4.0 SITE ASSESSMENT METHODS AND EVALUATION CRITERIA

This section describes the field inspection methods and criteria that were used in evaluating the proposed program sites. Site assessment methods included the following elements: visual observations, direct measurements, photographic documentation, and a combination of reviews of as-built construction plans (where available for the various storm sewer systems), and other documents and technical information. Site evaluation criteria included the following; flow data acquisition, water quality monitoring/sampling capabilities, site logistics, health and safety considerations, watershed characteristics, and equipment requirements/site preparation. These assessment methods and evaluation criteria are described in detail below.

4.1 SITE ASSESSMENT METHODS

Site assessments evaluations were completed from October 2005 to April 2006. CoBI representatives escorted TEC Team members to each of the sites to show the inspectors where the sites were located. A boat tour was conducted in late October 2005 to inspect the nearshore, marine, and many of the outfall sites. A land site tour was conducted in late December 2005 by CoBI Water Resource Program staff to inspect all of the primary surface water sites. In early April 2006 staff from the CoBI Engineering Department escorted TEC Team members to several priority BMP sites. Interspersed with these dates and following coordination with CoBI jurisdiction, TEC subsequently returned to selected sites to perform more detailed site assessments.

Site assessment methods included visual observations, direct measurements, photographic documentation, and a combination of reviews of as-built construction plans (where available for the various storm sewer systems) and other documents and technical information. At a minimum, TEC performed the following tasks at each site:

- Took digital photo images;
- Noted directions/access to site;
- Noted depth of flow (if flowing);
- Measured observed flow velocity (if flowing);
- Noted any evidence of surcharge (if flowing);
- Determined if traffic controls would be required;
- Measured invert to manhole rim depth (where applicable);
- Measured the outfall dimension, noted channel geometry, bottom matrix, and other pertinent factors;
- Prepared a hand sketch of the site (where applicable); and
- Recorded general comments.

For additional details on each site, refer to Appendices A and B, Site Evaluation Field Forms and Site Evaluation Photographs, respectively.

4.1.1 Visual Observations

Visual observations were used to assess the majority of the items detailed on the Site Evaluation Field Forms (Appendix A). In most instances, visual observations were used to determine relative current flow velocities within the various open channel piping and surface

water (stream/creek) systems. Where necessary, unique site conditions were noted or complex field implemented engineering designs, namely within vault interiors, were sketched. These sketch drawings are presented in Appendix A, along with their associated Site Evaluation Field Forms.

4.1.2 Direct Measurements

Direct measuring devices such as distance wheels, surveyor tapes, and measuring rods were used to collect direct measurements of the various engineering structures encountered at each potential project site. Measured parameters from these structures included, but were not limited to, manhole access way diameters, vault depths, piping sizes, etc. A hand held digital current velocity meter (Global Water© FP-101) was used at several of the sites to directly measure water flow through the piping systems or stream courses.

4.1.3 Photographic Documentation

Each site was photographed with a Canon® PowerShot A-60 digital camera. Most sites had two or more photos taken showing a wide angle view of the site and adjacent areas and a close-up view of the flow monitoring and sample collection point. The close-up views included vault interiors, pipe and culvert inlets and outfalls. Digital photographs are included in Appendix B. Specific photographic/site association cross references are included in the Section 3 tables.

4.1.4 Document Reviews

To complete the site assessments for several of the main evaluation criteria, data and information were ascertained through document and as-built plan reviews. These evaluation criteria included watershed characteristics, engineering dimensions (where direct measurement or visual observations were not possible, such as pipe slopes and elevations), technical equipment information, and additional site background information. In addition, subsequent follow-up calls and interviews were made to the various agency contacts to retrieve site specific information not readily available.

4.2 SURFACE WATER SITES EVALUATION CRITERIA

The goal of the site assessments was to provide adequate information to effectively assign a ranking score for each location based on each of the evaluation criteria listed below. To accomplish this, the following six evaluation criteria were used:

1. Flow Data Acquisition
2. Water Quality Monitoring/Sampling
3. Site Logistics
4. Health and Safety
5. Watershed Characteristics
6. Equipment Requirements/Site Preparation

In evaluating each of the potential project sites, the sites were rated and assigned a ranking number (from 0 to 5) defined by a set of matrix parameters for each of the evaluation criteria listed above. Assessments were completed at each potential project site independently. Field and research data was collected and recorded without bias towards any particular individual site or other conditions. Scores for each criteria were then added together to determine a total score for each potential sample site. Rankings for flow data acquisition, water quality monitoring / water sampling, site logistics and health and safety were a simple sliding scale with (1) being

the lowest and (5) being the highest scores, respectively. Watershed characteristics and equipment requirements/site preparation also utilized rankings from (1) to (5), however, these scores have slightly different definitions. These definitions are explained in the subject sections.

