerable leakage from the pipe and seepage from the hillslope. The seepage has contributed to slope instability particularly on the south bank. |
| Project Description: | Install manhole at the downstream end of the sound, buried CMP. Remove half round pipe and replace with 24-inch corrugated polyethylene pipe (CPEP) extending from the new manhole to the existing 24-inch CPEP. Cover CPEP with 150 cy of well draining material to stabilize this pipe as well as the slopes. It may be possible to deliver fill with chute or blower truck. |
| Related Projects | None |
| Estimated Project Cost: | \$70,000 |



Looking Downstream at Surface CPEP 3/3/2006



| | 42.10 | CHECKED BY: | : msg | | | | | | |
|----|--|-------------------|--------------|------|-----------|--------|--------|--|--|
| Y: | jcb | DATE: | 5/23/200 | | | | | | |
| | STORM DRAINAGE PIPES | | | | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | | |
| | | 400 | 0)/ | • | | • | 0.77 | | |
| | CLEARING AND GRUBBING | 139 | SY | \$ | 20 | \$ | 2,77 | | |
| | EXCAVATION | 0 | CY | \$ | 40 | \$ | - | | |
| | FILL | 150 | CY | \$ | 40 | \$ | 6,00 | | |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 10 | CY | \$ | 80 | \$ | 80 | | |
| | PAVEMENT RESTORATION | 0 | SY | \$ | 20 | \$ | - | | |
| | LANDSCAPE RESTORATION | 139 | SY | \$ | 20 | \$ | 2,77 | | |
| | 12" CPEP PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) | 0 | LF | \$ | 40 | \$ | - | | |
| | 18" CPEP PIPE | 0 | LF | \$ | 50 | \$ | - | | |
| | 24" CPEP PIPE | 30 | LF | \$ | 70 | \$ | 2,10 | | |
| | 30" CPEP PIPE | 0 | LF | \$ | 85 | \$ | - | | |
| | MANHOLES/CB | 1 | EA | \$ | 3,500 | \$ | 3,50 | | |
| | TEMPORARY BYPASS | 1 | LS | \$ | 3,000 | \$ | 3,00 | | |
| | ACCESS (10' WIDE) | 90 | LF | \$ | 10 | \$ | 90 | | |
| | RESTORATION OF ACCESS | 55 | SY | \$ | 15 | \$ | 82 | | |
| | | | | | Subtotal | \$ | 22,68 | | |
| | MISC | 10% | | | | \$ | 2,26 | | |
| | EROSION & SEDIMENTATION CONTROL | 5% | | | | \$ | 1,13 | | |
| | TRAFFIC CONTROL | 0% | | | | \$ | ., | | |
| | | 078 | | | | Ψ | | | |
| | | | | | Subtotal | \$ | 26,08 | | |
| | MOBILIZATION | 10% | | | | \$ | 2,60 | | |
| | | | | | Subtotal | \$ | 29,00 | | |
| | CONTINGENCY | 30% | | | 0421014 | \$ | 8,70 | | |
| | CONTINUEROT | 0070 | | | Subtotal | - T | 37,70 | | |
| | STATE SALES TAX | 8.80% | | | Subtotal | Ψ Φ | 3,31 | | |
| | STATE SALES TAX | Total Estimated C | onstruction | Cost | (Poundod) | φ Φ | 46,00 | | |
| | INDIRECT COSTS | Total Estimated C | Jonstruction | CUSI | (Rounded) | φ | 40,00 | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 11,50 | | |
| | PERMITTING | 5% | | | | \$ | 2,30 | | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 9,20 | | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 2 | PARCEL | \$ | 500 | | 1,00 | | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

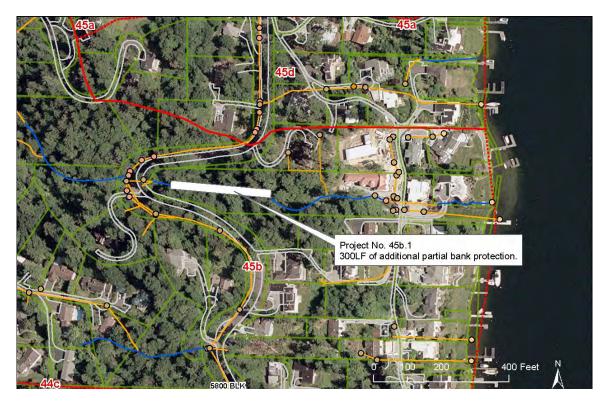
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 45b |
|-------------------------|--|
| Project No: | 45b.1 |
| Project Title: | Partial Stream Restoration along 300 feet near East Mercer Way in 5600 Block |
| Problem Description: | Existing quarry spall check dams are relatively effective but some repairs and bank protection needed. Erosion creates downstream deposition and potential for failure of East Mercer Way. |
| Project Description: | Partial stream restoration along 300 feet of channel involving repairs and additions to existing check dams as well as habitat friendly bank protection. |
| Related Projects | None |
| Estimated Project Cost: | \$179,000 |



Looking Upstream 12/8/2005

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| OJECT: | : 45b.1 jcb | CHECKED BY | msg 5/23/2006 | | | | | | |
|--------|--|-----------------|------------------|--------|----------|----|--------|--|--|
| | STREAM RESTORATION | DATE. | 5/23/200 | 0 | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | T PRICE | | AMOUNT | | |
| | CONSTRUCTION COSTS | ł | + | | | | | | |
| | CLEARING AND GRUBBING | 300 | LF | \$ | 10 | \$ | 3,0 | | |
| | REMOVE/DISPOSE MISC DEBRIS | 300 | LF | \$ | 2 | \$ | 6 | | |
| | EXCAVATION | 50 | CY | \$ | 50 | \$ | 2,5 | | |
| | BOULDERS | 60 | TON | \$ | 100 | \$ | 6,0 | | |
| | STREAMBED GRAVEL MIX | 20 | TON | \$ | 80 | \$ | 1,6 | | |
| | LOGS | 16 | EA | \$ | 1,400 | \$ | 22,4 | | |
| | ROOTWADS | 4 | EA | \$ | 900 | \$ | 3,6 | | |
| | REUSE ONSITE LOGS | 2 | EA | \$ | 500 | \$ | 1,0 | | |
| | TEMPORARY BYPASS | - 1 | LS | \$ | 1,000 | \$ | 1,0 | | |
| | ACCESS (10' WIDE) | 100 | LF | \$ | 1,000 | \$ | 1,0 | | |
| | ACCESS RESTORATION | 100 | LF | \$ | 10 | \$ | 1,0 | | |
| | RIPARIAN PLANTING AND SEEDING | 300 | LF | \$ | 30 | \$ | 9,0 | | |
| | | 500 | LI | Ψ | 50 | Ψ | 5,0 | | |
| | | | | | Subtotal | \$ | 52,7 | | |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | | | |
| | MISC | 10% | | | | \$ | 5,2 | | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 5,2 | | |
| | TRAFFIC CONTROL | 5% | | | | \$ | 2,0 | | |
| | | | | | Subtotal | \$ | 65,8 | | |
| | MOBILIZATION | 10% | | | | \$ | 6, | | |
| | | | | | Subtotal | | 72, | | |
| | CONTINGENCY | 30% | | | - | \$ | 21,6 | | |
| | | | | | Subtotal | \$ | 93,6 | | |
| | STATE SALES TAX | 8.80% | | | - | \$ | 8,2 | | |
| | | Total Estimated | Construction | Cost (| Rounded) | \$ | 115,0 | | |
| | INDIRECT COSTS | | | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 28,7 | | |
| | PERMITTING | 10% | | | | \$ | 11, | | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 23,0 | | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | \$ | 1 | | |