4.2.1 Flow Data Acquisition

The flow data acquisition criteria assessed the quality of the available instrumentation placement positions, condition of the flow channel, and site location relative to tidal influence for each site. Other concerns such as potential flow volumes, site type, engineering constraints, access to measurement point, and potential turbulence effects were all factored into the assignment of the matrix ranking score for site specific flow measurement.

A low score indicated that accurate flow data collection would not be feasible or that the site was otherwise disqualified for overall consideration due to specific flow measurement inadequacies; a high score indicated that accurate flow data would be easier to collect or generally more attainable.

4.2.2 Water Quality Monitoring/Water Sampling

The water quality monitoring/water sampling criteria assessed whether or not representative analytical sample and associated physio-chemical data could be accurately collected, measured, and routinely completed at a potential site. Considerations were made as to whether a site would be set up as an above grade location (with heavy-duty wooden equipment enclosures) or a below grade location (hanging or otherwise securing all necessary sample/physio-chemical collection gear within the confines of a vault). Other considerations such as the amount of room at a site for set-up, tidal influences, right-of-way concerns, system input source control, available historical analytical results, and engineering and equipment limitations were also factored into the ranking of sample collection at each site. A low score indicated that storm sampling would be challenging; a high score indicated storm sampling would be easier.

4.2.3 Site Logistics

The site logistics criteria assessed the sites from an operational perspective. Factors pertaining to how each site would be managed, approached, and accessed were factored into this category. Specifically, this criteria considered the site location, site property ownership, general site type, vehicle and personnel access, potential sampling location(s), erosion, keys/gates/codes, security issues, vandalism potential, site lighting, construction foundation material for pad/equipment placement, estimation of site set-up time, site visibility, vegetation control/site clearance and location markers. A low score indicated difficult logistic conditions; a high score indicated good logistic conditions.

4.2.4 Health and Safety

The health and safety criteria evaluated the potential health and safety hazards located in and around each site. Since some of the tasks to be performed during this project would occur in below grade vaults, confined space entry (CSE) will be a semi-routine occurrence. In addition, other health and safety issues that were factored into the evaluation included vehicular and pedestrian traffic, available emergency services (such as confined space entry rescue teams), tidal influence (flooding), property access and ownership, type of site, flow monitoring and sampling locations and their access, cell phone reception, traffic control procedures, site location, other personnel safety issues, proximity to open water, and the location of the nearest hospital. A low score indicated that health and safety was of high concern; a high score indicated that health and safety was of lower concern.

4.2.5 Watershed Characteristics

The watershed characteristic criteria evaluated the watershed characteristics associated with each potential site by using documented data, GIS information and available reports. In addition, adjacent land use types were noted and considered in the evaluation. Matrix parameters that were evaluated for the ranking of the watershed characteristics included: the percent development within a watershed, land use types and the percent of these types within a watershed, land use density, watershed size, geometric mean fecal coliform concentrations (where information is available) (TEC 2006c), and the percent of the total impervious area in each watershed. Other considerations such as the potential applicability of project data for multiple use/users (i.e., flow gauging data) emanating from the study of a particular site and the underlying aquifer systems and their current and potential use also factored into the scoring of this category. Based on these considerations, a single watershed characteristic ranking score of 1 through 5 was assigned to each potential site as follows: 1 = not desirable, 3 = average land use/watershed size/percent development, and 5 = very desirable qualities for that specific watershed type for its given evaluation parameters. Ranking scores of a 2 were considered below average and a score of 4 were above average, respectively.

4.2.6 Equipment Requirements/Site Preparation

Equipment requirements were assessed based on the potential use of various types of CoBI-owned or agency-loaned equipment that may be available for use during the upcoming pilot study and long-term implementation of the WQFMP. This equipment would be used to conduct flow monitoring, water sample collection, physio-chemical data collection, data logging, and rain gauging. Equipment assessments were made for each of the potential sites. Specific types of gear that would produce the best results at a given site were evaluated and noted on the Site Evaluation Forms (Appendix A). These evaluations were site specific and based on the intended parameter collection of a project location. Also factored into the evaluations were types and quantities of equipment already in-use or owned by other agencies that may be available for use during the upcoming pilot study and longer-term program use. Other matrix factors such as equipment set-up, site set-up, equipment life and reliability, calibration procedures and refurbishment costs were considered during the assignment of the ranking scores for each potential site.

Based on these considerations a single equipment requirement/site preparation ranking score of 1 through 5 were assigned to each proposed site where 1 is cost prohibitive, 3 is average, and 5 is a very cost effective. Ranking scores of a 2 were considered below average and a score of 4 were above average, respectively.

4.3 NEARSHORE / MARINE SITES EVALUATION CRITERIA

Nearshore/marine sites proposed for program use were based on three main evaluation considerations (differing slightly from those applied to surface water locations). These main evaluation considerations were as follows:

1. Was there a previously established site which was in current or rotating use by other agencies or other CoBI programs that could be used for purposes of the WQFMP?
2. Was there a need for a site that could provide water quality, water chemistry, sediment, or other data type requirements at a critical program location where a site does not currently exist?

3. Was there an advantage in the establishment of a single site that combines or otherwise includes multiple sites (within an appropriate proximity to each other) with a variety of program uses that enhances efficiency and effectiveness of the WQFMP?

The nearshore/marine sites were not ranked to the degree or in the same manner as the surface water sites. Selection of the appropriate nearshore/marine sites will be based on the final selection of the surface water, outfall and BMP sites. There may also be independent uses, not associated with terrestrial sites, for the nearshore/marine sites which are yet to be determined. Therefore all of the nearshore/marine sites are considered viable options for program use.

4.4 OUTFALL ANDSTORMWATER BMP STRUCTURE SITES EVALUATION CRITERIA

Outfall and stormwater BMP sites were evaluated in a similar fashion to both the terrestrial and nearshore/marine sites. In much the same way as the nearshore/marine sites were evaluated, the outfalls and BMP site selection process focused on previously established sites, especially those that may currently be in use for related water quality programs and at sites that exhibited favorable sampling and/or monitoring qualities. Since most of the island consists of residential use, locating viable outfalls that were representative of other land use types was the primary focus, and thus became the overall selection factor.

Similar to the surface water sites, outfall and BMP locations were assessed and evaluated based on the availability of physical structure/s that exist in areas of programmatic interest access and other logistical characteristics, as well as flow monitoring and sampling characteristics. Therefore these sites were ranked using the same criteria as the surface water sites.

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5.0 SITE EVALUATION RESULTS

Table 5-1 summarizes the numerical scores for each proposed program site (except nearshore/marine sites) and presents their overall ranking using the methods described in Section 4. The maximum possible total score for any site was 30 (6 main evaluation criteria x 5). A higher overall score indicated a site was better suited for conducting flow monitoring and physio-chemical sampling, was uniquely representative of its watershed type locale, and presented advantageous qualities to utilize available monitoring equipment with favorable site preparation conditions. A lower overall score indicated the converse to the attributes above. Sites with scores equal to or below 12 would generally not be considered for use in the CoBI WQFMP. Sites with scores between 12 and 15 are considered poor candidates. Sites with scores between 16 and 20 are average or adequate for their intended program use. Sites with scores between 21 and 25 are good to advantageous for their intended program use. Sites with scores 26 and above are excellent locations and would likely produce representable and reproducible data in a consistent fashion.

Recommendations as to which sites would be well suited for their intended use in the CoBI WQFMP, meaning that these sites would feasible for inclusion into the Pilot Study and for use as established long-term monitoring sites, are based on the total site scores listed in Table 5-1. Specific recommendations are presented in Section 6.

Other potential program sites discussed in Sections 3.1 and 3.3, described as “reserve sites”, are not presented in the evaluation results or recommendation sections of this SER. Although these sites are generally considered to be of lower-quality, they could have certain characteristics that may facilitate their future use for specific sampling and/or flow monitoring requirements. Use of these sites for specific program purposes should be re-visited as necessary if and when the need should arise.