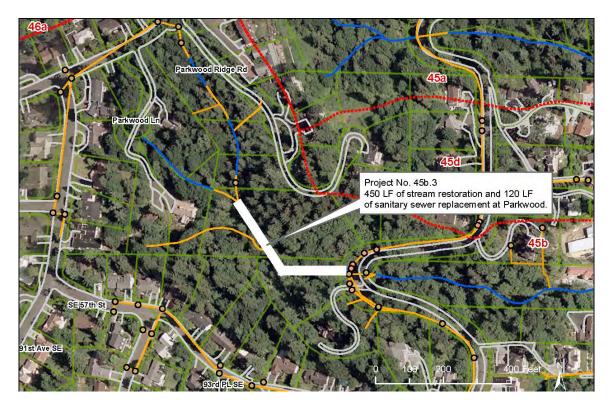
The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 45b |
|-------------------------|---|
| Project No: | 45b.3 |
| Project Title: | 450 feet of Stream Restoration and 120 feet of Sewer Replacement at Parkwood |
| Problem Description: | Stream downcutting has exposed 120 feet of sewer and generated considerable sediment, which is a maintenance problem downstream. Sewer is leaking into water course. |
| Project Description: | Stream restoration along 450 feet of channel is needed along with reconstruction of 120 feet of sanitary sewer. Erosion problem upstream previously solved by installation of piping in the water course. |
| Related Projects | Predesign investigation underway for this site. |
| Estimated Project Cost: | \$444,000 |



Looking Downstream at Exposed Sewer Pipe 9/12/2005

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| OJECT | | CHECKED BY | | | | | |
|-------|--|-------------------|--------------|---------|------------|----------|--------|
| BY: | jcb STREAM RESTORATION | DATE: | 5/23/200 | 6 | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT |
| | CONSTRUCTION COSTS | 40/41111 | 0.01 | 0. | | | |
| | CLEARING AND GRUBBING | 1,200 | SY | \$ | 4 \$ | \$ | 4,80 |
| | REMOVE/DISPOSE MISC DEBRIS | 450 | LF | \$ | | \$ | 90 |
| | EXCAVATION AND HAUL | 100 | CY | \$ | | \$ \$ | 4,00 |
| | BOULDERS | 180 | TON | \$ | | \$ | 18,00 |
| | STREAMBED GRAVEL MIX | 60 | TON | \$ | | \$ | 4,80 |
| | SANDING MIX | 25 | TON | \$ | 80 5 | * | 2,00 |
| | LOGS | 30 | EA | գ \$ | 1,400 \$ | - | 42,00 |
| | ROOTWADS | 1 | EA | \$ | 900 | | 42,00 |
| | | | | | | * | |
| | REUSE ONSITE LOGS | 2 | EA | \$ | 500 \$ | | 1,00 |
| | TEMPORARY BYPASS | 1 | LS | \$ | - / | \$ | 5,00 |
| | ACCESS RESTORATION | 250 | SY | \$ | 15 \$ | | 3,75 |
| | RIPARIAN PLANTING AND SEEDING | 750 | SY | \$ | 25 \$ | | 18,7 |
| | 5' WIDE CRUSHED ROCK TRAIL | 1,025 | LF | \$ | | \$ | 14,3 |
| | TRAIL AREA PLANTING AND SEEDING | 350 | SY | \$ | 22.50 | | 7,8 |
| | 6" SEWER REPLACEMENT (NO TEMP BYPASS) | 150 | LF | \$ | 75 \$ | | 11,2 |
| | | | | | Subtotal S | \$ | 139,3 |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - |
| | MISC | 10% | | | 9 | \$ | 13,9 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | 9 | \$ | 13,9 |
| | TRAFFIC CONTROL | 1 | LS | | 5 | \$ | 5,0 |
| | | | | | Subtotal | \$ | 172,2 |
| | MOBILIZATION | 10% | | | 9 | \$ | 17,2 |
| | | | | | Subtotal S | \$ | 189,0 |
| | CONTINGENCY | 30% | | | 5 | \$ | 56,7 |
| | | | | | Subtotal | \$ | 245,7 |
| | STATE SALES TAX | 8.80% | | | ş | \$ | 21,6 |
| | | Total Estimated (| Construction | Cost | (Rounded) | \$ | 302,0 |
| | INDIRECT COSTS | | | | | | |
| | SURVEYING AND DESIGN | 20% | | | 9 | \$ | 60,4 |
| | PERMITTING | 7% | | | 5 | \$ | 21,1 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | 5 | \$ | 60,4 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 \$ | \$ | 5 |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 45b |
|-------------------------|--|
| Project No: | 45b.4 |
| Project Title: | 120 feet of butt-fused HDPE pipe to ravine bottom near Parkwood |
| Problem Description: | Drop at culvert outlet of 12-inch CMP culvert under private road is eroding partially protected steep slope. Erosion also occurring downstream of the outlet. Rate of erosion is moderate. |
| Project Description: | Replace culvert with manhole, concrete anchor and 120 feet of butt-fused HDPE pipe to ravine bottom. |
| Related Projects | None |
| Estimated Project Cost: | \$77,000 |



Culvert Outfall on Steep Slope 12/8/2005



| | PLANNING LEVEL CONSTRUCTION COST | OPINION-MERCER IS | SLAND CIP | | | | | |
|----------|--|-------------------|--------------|------|-----------|---------|--------|--|
| PROJECT: | | CHECKED BY: msg | | | | | | |
| | jcb | DATE: | 5/23/200 | 6 | | | | |
| | BYPASS PIPE | | | | | | AMOUNT | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | |
| | | 100 | 0)/ | • | | • | 0.400 | |
| | CLEARING AND GRUBBING | 120 | SY | \$ | 20 | \$ | 2,400 | |
| | EXCAVATION | 10 | CY | \$ | 40 | \$ | 400 | |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 5 | TON | \$ | 100 | \$ | 500 | |
| | PIPE ANCHORS | 2 | EA | \$ | 800 | \$ | 1,280 | |
| | 12" BUTT FUSED HDPE PIPE | 120 | LF | \$ | 75 | \$ | 9,000 | |
| | ANCHOR BLOCK AND SPECIAL FITTINGS | 1 | EA | \$ | 5,000 | | 5,000 | |
| | MANHOLES/CB | 1 | EA | \$ | 3,500 | \$ | 3,500 | |
| | UTILITY RELOCATIONS | 0 | EA | \$ | 8,000 | \$ | - | |
| | TEMPORARY BYPASS | 0 | LS | \$ | - | \$ | - | |
| | ACCESS (10' WIDE) | 0 | LF | \$ | 10 | \$ | - | |
| | RESTORATION OF ACCESS AND AREA | 147 | SY | \$ | 15 | \$ | 2,200 | |
| | | | | | Subtotal | \$ | 24,280 | |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - | |
| | MISC | 10% | | | | \$ | 2,428 | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 2,428 | |
| | TRAFFIC CONTROL | 0% | | | | \$ | - | |
| | | | | | Subtotal | \$ | 29,136 | |
| | MOBILIZATION | 10% | | | | \$ | 2,914 | |
| | | | | | Subtotal | \$ | 32,000 | |
| | CONTINGENCY | 30% | | | | \$ | 9,600 | |
| | | | | | Subtotal | \$ | 41,600 | |
| | STATE SALES TAX | 8.80% | | | | \$ | 3,661 | |
| | | Total Estimated C | Construction | Cost | (Rounded) | \$ | 51,000 | |
| | INDIRECT COSTS | | | | (, | + | - , | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 12,750 | |
| | PERMITTING | 5% | | | | \$ | 2,550 | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | ф \$ | 10,200 | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | э \$ | 500 | |
| | | Total Estim | ated Project | Cost | (Rounded) | \$ | 77,000 | |