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Table 5-1. WQFMP Site Evaluation Matrix

Site ID	Site Description	Flow[1]	Sample Collection[1]	Logistics[1]	Health & Safety[1]	Watershed Characteristics[2]	Equip/Site Prep[3]	Total Score
Surface Water Sites								
SE1A	Ravine Creek at north side Winslow Ave crossing	5	5	4	4	5	4	**27**
SE5A	Weaver Creek at Sheppard Road	4	3	4	4	4	3	**22**
SE10	Hawley Creek below confluence	1	2	2	2	4	2	**13**
SE11	Hawley Creek West Fork at Wing Point Way	3	3	3	3	4	3	**19**
SE12	Hawley Creek East Fork at Wing Point Way	1	2	2	3	3	3	**14**
SE16	Murden Creek (Grisdale Creek) crossing at SR-305	5	4	4	3	4	3	**23**
SE20	Manitou Beach Creek at Beach Crest Drive	2	3	2	3	2	3	**15**
SE21	Dripping Water Creek at Sunrise Drive	3	3	3	3	5	3	**20**
SE24	Coho Creek at Hidden Cove Road.	3	3	2	3	2	2	**15**
SE27	Manzanita Creek at Peterson Hill Road	5	5	4	3	3	4	**24**
SE34	Issei Creek (East Fork)	3	4	3	3	5	4	**22**
SE35	Springbrook Creek at Fletcher Bay Road	5	5	3	4	5	5	**27**
SE38	Schel-Chelb Creek at Baker Hill Road	4	5	4	3	4	3	**23**
SE41	Mac's Dam Creek at Country Club Road	3	3	3	3	2	3	**17**
SE42	Crane Lake Creek at Country Club Road.	2	3	3	3	4	2	**17**
SE45	Issei Creek West Fork	3	3	3	3	3	3	**18**
SE47	McDonald Creek at road-end	2	2	2	3	2	2	**13**
SE52	Tani Creek at Country Club Road in Blakely Harbor Park	2	3	3	3	3	2	**16**
SE55	Blakely Falls Creek at Halls Hill Road	2	3	3	3	2	2	**15**
SE62	Cooper Creek near Head-of-the-Bay well field	4	4	4	3	3	3	**21**
SE63	Sportsman's Club Creek at Wyatt Way	4	4	3	3	4	3	**21**
SE80	Rose Creek at bottom of Rose Loop	2	2	2	3	2	2	**13**

Table 5-1. WQFMP Site Evaluation Matrix

Site ID	Site Description	Flow[1]	Sample Collection[1]	Logistics[1]	Health & Safety[1]	Watershed Characteristics[2]	Equip/Site Prep[3]	Total Score
Outfall Sites								
OFL 145	Madison Avenue South Discharge	3	3	3	4	5	3	**21**
OFL 169	Madrone Creek Stormwater Discharge	4	4	4	3	5	3	**23**
OFL 166	Point Monroe Lagoon Creeklet at Fay Bainbridge State Park	2	2	3	3	2	2	**14**
OFL 50	Outfall at Lynwood Center	1	1	2	3	4	1	**12**
OFL 178	Eagle Outfall at Ferncliff Road	3	3	3	3	4	2	**18**
Stormwater BMP Sites								
BMP1	Vincent Road Recycle Center Decant Pond Discharge	3	3	3	3	4	4	**20**
BMP2	CoBI O&M Yard Retention Pond Discharge	2	3	3	3	4	4	**19**

Notes:
1 Ranking Grade Key Site Parameters: 0 = not feasible, disqualifying 1 = very low, poor 2 = below average, fair 3 = average 4 = above average 5 = excellent qualities
2 Ranking Grade Key WSC Parameters: 1 = not desirable 3 = average land use/size/development % 5 = very desirable qualities for that specific WS type for its given evaluation parameters
3 Ranking Grade Key Cost Parameters: 1 = prohibitive, 3 = average, 5 = very effective

6.0 SITE SELECTION RECOMMENDATIONS

This section presents the Site Selection Recommendations from the evaluation of the proposed surface water, outfalls and stormwater BMPs sites identified during the field assessment process. Recommended site usage includes: *Pilot Study and Long-term Project Use, Long-term Project Use, Periodic Use, Single Event or Periodic Use, and Single Event or Otherwise Not Recommended for Use*. These recommendations and corresponding results are further explained below. Equipment recommendations and site access coordination issues are also discussed in this section.

6.1 SITE RECOMMENDATIONS

In total there are 22 surface water, five outfall, and two BMP structure sites that received secondary (detailed) site assessments and were evaluated for potential CoBI WQFMP use. In addition, there were 55 sites (non-bolded entries listed in Table 3-1) that are generally proposed for alternate use. The future use of these sites can be further assessed as specific program needs arise. Specific selection of the 96 nearshore/marine sites that have been proposed for potential program use will greatly depend on the selection of the land sites). The nearshore/marine sites were evaluated differently then the land sites, as explained in Section 4.3. Therefore, currently, all of these sites have similar use potential.