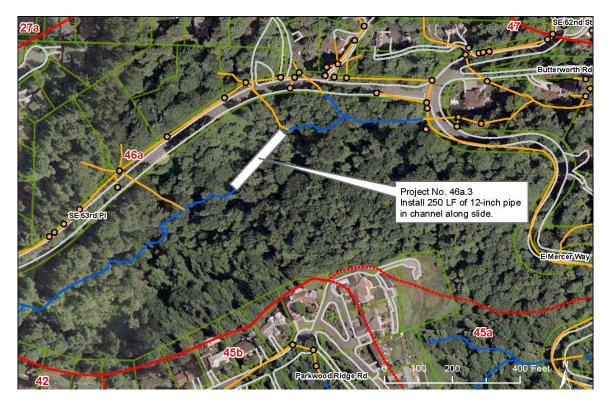
The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 46a |
|-------------------------|---|
| Project No: | 46a.3 |
| Project Title: | Install 250 feet of 12-inch corrugated polyethylene pipe in channel to stop slope movement near SE 53 rd Place. |
| Problem Description: | Large scale slope movement into creek is pinching channel along 250-foot reach. Creek erosion of toe and fill south of street may be contributing to slope movement. This is a large source of sediment. The slope and much of the contributing area is mapped as a slide. |
| Project Description: | Install 250 feet of 12-inch CPEP along channel. Environmental and permitting concerns may be significant. Additional investigation should be done to determine if another alternative (rock lining and removal of fill at the top of the slope along the road) would stabilize the slope. |
| Related Projects | City will be making improvements to the drainage system in SE 53 rd Place in 2006 with one objective to keep more runoff in the SE 53 rd Place system and reduce runoff currently flowing to the cross culverts and watercourse. |
| Estimated Project Cost: | \$109,000 |

No picture available.

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| ROJECT: | 46a.3 | CHECKED BY: msg | | | | | | |
|---------|--|-------------------|--------------|------|-----------|----|--------|--|
| BY: | jcb | DATE: | 5/23/200 | | | | | |
| | STORM DRAIN PIPE | | | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | |
| | CONSTRUCTION COSTS | 100 | <u></u> | • | | • | | |
| | CLEARING AND GRUBBING | 139 | SY | \$ | 20 | \$ | 2,77 | |
| | EXCAVATION | 200 | CY | \$ | 40 | \$ | 8,00 | |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 10 | CY | \$ | 80 | \$ | 80 | |
| | PAVEMENT RESTORATION | 0 | SY | \$ | 20 | \$ | - | |
| | LANDSCAPE RESTORATION | 250 | SY | \$ | 20 | \$ | 5,00 | |
| | 12" CPEP PIPE (TRENCHING,BEDDING,PIPE,BACKFILL) | 250 | LF | \$ | 40 | \$ | 10,00 | |
| | 18" CPEP PIPE | 0 | LF | \$ | 50 | \$ | - | |
| | 24" CPEP PIPE | 0 | LF | \$ | 70 | \$ | - | |
| | 30" CPEP PIPE | 0 | LF | \$ | 85 | \$ | - | |
| | MANHOLES/CB | 0 | EA | \$ | 3,500 | \$ | - | |
| | TEMPORARY BYPASS | 1 | LS | \$ | 3,000 | \$ | 3,00 | |
| | ACCESS (10' WIDE) | 180 | LF | \$ | 10 | \$ | 1,80 | |
| | RESTORATION OF ACCESS | 110 | SY | \$ | | \$ | 1,65 | |
| | | | | | | | | |
| | | | | | Subtotal | \$ | 33,02 | |
| | MISC | 10% | | | | \$ | 3,30 | |
| | EROSION & SEDIMENTATION CONTROL | 5% | | | | \$ | 1,65 | |
| | TRAFFIC CONTROL | 5% | | | | \$ | 1,65 | |
| | | 5% | | | | φ | 1,05 | |
| | | | | | Subtotal | \$ | 39,63 | |
| | MOBILIZATION | 10% | | | | \$ | 3,96 | |
| | | | | | Subtotal | | 44,00 | |
| | CONTINGENCY | 30% | | | | \$ | 13,20 | |
| | | | | | Subtotal | \$ | 57,20 | |
| | STATE SALES TAX | 8.80% | | | | \$ | 5,03 | |
| | | Total Estimated C | Construction | Cost | (Rounded) | \$ | 70,00 | |
| | INDIRECT COSTS | | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 17,50 | |
| | PERMITTING | 10% | | | | \$ | 7,00 | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 14,00 | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ | - | |

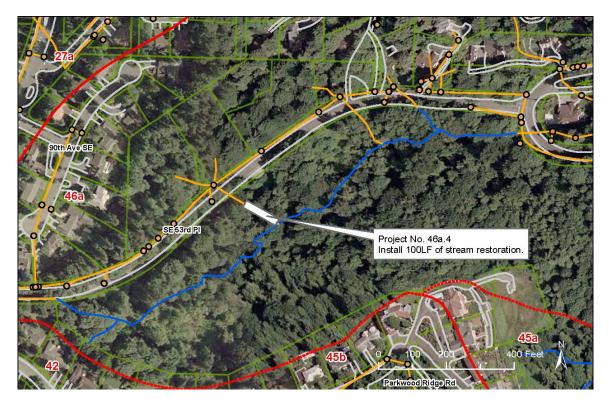
The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 46a |
|-------------------------|--|
| Project No: | 46a.4 |
| Project Title: | Stream restoration along 100 feet of channel near 53 rd Place |
| Problem Description: | Downstream of pipe outlet, channel is downcutting along 100 feet of soft fill and slide material. This tributary stream is located south of 53 rd Place on city open space. |
| Project Description: | Stream restoration along 100 feet to stabilize soft bed and banks. |
| Related Projects | None |
| Estimated Project Cost: | \$99,000 |

No picture on file.

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring

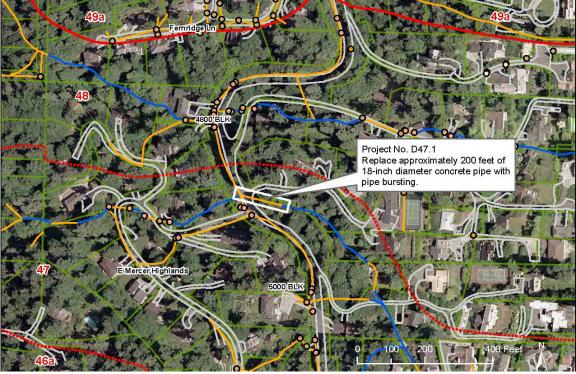


| OJECT | : 46a.4 | CHECKED BY | ∕∶msg | | | |
|-------|--|-----------------|--------------|------|-----------|-------------|
| : | jcb | DATE: | 5/23/200 | 6 | | |
| | STREAM RESTORATION | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | AMOUNT |
| | CONSTRUCTION COSTS | | | | | |
| | CLEARING AND GRUBBING | 100 | LF | \$ | | \$ 1,0 |
| | REMOVE/DISPOSE MISC DEBRIS | 100 | LF | \$ | 2 | \$ 2 |
| | EXCAVATION | 45 | CY | \$ | 50 | \$ 2,2 |
| | BOULDERS | 40 | TON | \$ | 100 | \$ 4,0 |
| | STREAMBED GRAVEL MIX | 25 | TON | \$ | 80 | \$ 2,0 |
| | LOGS | 10 | EA | \$ | 1,400 | \$ 14,00 |
| | ROOTWADS | 0 | EA | \$ | 900 | \$ - |
| | REUSE ONSITE LOGS | 1 | EA | \$ | 500 | \$ 5 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ 1,0 |
| | ACCESS (10' WIDE) | 50 | LF | \$ | 10 | \$ 5 |
| | ACCESS RESTORATION | 50 | LF | \$ | 10 | \$ 5 |
| | RIPARIAN PLANTING AND SEEDING | 100 | LF | \$ | 30 | \$ 3,0 |
| | | | | | Subtotal | \$ 28,9 |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ - |
| | MISC | 10% | | | | \$ 2,8 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ 2,8 |
| | TRAFFIC CONTROL | 5% | | | | \$ 1,4 |
| | | | | | Subtotal | \$ 36,1 |
| | MOBILIZATION | 10% | | | | \$ 3,6 |
| | | | | | Subtotal | \$ 40,0 |
| | CONTINGENCY | 30% | | | | \$ 12,0 |
| | | | | | Subtotal | \$ 52,0 |
| | STATE SALES TAX | 8.80% | | | | \$ 4,5 |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ 64,0 |
| | INDIRECT COSTS | | | | . , | |
| | SURVEYING AND DESIGN | 25% | | | | \$ 16,0 |
| | PERMITTING | 10% | | | | \$ 6,4 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ 12,8 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ 12,0 |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 47 |
|-------------------------|---|
| Project No: | D47.1 |
| Project Title: | Culvert Under East Mercer Way Near House #4905 |
| Problem Description: | 18-inch-diameter culvert is broken (visible cracks and squashing). |
| Project Description: | Replace approximately 200 feet of 18-inch-diameter concrete pipe using pipe bursting methods. |
| Related Projects | None |
| Estimated Project Cost: | \$243,000 |

- No Photo Available - See Appendix F for detailed TV inspection.