Recommended site usage categories included: *Pilot Study and Long-term Project Use, Long-term Project Use, Periodic Use, Single Event or Periodic Use, and Single Event or Otherwise Not Recommended for Use.* Sites deemed for *Pilot Study and Long-term Use* are of the highest quality and best represent a specific type-locale. These sites should be considered for use in both the pilot study and continued use in the WQFMP. Sites deemed for *Long-term Project Use* are of high quality and should be considered for regular use in the WQFMP. Sites deemed for *Periodic or Single Event or Periodic Use* are those locations that could produce representative and/or repeatable results. These could include sites that may establish background conditions in a particular location, or are needed to produce periodic data to report on compliance issues. However, data generation from these sites is not a consistent program need. Sites deemed *Single Event or Otherwise Not Recommended for Use* would be sites where a one-time data gap or compliance testing situation may be required, or sites of low quality where representative or reproducible results may be difficult or impossible to obtain.

Table 6-1 presents the overall site ranking and proposed recommended usage for each site. Site recommendations are as follows:

- Six sites are recommended for *Pilot Study and Long-term Use*,
- Seven sites are recommended for *Long-term Project Use*,
- Ten sites are recommended for *Periodic* Use – *Single Event or Periodic Use*, and
- Six sites are recommended for *Single Event* or *Otherwise Not Recommended for Use*.

6.2 EQUIPMENT RECOMMENDATIONS

Table 6-2 presents the recommended method(s) for conducting flow and water sampling at each proposed site. Since the CoBI has acquired water quality and flow monitoring gear to conduct WQFMP activities, all equipment recommendations were made with the City-owned gear in mind. It is recommended that where automated flow monitoring is proposed that area/velocity meters (Marsh-McBirney Flo-Totes III™ or equivalent) or level loggers (KPSI™

Series 550 loggers or equivalent) be installed. Flow at the remaining sites may be measured by similar or other methods. Springbrook Creek (SE35) would be best measured using the existing weir/level logger approach (Isco 4110 Ultrasonic meter). Sites recommended for automated water sampling would utilize the CoBI owned Isco™ 6712 potable and programmable water sampling units. Water quality readings, either for spot measurements or long-term deployment, would best be recorded with the CoBI's multi-parameter datalogger and sonde system (YSI™ 650 and 6920, respectively).

Water quality readings could be collected using the multi-parameter datalogger and sonde (YSI™ 650 and 6920 combined system), and other specialty gear (also City-owned), such as Secchi discs (for depth and light penetration measurements), remotely-triggered samplers (for water sample collection at specific depths), portable global positioning system (GPS) units (to locate sites on the water), and specialty netting gear (for seining activities). CoBI will make final nearshore/marine site selections in the future based on the land sites that are selected.

6.3 SITE ACCESS COORDINATION

Recommended potential sites are located in a variety of settings – streams, outfalls, vaults, and pipes. While the majority of the recommended potential sites are easily accessed, the following sites will require additional coordination for safe and proper access or preparation for CSE (by qualified and certified personnel only):

- **SE1A Ravine Creek**. Access to this site is across private property. CoBI does have a access rights and has a secured Right-Of-Way (ROW) agreement in place, respect and consideration should be exercised when accessing this site.
- **SE27 Manzanita Creek**. A portion of this site (creek to inlet side of culvert) is on private property. The landowner has agreed to provide access but would like to be notified of upcoming events prior to accessing that portion of the site.
- **SE35 Springbrook Creek**. This site is situated on private property and will require coordination with the home owners association and the CoBI for access and sample site construction.
- **SE47 McDonald Creek**. The access point and possibly the culvert outfall from the roadside ditch above this access point may be entirely on private property. No known agreement exists with the landowner. The CoBI point of contact (POC) should be consulted with before accessing this site.
- **BMP1 Vincent Rd Decant and Recycle Center**. This site is gated, therefore access should be coordinated prior to conducting WQFMP tasks. This is a City-owned facility and access should be discussed with the CoBI POC.
- **BMP2 CoBI Operation and Maintenance Facility Yard**. This facility is gated, therefore access should be coordinated prior to conducting WQFMP tasks. This is a City-owned facility and access should be discussed with the CoBI POC.
- **Outfall 50 Lynwood Center**. This location may be accessed from the beach (directly from the outfall) or as a confined space. If a CSE is warranted, then proper planning and certified personnel would be required.
- **Outfall 145 Madison Avenue South Discharge**. This site can be accessed via CoBI ROW and is available 24 hours/day. Site preparation and occasional operation and maintenance will require a CSE. CSE's involve proper planning and certified personnel will be required for all entries; and

- **Outfall 169 Lower Madison Brien Bjune Stormwater Discharge**. This site can be accessed via CoBI ROW and is available 24 hours/day. Site preparation and occasional operation and maintenance will likely require a CSE. CSE's involve proper planning and certified personnel will be required for all entries.