Project Location Map

| ACCESS (10' WIDE) 0 LF \$ ACCESS RESTORATION 0 SY \$ ACCESS RESTORATION 0 SY \$ CLEARING AND GRUBBING 100 SY \$ SAWCUTTING 0 LF \$ REMOVE PAVEMENT 0 SY \$ REMOVE PAVEMENT 0 LF \$ REMOVE CATCH BASIN 0 LF \$ 12' CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 24' CONC PIPE 0 LF \$ 1 12' CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 24' CONC PIPE 0 LF \$ 1 12' CONC PIPE 0 LF \$ 15.00 CATCH BASIN TYPE 1 1 EA \$ 1.40 MANHOLES/CB 0 EA \$ 3.00 ROADSIDE/LANDSCAPE RESTORATION 0 SY \$ 2.00 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 2.00 MISC EROSION & SEDIMENTATION CONTROL 5% \$ 5 MOBILIZATION 20% Subto Subto MOBILIZATION 20% Subto <th></th> <th>/10/2006</th> <th></th> | | /10/2006 | |
|---|-------------------------------|-----------------------|----------|
| CONSTRUCTION COSTS 0 LF \$ ACCESS (10' WIDE) 0 SY \$ ACCESS RESTORATION 0 SY \$ CLEARING AND GRUBBING 100 SY \$ SAWCUTTING 0 LF \$ REMOVE PAVEMENT 0 SY \$ REMOVE PAVEMENT 0 EA \$ REMOVE CATCH BASIN 0 EA \$ 12' CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 12' CONC PIPE 0 LF \$ 1 12' CONC PIPE 0 LF \$ 1 12' CONC PIPE 0 LF \$ 15.00 CATCH BASIN TYPE 1 1 EA \$ 15.00 CATCH BASIN TYPE 1 0 EA \$ 3.40 MANHOLES/CB 0 EA \$ 3.00 PAVEMENT RESTORATION 0 SY \$ 2.00 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1.00 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1.00 MISC EROSION & SEDIMENTATION CONTROL 5% \$ 5 MOBILIZATION 20% Subt | | | |
| ACCESS (10 WIDE) 0 LF \$ ACESS RESTORATION 0 SY \$ CLEARNG AND GRUBBING 100 SY \$ 2 SAWCUTTING 0 LF \$ 2 REMOVE PAVEMENT 0 SY \$ 2 REMOVE PAVEMENT 0 LF \$ 1 REMOVE CATCH BASIN 0 LF \$ 1 12" CONC PIPE 0 LF \$ 15 24" CONC PIPE 0 EA \$ 15.00 CATCH BASIN TYPE 1 0 EA \$ 15.00 CATCH BASIN TYPE 1 0 EA \$ 3.00 RELACE 10% 1 LS \$ 1.00 | | UNIT UNIT PRICE | AMOUNT |
| ACESS RESTORATION 0 SY \$ CLEARING AND GRUBBING 100 SY \$ 2 SAWCUTTING 0 LF \$ 1 REMOVE PAVEMENT 0 SY \$ 2 REMOVE CATCH BASIN 0 EA \$ 33 12" CONC PIPE 0 LF \$ 11 18" CONC PIPE 0 LF \$ 12 24" CONC PIPE 0 LF \$ 12 PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 15.00 CATCH BASIN TYPE 1 0 EA \$ 3.50 PAVEMENT RESTORATION 0 EA \$ 3.50 PAVEMENT RESTORATION 0 EA \$ 3.50 PAVEMENT RESTORATION 0 EA \$ 3.60 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1.00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 MOBILIZATION | | | |
| CLEARING AND GRUBBING 100 SY \$ 2 SAWCUTTING 0 LF \$ 1 REMOVE PAVEMENT 0 SY \$ 2 REMOVE PAVEMENT 0 LF \$ 3 REMOVE PAVEMENT 0 LF \$ 3 REMOVE CATCH BASIN 0 LF \$ 3 12° CONC PIPE 0 LF \$ 11 18° CONC PIPE 0 LF \$ 12 24° CONC PIPE 0 LF \$ 22 PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 1,40 MANHOLES/CB 0 EA \$ 1,40 MANHOLES/CB 0 EA \$ 3,52 PAVEMENT RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 1 LS \$ 2,00 MISC 10% | | | \$ |
| SAWCUTTING 0 LF \$ REMOVE PAVEMENT 0 SY \$ REMOVE CATCH BASIN 0 EA \$ REMOVE CATCH BASIN 0 LF \$ 12" CONC PIPE 0 LF \$ 18" CONC PIPE 0 LF \$ 24" CONC PIPE 0 LF \$ 25" RELACE 18" CONC PIPE 0 LF \$ 24" CONC PIPE 0 EA \$ 10" CATCH BASIN TYPE 1 1 EA \$ 11" CATCH BASIN TYPE 1 1 LS \$ 12" CONCHARDSCAPE RESTORATION 1 LS \$ 11" CATCH BASIN TYPE 1 1 LS \$ 12" CONTROL 5% <td>ON 0 5</td> <td>SY \$ 5</td> <td>\$</td> | ON 0 5 | SY \$ 5 | \$ |
| REMOVE PAVEMENT 0 SY \$ 2 REMOVE PIPE 0 LF \$ - REMOVE CATCH BASIN 0 EA \$ 3 12' CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 17 18' CONC PIPE 0 LF \$ 17 18' CONC PIPE 0 LF \$ 17 24' CONC PIPE 0 LF \$ 12' 22' PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 14,40 MANHOLES/CB 0 EA \$ 3,50 PAVEMENT RESTORATION 0 EA \$ 3,50 PAVEMENT RESTORATION 0 EA \$ 3,50 PAVEMENT RESTORATION 1 LS \$ 1,00 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 EA \$ 3,00 TIEMPORARY BYPASS 1 LS \$ 2,00 EXPORISON & \$ \$ 2,00 \$ \$ \$ \$ | JBBING 100 S | SY \$ 20 | \$ 2,0 |
| REMOVE PIPE 0 LF \$ 5 REMOVE CATCH BASIN 0 EA \$ 33 12° CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 11 18° CONC PIPE 0 LF \$ 11 24° CONC PIPE 0 LF \$ 12 24° CONC PIPE 0 LF \$ 22 RELACE 18° CONC PIPE WITH PIPE BURSTING 200 LF \$ 22 PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 15,00 CATCH BASIN TYPE 1 0 EA \$ 3,55 PAVEMENT RESTORATION 0 EA \$ 3,55 PAVEMENT RESTORATION 1 LS \$ 1,00 REPAPBOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% Subto \$ \$ | 0 L | LF \$ 8 | \$ |
| REMOVE PIPE 0 LF \$ 5 REMOVE CATCH BASIN 0 EA \$ 33 12° CONC PIPE (TEENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 11 18° CONC PIPE 0 LF \$ 11 24° CONC PIPE 0 LF \$ 22 RELACE 18° CONC PIPE 0 LF \$ 22 RELACE 18° CONC PIPE 0 LF \$ 22 PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 3,50 CATCH BASIN TYPE 1 0 EA \$ 3,50 PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 MISC 10% Subto \$ \$ MISC 10% Subto \$ \$ MOBILIZATION 20% Subto \$ \$ | т 0 5 | | \$ |
| REMOVE CATCH BASIN 0 EA \$ 30 12° CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 11 18° CONC PIPE 0 LF \$ 12 24° CONC PIPE 0 LF \$ 12 24° CONC PIPE 0 LF \$ 22 RELACE 18° CONC PIPE WITH PIPE BURSTING 200 LF \$ 22 PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 1,44 MANHOLES/CB 0 EA \$ 3,55 PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% 5% Subto MOBILIZATION 20% Subto Subto STATE SALES TAX 8.80% Subto Subto STATE | | | \$ |
| 12" CONC PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) 0 LF \$ 11 18" CONC PIPE 0 LF \$ 15 24" CONC PIPE 0 LF \$ 22 RELACE 18" CONC PIPE WITH PIPE BURSTING 200 LF \$ 22 PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 15,00 CATCH BASIN TYPE 1 0 EA \$ 15,00 CATCH BASIN TYPE 1 0 EA \$ 3,50 PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% 5% Subto 5% MOBILIZATION 20% Subto Subto MOBILIZATION 20% Subto Subto STATE SALES TAX 8.80% Subto Subto S | · - | | \$ |
| 18" CONC PIPE 0 LF \$ 15 24" CONC PIPE 0 LF \$ 22 RELACE 18" CONC PIPE WITH PIPE BURSTING 200 LF \$ 22 PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 15,00 CATCH BASIN TYPE 1 0 EA \$ 1,44 MANHOLES/CB 0 EA \$ 3,50 PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% EROSION & SEDIMENTATION CONTROL 5% 5 MOBILIZATION 20% Subto Subto MOBILIZATION 20% Subto Subto STATE SALES TAX 8.80% Subto NDIRECT COSTS 25% Subto | | | \$ \$ |
| 24" CONC PIPE 0 LF \$ 22" RELACE 18" CONC PIPE WITH PIPE BURSTING 200 LF \$ 22 PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 15,00 CATCH BASIN TYPE 1 0 EA \$ 3,66 PAVEMENT RESTORATION 0 EA \$ 3,66 PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% EROSION & SEDIMENTATION CONTROL 5% 5% 5% TRAFFIC CONTROL 5% Subto 5% 5% 5% MOBILIZATION 20% Subto 5% 5% 5% STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder States) 5% SURVEYING AND DESIGN 25% 25% 5% 5% <td>, , , - ,</td> <td>•</td> <td></td> | , , , - , | • | |
| RELACE 18" CONC PIPE WITH PIPE BURSTING200LF\$24PIPE BURSTING INSERTION/PULL PIT1EA\$15,00CATCH BASIN TYPE 10EA\$1,44MANHOLES/CB0EA\$3,55PAVEMENT RESTORATION0SY\$2ROADSIDE/LANDSCAPE RESTORATION1LS\$1,00RIPRAP/BOULDERS/QUARRY SPALLS5CY\$4UTILITY RELOCATIONS0EA\$8,00TEMPORARY BYPASS1LS\$2,00MISC10%Subto5%SubtoMOBILIZATION20%SubtoSubtoMOBILIZATION20%SubtoSTATE SALES TAX8.80%SubtoSURVEYING AND DESIGN25%25% | · - | • • • | \$ |
| PIPE BURSTING INSERTION/PULL PIT 1 EA \$ 15,00 CATCH BASIN TYPE 1 0 EA \$ 1,44 MANHOLES/CB 0 EA \$ 3,50 PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% EROSION & SEDIMENTATION CONTROL 5% Subto MOBILIZATION 20% Subto Subto MOBILIZATION 20% Subto Subto STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounded Subto) SURVEYING AND DESIGN 25% 25% | · - | | * |
| CATCH BASIN TYPE 1 0 EA \$ 1,40 MANHOLES/CB 0 EA \$ 3,50 PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% EROSION & SEDIMENTATION CONTROL 5% TRAFFIC CONTROL 5% MOBILIZATION 20% MOBILIZATION 20% Subto State SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | PIPE WITH PIPE BURSTING 200 L | • • • | \$ 50, |
| MANHOLES/CB 0 EA \$ 3,50 PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% EROSION & SEDIMENTATION CONTROL 5% TRAFFIC CONTROL 5% CONTINGENCY 30% Subto MOBILIZATION 20% MOBILIZATION 20% Subto State Sales TAX 8,80% Total Estimated Construction Cost (Rounded INDIRECT COSTS SURVEYING AND DESIGN 25% | ERTION/PULL PIT 1 E | EA \$ 15,000 | \$ 15, |
| PAVEMENT RESTORATION 0 SY \$ 2 ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% EROSION & SEDIMENTATION CONTROL 5% TRAFFIC CONTROL 5% CONTINGENCY 30% Subto MOBILIZATION 20% CONTINGENCY 30% Subto STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounded SUBTO SURVEYING AND DESIGN 25% | 1 0 E | EA \$ 1,400 | \$ |
| PAVEMENT RESTORATION ROADSIDE/LANDSCAPE RESTORATION RIPRAP/BOULDERS/QUARRY SPALLS UTILITY RELOCATIONS 1 LS 5 CY 4 UTILITY RELOCATIONS 0 EA 5 CY 1 LS 5 2,00 MISC FROSION & SEDIMENTATION CONTROL 5% TRAFFIC CONTROL 5% CONTINGENCY SUBTO CONTINGENCY SUBTO STATE SALES TAX SURVEYING AND DESIGN 25% 25% | 0 E | EA \$ 3,500 | \$ |
| ROADSIDE/LANDSCAPE RESTORATION 1 LS \$ 1,00 RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 1 LS \$ 2,00 MISC 10% 5 CV \$ EROSION & SEDIMENTATION CONTROL 5% 5% 5% 5% MOBILIZATION 20% Subto Subto CONTINGENCY 30% Subto Subto STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder Index of the second se | RATION 0 S | | \$ |
| RIPRAP/BOULDERS/QUARRY SPALLS 5 CY \$ 4 UTILITY RELOCATIONS 0 EA \$ 8,00 TEMPORARY BYPASS 1 LS \$ 2,00 MISC 1 LS \$ 2,00 MISC 10% 5 CV \$ 2,00 MISC 10% 5 CV \$ 2,00 MISC 10% 5% CV \$ 2,00 MISC 10% 5% CV \$ CONTINCOL 5% CV \$ CONTINGENCY Subto STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounded Construction Cos | | | \$ |
| UTILITY RELOCATIONS TEMPORARY BYPASS 0 1 LS \$ 8,00 1 LS \$ 2,00 MISC EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL 5% TRAFFIC CONTROL 5% MOBILIZATION 20% Subto CONTINGENCY 30% STATE SALES TAX SUBTO STATE SALES TAX INDIRECT COSTS SURVEYING AND DESIGN 25% | | . , | \$ 1, |
| TEMPORARY BYPASS 1 LS \$ 2,00 MISC 10% Subto EROSION & SEDIMENTATION CONTROL 5% TRAFFIC CONTROL 5% MOBILIZATION 20% CONTINGENCY 30% Stablo Subto STATE SALES TAX 8.80% INDIRECT COSTS 25% | | | • |
| MISC 10% EROSION & SEDIMENTATION CONTROL 5% TRAFFIC CONTROL 5% MOBILIZATION 20% MOBILIZATION 20% CONTINGENCY 30% STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder SURVEYING AND DESIGN 25% | | + -) | |
| MISC 10% EROSION & SEDIMENTATION CONTROL 5% TRAFFIC CONTROL 5% MOBILIZATION 20% CONTINGENCY 30% Subto STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | | | |
| EROSION & SEDIMENTATION CONTROL TRAFFIC CONTROL 5% Subto Subto 20% CONTINGENCY STATE SALES TAX NDIRECT COSTS SURVEYING AND DESIGN 25% | | Subtotal | \$ 70, |
| EROSION & SEDIMENTATION CONTROL 5% TRAFFIC CONTROL 5% MOBILIZATION 20% CONTINGENCY 30% STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | 10% | | \$ 7, |
| TRAFFIC CONTROL 5% MOBILIZATION 20% CONTINGENCY 30% STATE SALES TAX NDIRECT COSTS SURVEYING AND DESIGN 25% | | | \$ 3. |
| MOBILIZATION 20% Subto CONTINGENCY 30% Subto STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | | | . , |
| MOBILIZATION 20% CONTINGENCY 30% STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | 5% | | \$ 3, |
| MOBILIZATION 20% CONTINGENCY 30% STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | | Subtotal | \$ 84. |
| CONTINGENCY 30% SUBUD STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | 20% | Gubtota | \$ 16, |
| CONTINGENCY 30% SUBUD STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | | | |
| STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | | Subtotal | \$ 101, |
| STATE SALES TAX 8.80% Total Estimated Construction Cost (Rounder INDIRECT COSTS SURVEYING AND DESIGN 25% | 30% | | \$ 30, |
| INDIRECT COSTS SURVEYING AND DESIGN 25% | | Subtotal | \$ 131, |
| INDIRECT COSTS SURVEYING AND DESIGN 25% | 8.80% | | \$ 11, |
| SURVEYING AND DESIGN 25% | Total Estimated Constru- | uction Cost (Rounded) | \$ 162, |
| | INDIRECT COSTS | | |
| | ESIGN 25% | | \$ 40, |
| | 5% | | \$ 8, |
| CONSTRUCTION ENGINEERING AND ADMINISTRATION 20% | | | \$ 32, |
| | | CEL \$ 500 | |