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Table 6-1. Site Evaluation Matrix Summary and Recommendations

[1]Overall Site Rank	Site ID	Site Description	Total Score	Recommended Project Action
Surface Water Sites				
1	SE1A	Ravine Creek at north side Winslow Ave crossing	27	Pilot Study and Long-term Project Use
2	SE35	Springbrook Creek at Fletcher Bay Road	27	Long-term Project Use
3	SE27	Manzanita Creek at Peterson Hill Road	24	Long-term Project Use
4	SE16	Murden Creek (Grisdale Creek) crossing at SR-305	23	Pilot Study and Long-term Project Use
5	SE38	Schel-Chelb Creek at Baker Hill Road	23	Pilot Study and Long-term Project Use
6	SE5A	Weaver Creek at Sheppard Road	22	Long-term Project Use
7	SE34	Issei Creek (East Fork)	22	Single Event or Periodic Use
8	SE62	Cooper Creek near Head-of-the-Bay well field	21	Long-term Project Use
9	SE63	Sportsman's Club Creek at Wyatt Way	21	Long-term Project Use
10	SE21	Dripping Water Creek at Sunrise Drive	20	Single Event or Periodic Use
11	SE11	Hawley Creek West Fork at Wing Point Way	19	Single Event or Periodic Use
12	SE45	Issei Creek West Fork	18	Single Event or Periodic Use
13	SE41	Mac's Dam Creek at Country Club Road	17	Periodic Use
14	SE42	Crane Lake Creek at Country Club Road.	17	Single Event or Periodic Use
15	SE52	Tani Creek at Country Club Road in Blakely Harbor Park	16	Single Event or Periodic Use
16	SE20	Manitou Beach Creek at Beach Crest Drive	15	Single Event or Otherwise not Recommended for Use
17	SE24	Coho Creek at Hidden Cove Road.	15	Single Event or Periodic Use
18	SE55	Blakely Falls Creek at Halls Hill Road	15	Single Event or Otherwise not Recommended for Use
19	SE12	Hawley Creek East Fork at Wing Point Way	14	Single Event or Periodic Use
20	SE10	Hawley Creek below confluence	13	Single Event or Otherwise not Recommended for Use
21	SE47	McDonald Creek at road-end	13	Single Event or Otherwise not Recommended for Use
22	SE80	Rose Creek at bottom of Rose Loop	13	Single Event or Otherwise not Recommended for Use

Table 6-1. Site Evaluation Matrix Summary and Recommendations

[1]Overall Site Rank	Site ID	Site Description	Total Score	Recommended Project Action
Outfall Sites				
1	OFL 169 (SE4)	Lower Madison Brien Bjune Stormwater Discharge	23	Pilot Study and Long-term Project Use
2	OFL 145 (SE3)	Madison Avenue South Discharge	21	Pilot Study and Long-term Project Use
3	OFL 178 (SE66)	Eagle Outfall at Ferncliff Road	18	Long-term Project Use
4	OFL 166 (SE26)	Point Monroe Lagoon Creeklet at Fay Bainbridge State Park	14	Single Event or Periodic Use
5	OFL 50	Outfall at Lynwood Center	12	Single Event or Otherwise not Recommended for Use
Stormwater BMP Sites				
1	BMP1 (SE58)	Vincent Road Recycle Center Decant Pond Discharge	20	Pilot Study and Long-term Project Use
2	BMP2	CoBI O&M Yard Retention Pond Discharge	19	Long-term Project Use

Notes:
1 No. Refers to site ranking scores.

Table 6-2. Equipment Recommendations for Proposed WQFM Sites

[1]Overall Site Rank	Site ID	Site Description	Site Type	Flow/Sampling Gear Location	Recommended Flow Monitoring Gear	Recommended Sampling Gear	Misc.
Surface Water Sites							
1	SE1A	Ravine Creek at north side Winslow Ave crossing	CRK to CLV	above-grade	AVM, DL, CVM	PDEN, ISSG, MPM	12VB, AH
2	SE35	Springbrook Creek at Fletcher Bay Road	CLV to CRK	Site is currently set up as a flow and sampling monitoring station. Weir Structure and LVM used, has SG. Set up deployment for ISSG.			
3	SE27	Manzanita Creek at Peterson Hill Road	CLV to CRK	above-grade	SG, LVM, DL, CVM	PDEN, ISSG, MPM	12VB, AH
4	SE16	Murden Creek (Grisdale Creek) crossing at SR-305	CRK/CLV/CRK	above-grade	AVM, DL, CVM or LVM, SG, DL	PDEN, ISSG, MPM	12VB, AH
5	SE38	Schel-Chelb Creek at Baker Hill Road	CRK/CLV/CRK	above-grade	SG, LVM, DL, CVM	PDEN, ISSG, MPM	12VB, AH
6	SE5A	Weaver Creek at Sheppard Road	CLV to CRK	above-grade	AVM, DL, CVM or LVM, SG, DL	PDEN, ISSG, MPM	12VB, AH
7	SE34	Issei Creek (East Fork)	CLV to CRK	above-grade	SG, LVM, DL, CVM	PDEN, ISSG, MPM (at convergent point)	12VB, AH
8	SE62	Cooper Creek near Head-of-the-Bay well field	CRK/CLV/CRK	above-grade	SG, LVM, DL, CVM	PDEN, ISSG, MPM	12VB, AH
9	SE63	Sportsman's Club Creek at Wyatt Way	CRK to CLV	above-grade	AVM, DL, CVM	PDEN, ISSG, MPM	12VB, AH
10	SE21	Dripping Water Creek at Sunrise Drive	CRK to CLV	above-grade	SG, LVM, DL, CVM	Grab, MPM	NA
11	SE11	Hawley Creek West Fork at Wing Point Way	CRK to CLV	above-grade	SG, LVM, DL, CVM	PDEN, ISSG, or Grab, MPM	12VB, AH
12	SE45	Issei Creek West Fork	CLV to CRK	above-grade	AVM, DL, CVM	PDEN, ISSG, MPM (at convergent point)	12VB, AH
13	SE41	Mac's Dam Creek at Country Club Road	CRK to CLV	above-grade	AVM, DL, CVM	PDEN, ISSG, MPM	12VB, AH
14	SE42	Crane Lake Creek at Country Club Road	CLV to CRK	above-grade	AVM, DL, Hand	Grab, MPM	NA
15	SE52	Tani Creek at Country Club Road in Blakely Harbor Park	CRK to CLV	above-grade	Hand	Grab, MPM	NA
16	SE20	Manitou Beach Creek at Beach Crest Drive	CRK/CLV/CRK	above-grade	SG, LVM, DL, CVM, or Hand	Grab, MPM	NA

Table 6-2. Equipment Recommendations for Proposed WQFM Sites

[1]Overall Site Rank	Site ID	Site Description	Site Type	Flow/Sampling Gear Location	Recommended Flow Monitoring Gear	Recommended Sampling Gear	Misc.
17	SE24	Coho Creek at Hidden Cove Road.	CRK	above grade	SG, LVM, DL, CVM	PDEN, ISSG, MPM	12VB, AH
18	SE55	Blakely Falls Creek at Halls Hill Road	CRK/CLV/CRK	above-grade	AVM, DL, Hand	Grab, MPM	NA
19	SE12	Hawley Creek East Fork at Wing Point Way	CRK	above grade	Hand	Grab, MPM	NA
20	SE10	Hawley Creek below confluence	CRK	above grade	Hand	Grab, MPM	NA
21	SE47	McDonald Creek at road-end	CLV to CRK	above-grade	Hand	Grab, MPM	NA
22	SE80	Rose Creek at bottom of Rose Loop	CRK/CLV/CRK	above-grade	Hand	Grab, MPM	NA
Outfall Sites							
1	OFL 169	Madrone Creek Stormwater Discharge	MH/V	in-vault below grade	AVM, DL, CVM	VIES, ISSG, MPM	12VB, AH
2	OFL 145	Madison Avenue South Discharge	V	in-vault /above grade	AVM, DL, CVM	ISSG or Grab, MPM	12VB, AH
3	OFL 178	Eagle Outfall at Ferncliff Road	V	in-vault below grade	AVM, DL, or Hand	Grab, MPM	NA
4	OFL 166	Point Monroe Lagoon Creeklet at Fay Bainbridge State Park	CLV/OTB	outfall pipe above grade	AVM, DL or Hand	Grab, MPM	NA
5	OFL 50	Outfall at Lynwood Center	OTB	outfall pipe above grade	Hand	Grab, MPM	NA
Stormwater BMP Sites							
1	BMP1	Vincent Road Recycle Center Decant Pond Discharge	CB	outfall pipe above grade	AVM, DL, or Hand	Grab, MPM	NA
2	BMP2	CoBI O&M Yard Retention Pond Discharge	CB	outfall pipe above grade	AVM, DL or Hand	Grab, MPM	NA