1. The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.

2. The convertion items and quantities are based upon conceptual solution types and should be considered conceptual. Work did not include site visit to perform site specific cost estimate. See Report text.

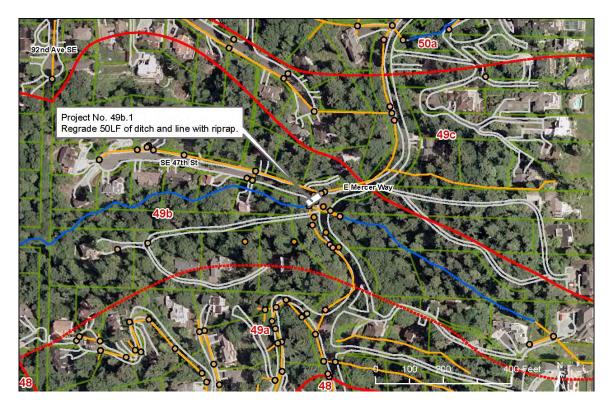
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 49b |
|-------------------------|---|
| Project No: | 49b.1 |
| Project Title: | Regrade 50 LF of ditch and line with Riprap |
| Problem Description: | Pipe system outlet from East Mercer Way and SE 47 th Street discharges onto East Mercer Way embankment eroding a deep channel and 2 foot drop at outlet. Pipe outlet is also partially crushed. See Appendix E for a field sketch of the problem area. |
| Project Description: | Regrade 50 LF of outlet ditch and line with riprap. (Quarry spalls would be too small.) |
| Related Projects | None |
| Estimated Project Cost: | \$12,000 |



Erosion at Pipe Outlet (pipe crushed) 12/8/2005

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| PROJECT | | CHECKED BY: msg | | | | | | |
|---------|--|-------------------|--------------|---------|-----------|----------|--------|--|
| SY: | jcb | DATE: | 5/24/200 | | | | | |
| | OUTLET PROTECTION/DITCH LINING BID ITEM | QUANTITY | UNIT | | IT PRICE | | | |
| | | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | |
| | CLEARING AND GRUBBING | 28 | SY | \$ | 20 | ¢ | 55 | |
| | REGRADING | 1 | LS | \$ | | \$ | 1,50 | |
| | RIPRAP/BOULDERS | 20 | CY | \$ | 1,500 | \$ | 1,50 | |
| | PAVEMENT RESTORATION | 20 | SY | \$ | 20 | φ \$ | 1,00 | |
| | LANDSCAPE RESTORATION | 20 | SY | \$ | 20 | φ \$ | - 40 | |
| | GEOTEXTILE | 20 | SY | \$ | 20 | φ \$ | 40 | |
| | 12" CPEP PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) | 20 | LF | ъ \$ | 40 | | 2 | |
| | | 0 | LF | | 40 50 | \$ \$ | - | |
| | 18" CPEP PIPE | - | | \$ | | | - | |
| | 24" CPEP PIPE | 0 | LF | \$ | | \$ | - | |
| | MANHOLES/CB | 0 | EA | \$ | 3,500 | \$ | - | |
| | UTILITY RELOCATIONS | 0 | EA | \$ | 8,000 | \$ | - | |
| | TEMPORARY BYPASS | 0 | LS | \$ | - | \$ | - | |
| | ACCESS (10' WIDE) | 0 | LF | \$ | 10 | \$ | - | |
| | RESTORATION OF ACCESS | 0 | SY | \$ | 5 | \$ | - | |
| | | | | | Subtotal | \$ | 4,07 | |
| | MISC | 10% | | | | \$ | 40 | |
| | EROSION & SEDIMENTATION CONTROL | 5% | | | | \$ | 20 | |
| | TRAFFIC CONTROL | 5% | | | | \$ | 20 | |
| | | | | | Subtotal | | 4,89 | |
| | MOBILIZATION | 10% | | | | \$ | 48 | |
| | | | | | Subtotal | \$ | 5,00 | |
| | CONTINGENCY | 30% | | | | \$ | 1,50 | |
| | | | | | Subtotal | \$ | 6,50 | |
| | STATE SALES TAX | 8.80% | | | | \$ | 57 | |
| | | Total Estimated (| Construction | Cost | (Rounded) | \$ | 8,00 | |
| | INDIRECT COSTS | | | | . , | | , | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 2,00 | |
| | PERMITTING | 10% | | | | \$ | _,00 | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 1,60 | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ | - | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

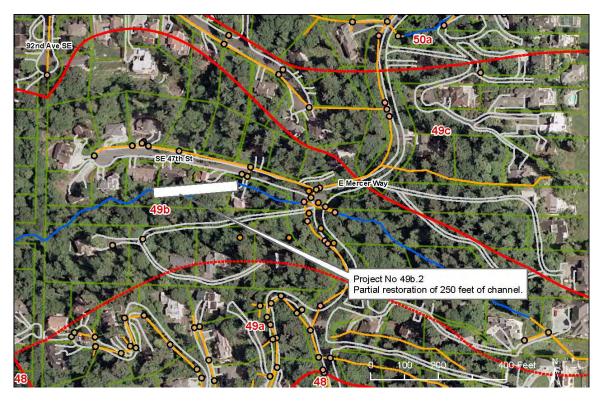
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 49b |
|-------------------------|---|
| Project No: | 49b.2 |
| Project Title: | Partial stream restoration along 250 feet of channel near SE 47 th Street. |
| Problem Description: | Moderate bank erosion and headcutting along portions of 250 feet of channel. |
| Project Description: | Partial stream restoration along 250 feet of channel. |
| Related Projects | None |
| Estimated Project Cost: | \$150,000 |



Looking Upstream 12/8/2005

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| OJECT | : 49b.2 | CHECKED BY | ': msg | | | | |
|-------|--|-----------------|--------------|------|-----------|----|--------|
| BY: | jcb | DATE: | 5/24/200 | | | | |
| | STREAM RESTORATION | | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT |
| | CONSTRUCTION COSTS | | | | | | |
| | CLEARING AND GRUBBING | 150 | LF | \$ | | \$ | 1,50 |
| | REMOVE/DISPOSE MISC DEBRIS | 150 | LF | \$ | 2 | \$ | 30 |
| | EXCAVATION | 60 | CY | \$ | 50 | \$ | 3,00 |
| | BOULDERS | 60 | TON | \$ | 100 | \$ | 6,00 |
| | STREAMBED GRAVEL MIX | 38 | TON | \$ | 80 | \$ | 3,00 |
| | LOGS | 15 | EA | \$ | 1,400 | \$ | 21,00 |
| | ROOTWADS | 3 | EA | \$ | 900 | \$ | 2,70 |
| | REUSE ONSITE LOGS | 2 | EA | \$ | 500 | \$ | 75 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | \$ | 1,00 |
| | ACCESS (10' WIDE) | 100 | LF | \$ | 10 | \$ | 1,00 |
| | ACCESS RESTORATION | 100 | LF | \$ | 10 | \$ | 1,00 |
| | RIPARIAN PLANTING AND SEEDING | 150 | LF | \$ | 30 | \$ | 4,5 |
| | | | | | Subtotal | \$ | 45,7 |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - |
| | MISC | 10% | | | | \$ | 4,5 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 4,5 |
| | TRAFFIC CONTROL | 0% | | | | \$ | - |
| | | | | | Subtotal | \$ | 54,9 |
| | MOBILIZATION | 10% | | | | \$ | 5,4 |
| | | | | | Subtotal | \$ | 60,0 |
| | CONTINGENCY | 30% | | | _ | \$ | 18,0 |
| | | | | | Subtotal | \$ | 78,00 |
| | STATE SALES TAX | 8.80% | | | | \$ | 6,86 |
| | INDIRECT COSTS | Total Estimated | Construction | Cost | (Rounded) | \$ | 96,0 |
| | | 250/ | | | | ¢ | 24.0 |
| | SURVEYING AND DESIGN PERMITTING | 25% 10% | | | | \$ | 24,0 |
| | | | | | | \$ | 9,6 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | DADOEL | • | 500 | \$ | 19,2 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 2 | PARCEL | \$ | 500 | \$ | 1,0 |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 49b |
|-------------------------|--|
| Project No: | 49b.4 |
| Project Title: | Butt-fused HDPE pipeline on stream stabilization east of 91 st Avenue SE in 4700 Block |
| Problem Description: | Large scale, severe erosion of 1,000 CY at an existing 12-inch storm drainage outlet which drops six feet into a steep channel in sandy soil. Channel incision is about 100 feet long and the depth varies from 5 to 20 feet. See Appendix E for a field sketch of the problem area. |
| Project Description: | Two alternatives are considered for this problem. The first is to install 12-inch-diameter HDPE pipeline with manhole energy dissipator at the downstream end. Under this alternative it may be desirable to fill the erosion scar. The second alternative is stream stabilization along the 100 feet of channel. It is recommended the City get input from WDFW prior to selecting the preferred alternative. The cost estimate is based on the HDPE pipeline alternative. |
| Related Projects | None |
| Estimated Project Cost: | \$195,000 |



Looking Upstream at Upper Half of Erosion Problem 12/14/2005



| PROJECT | | | | | | | |
|---------|--|-------------------|--------------|------|----------|----|--------|
| BY: | jcb | DATE: | 5/24/200 | | | | |
| | BYPASS PIPE | | - | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT |
| | CONSTRUCTION COSTS | | | | | | |
| | CLEARING AND GRUBBING | 100 | SY | \$ | | \$ | 2,00 |
| | FILL | 1,000 | CY | \$ | | \$ | 30,00 |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 5 | CY | \$ | 80 | \$ | 40 |
| | PIPE ANCHORS | 1 | EA | \$ | 800 | \$ | 1,06 |
| | 12" BUTT FUSED HDPE PIPE | 100 | LF | \$ | 75 | \$ | 7,50 |
| | ANCHOR BLOCK AND SPECIAL FITTINGS | 1 | EA | \$ | 5,000 | \$ | 5,00 |
| | MANHOLES/CB | 2 | EA | \$ | 3,500 | \$ | 7,00 |
| | 12" CPEP PIPE (TRENCHING, BEDDING, PIPE, BACKFILL) | 20 | LF | \$ | 40 | \$ | 80 |
| | UTILITY RELOCATIONS | 0 | EA | \$ | 8,000 | \$ | - |
| | TEMPORARY BYPASS | 1 | LS | \$ | - | \$ | - |
| | ACCESS (10' WIDE) | 170 | LF | \$ | 10 | \$ | 1,70 |
| | RESTORATION OF ACCESS AND AREA | 226 | SY | \$ | | \$ | 3,39 |
| | | | | | Subtotal | \$ | 58,85 |
| | SPECIAL ACCESS/CONSTRUCTION | 0% | | | | \$ | - |
| | MISC | 10% | | | | \$ | 5,88 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 5,88 |
| | TRAFFIC CONTROL | 5% | | | | \$ | 2,94 |
| | | | | | Subtotal | \$ | 73,57 |
| | MOBILIZATION | 10% | | | | \$ | 7,35 |
| | | | | | Subtotal | \$ | 81,00 |
| | CONTINGENCY | 30% | | | | \$ | 24,30 |
| | | | | | Subtotal | \$ | 105,30 |
| | STATE SALES TAX | 8.80% | | | | \$ | 9,26 |
| | | Total Estimated (| Construction | Cost | Rounded) | \$ | 130,00 |
| | INDIRECT COSTS | | | | . , | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 32,50 |
| | PERMITTING | 5% | | | | \$ | 6,50 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 26,00 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 0 | PARCEL | \$ | 500 | \$ | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

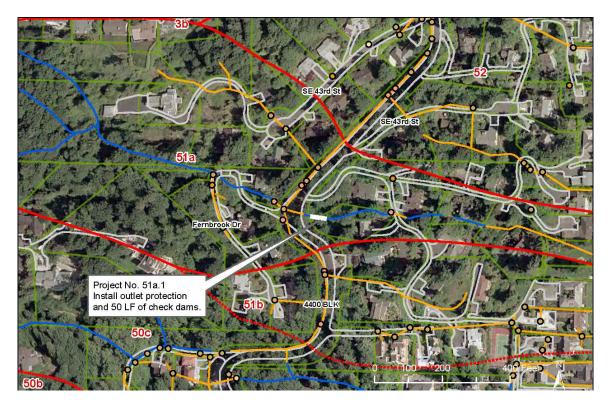
3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 51a |
|-------------------------|---|
| Project No: | 51a.1 |
| Project Title: | Install outlet protection and 50 feet of check dams near East Mercer Way in 4300 Block |
| Problem Description: | 50 feet of south bank erosion and outlet erosion at 18-inch culvert may threaten embankment of East Mercer Way. Considerable sand in channel from upstream. Also low intensity erosion for about 150 feet downstream of this site. See Appendix E for a field sketch of the problem area. |
| Project Description: | Install outlet protection and 50 feet of check dams to contain flow. Fill along toe of slope for stabilization. |
| Related Projects | None |
| Estimated Project Cost: | \$45,000 |



Looking Upstream at Steep Channel and Outlet. Erosion of Bank on Left. 12/14/2005

City of Mercer Island Comprehensive Basin Review and Watercourse Monitoring



| PROJECT: | T: 51a.1 CHECKED BY: msg | | | | | | | | |
|----------|--|-------------------|-------------|------|-----------|----|--------|--|--|
| BY: | jcb | DATE: | 5/24/200 | 6 | | | | | |
| | check dam | | | • | | | | | |
| | BID ITEM | QUANTITY | UNIT | UN | IT PRICE | | AMOUNT | | |
| | CONSTRUCTION COSTS | • | • | • | | | | | |
| | CLEARING AND GRUBBING | 50 | LF | \$ | 20 | \$ | 1,000 | | |
| | REMOVE/DISPOSE MISC DEBRIS | 50 | LF | \$ | 2 | \$ | 10 | | |
| | EXCAVATION | 5 | CY | \$ | 50 | \$ | 250 | | |
| | RIPRAP/BOULDERS/QUARRY SPALLS | 20 | CY | \$ | 100 | \$ | 2,00 | | |
| | FILL | 50 | CY | \$ | 30 | \$ | 1,500 | | |
| | LOGS | 2 | EA | \$ | 1,400 | \$ | 2,800 | | |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | | 1,000 | | |
| | ACCESS (10' WIDE) | 150 | LF | \$ | 10 | | 1,500 | | |
| | ACCESS RESTORATION | 150 | LF | \$ | 10 | \$ | 1,500 | | |
| | RIPARIAN PLANTING AND SEEDING | 50 | LF | \$ | 30 | \$ | 1,500 | | |
| | | | | | Subtotal | \$ | 13,15 | | |
| | SPECIAL ACCESS/CONSTRUCTION | 5% | | | | \$ | - | | |
| | MISC | 10% | | | | \$ | 1,31 | | |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 1,31 | | |
| | TRAFFIC CONTROL | 5% | | | | \$ | 65 | | |
| | | | | | Subtotal | | 16,43 | | |
| | MOBILIZATION | 10% | | | | \$ | 1,64 | | |
| | | | | | Subtotal | \$ | 18,00 | | |
| | CONTINGENCY | 30% | | | | \$ | 5,40 | | |
| | | | | | Subtotal | \$ | 23,40 | | |
| | STATE SALES TAX | 8.80% | | | | \$ | 2,05 | | |
| | | Total Estimated C | onstruction | Cost | (Rounded) | \$ | 29,00 | | |
| | INDIRECT COSTS | | | | , | | , | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 7,25 | | |
| | PERMITTING | 10% | | | | \$ | 2,90 | | |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 5,80 | | |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 1 | PARCEL | \$ | 500 | \$ | 50 | | |

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.

3. Land Acquisition unit costs are for Administrative Costs only.

| Basin No.: | 52 |
|-------------------------|---|
| Project No: | 52.1 |
| Project Title: | 150 feet of Channel Stabilization on downstream side of East Mercer Way in 4300 Block |
| Problem Description: | Rapid bed erosion, bank erosion and headcuts in a small channel with a bottom width of 2 feet and a depth of 3 to 7 feet on downstream side of East Mercer Way. Bed and banks consist of erodible sandy material and fill. |
| Project Description: | Installation of channel stabilization on 150 feet of this small water course. |
| Related Projects | None |
| Estimated Project Cost: | \$105,000 |



Looking Upstream 12/14/2005



Project Location Map

| PROJECT: BY: | | CHECKED BY: msg | | | | | |
|-----------------|--|-----------------|--------------|------------|-----------|----|--------|
| | jcb | DATE: 5/24/2006 | | | | | |
| | CHANNEL STABILIZATION | QUANTITY | | | | | AMOUNT |
| | BID ITEM | QUANTITY | UNIT | UNIT PRICE | | | AMOUNT |
| | | 150 | LF | ¢ | 10 | \$ | 4.50 |
| | CLEARING AND GRUBBING REMOVE/DISPOSE MISC DEBRIS | 150 | LF | \$ | 10 | | 1,50 |
| | | | | \$ | 2 | \$ | 30 |
| | EXCAVATION | 68 | CY | \$ | 40 | \$ | 2,70 |
| | BOULDERS | 60 | TON | \$ | 100 | \$ | 6,00 |
| | STREAMBED GRAVEL MIX | 38 | TON | \$ | 80 | \$ | 3,000 |
| | LOGS | 8 | EA | \$ | 1,400 | | 10,500 |
| | TEMPORARY BYPASS | 1 | LS | \$ | 1,000 | | 1,000 |
| | ACCESS (10' WIDE) | 50 | LF | \$ | 10 | | 50 |
| | ACCESS RESTORATION | 50 | LF | \$ | 10 | \$ | 500 |
| | RIPARIAN PLANTING AND SEEDING | 150 | LF | \$ | 30 | \$ | 4,50 |
| | | | | | Subtotal | \$ | 30,50 |
| | SPECIAL ACCESS/CONSTRUCTION | 5% | | | | \$ | 1,52 |
| | MISC | 10% | | | | \$ | 3,05 |
| | EROSION & SEDIMENTATION CONTROL | 10% | | | | \$ | 3,05 |
| | TRAFFIC CONTROL-approach from east | 0% | | | | \$ | - |
| | | | | | Subtotal | \$ | 38,12 |
| | MOBILIZATION | 10% | | | | \$ | 3,81 |
| | | | | | Subtotal | \$ | 42,00 |
| | CONTINGENCY | 30% | | | | \$ | 12,60 |
| | | | | | Subtotal | \$ | 54,60 |
| | STATE SALES TAX | 8.80% | | | | \$ | 4,80 |
| | | Total Estimated | Construction | Cost | (Rounded) | \$ | 67,000 |
| | INDIRECT COSTS | | | | | | |
| | SURVEYING AND DESIGN | 25% | | | | \$ | 16,75 |
| | PERMITTING | 10% | | | | \$ | 6,700 |
| | CONSTRUCTION ENGINEERING AND ADMINISTRATION | 20% | | | | \$ | 13,40 |
| | EASEMENTS/LAND ACQUISITION ADMINISTRATION (See note 3) | 3 | PARCEL | \$ | 500 | \$ | 1,50 |

Notes:

The above cost opinion is in 2006 dollars and does not include future escalation, financing, or O&M costs.
 The construction items and quantities are based upon conceptual solution types and should be considered conceptual. See Report text.
 Land Acquisition unit costs are for Administrative Costs only.

Appendix H ADDITIONAL FIELD PHOTOGRAPHS





Problem No. 4.2



Problem No. 6.1



Problem No. 6.2



Problem No. 6.2



Problem No. 6.2



Problem No. 6.2



Problem No. 10.4



Problem No. 10.4



Problem No. 10.4



Problem No. 26.1



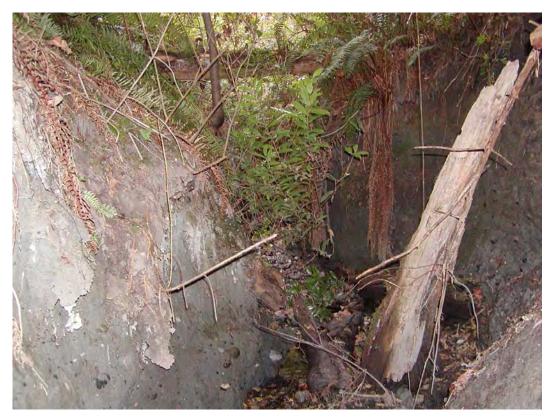
Problem No. 27a.1



Problem No. 27a.3



Problem No. 27a.3



Problem No. 27a.3



Problem No. 27a.3



Problem No. 27a.3



Problem No. 27a.6



Problem No. 29.1



Problem No. 29.2_60



Problem No. 29.2_60



Problem No. 29.2_60



Problem No. 32b.1



Problem No. 32b.1



Problem No. 37b.1



Problem No. 37b.1



Problem No. 39a.1



Problem No. 39a.1



Problem No. 42.1a



Problem No. 42.2



Problem No. 42.2



Problem No. 42.3



Problem No. 42.3



Problem No. 42.4



Problem No. 42.8a



Problem No. 42.8a



Problem No. 44b.1_60



Problem No. 44b.1_60



Problem No. 45b1



Problem No. 45b2



Problem No. 45b4



Problem No. 46.1



Problem No. 46.1



Problem No. 46.1



Problem No. 46.1



Problem No. 46.1



Problem No. 46.6



Problem No. 46.7



Problem No. 46.10



Problem No. 46.10



Problem No. 46a1



Problem No. 49b1



Problem No. 49b2



Problem No. 49b2



Problem No. 49b.4_60



Problem No. 49b.4_60



Problem No. 49b.4_60



Problem No. 50b1



Problem No. 50b3



Problem No. 50c.1_60



Problem No. 51a.1_60



Problem No. 51a.1_60



Problem No. 52.2_60