Notes:
12VB = 12 volt battery
AG = above- grade
AH = assorted hardware, fasteners, PVC piping, and hangers if required
AVM = area velocity meter (Marsh McBirney Flo-Tote III or similar)
CB = catch basin
CLV = culvert pipe
CRK = creek
CVM = current velocity meter for vertical flow profiling
DL = data logger for AVM
Grab = grab sampler, hand sampling, non-automated
Hand = manual flow measurement, rating curve
ISNG = Isco auto-sampler, narrow gauge body (≤18")
ISSG = Isco auto-sampler, standard gauge body
LVM = level measuring device such as ultrasonic or pressure transducer probe
MH = manhole
MPM = multi-parameter physio-chemical meter (pH, Cond, Temp, Turb,%Sal)
NA = not applicable
OTB = outfall to beach front or back bay area
PDEN = pad and/or equipment enclosure
SG = staff gauge
V = vault
VIES = vault interior equipment system
WS = weir structure

7.0 REFERENCES

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APPENDICES

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APPENDIX A

A-1 SITE EVALUATION CODES TABLE

A-2 SITE EVALUATION FIELD FORMS

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Appendix A - Evaluation Codes Tables

Table A1. CoBI SITE AREA CODES (Site_Area_Code)	
Agate Passage	AGPS
Background	BKGD
Blakely Harbor	BLKH
Eagle Dale	EGDL
Eagle Harbor	EGLH
Fletcher Bay	FLBY
Gazzam Lake	GZLK
Manzanita Bay	MZBY
Murden Cove	MDCV
North Eagle Harbor	NEGH
Other Non-Program Sites	ONPS
Pleasant Beach	PLBH
Point White-Battle Point	PWBP
Port Madison	PTMD
Port Madison Bay	PTMB
Port Orchard Bay	POBY
Port Orchard Reach	PORH
Puget Sound	PGSD
Rich Passage	RIPS
Rolling Bay-Point Monroe	RBPM
Rockaway Beach	RWBH
South Beach	SHBH
Sunrise	SNRS

Table A2. PRIMARY SITE TYPE CODES (Primary_Site_Type)	
Best Management Practice Stormwater Structure	BMP
Marine	MR
Nearshore	NS
Other	OTH
Piping System	PS
Surface Water	SW
Unknown	UNK

Table A3. SECONDARY SITE TYPE CODES (Secondary_Site_Type)	
Beach, Beach front or inter-tidal area	BCH
Creek	CRK
Culvert	CLV
Ditch	DTH
Flow	FLW
Lake or pond	LAK
Manhole	MNH
Other	OTH
Outfall	OFL
Sediment sample	SED
Spring / seep	SPR
Storm water retention structure	SWR
Vault	VLT
Water	WTR

Table A4. CoBI WATERSHED CODES (Watershed_Code)	
Agate Passage / AGPS	AGPS
Blakely Harbor / BLKH	BLKH
Eagle Dale / EGDL	EGDL
Fletcher Bay / FLBY	FLBY
Gazzam Lake / GZLK	GZLK
Manzanita Bay / MZBY	MZBY
Murden Cove / MDCV	MDCV
North Eagle Harbor / NEGH	NEGH
Pleasant Beach / PLBH	PLBH
Port Madison / PTMD	PTMD
South Beach / SHBH	SHBH
Sunrise / SNRS	SNRS

Table A5. CoBI SUB-BASIN CODES (CoBI_Sub-basin_Code)	
Agate Passage / AGPS	AGPS-X
Blakely Harbor / BLKH	BLKH-X
Eagle Dale / EGDL	EGDL-X
Fletcher Bay / FLBY	FLBY-X
Gazzam Lake / GZLK	GZLK-X
Manzanita Bay / MZBY	MZBY-X
Murden Cove / MDCV	MDCV-X
North Eagle Harbor / NEGH	NEGH-X
Pleasant Beach / PLBH	PLBH-X
Port Madison / PTMD	PTMD-X
South Beach / SHBH	SHBH-X
Sunrise / SNRS	SNRS-X

Watershed Code - Sequential subbasin number

Table A6. SITE OWNERSHIP TYPE (Site_Ownership_Type)	
City/Local Government	CTLG
County	CONT
Federal	FED
Other	OTHR
Private	PRVT
State	STATE
Tribal	TRBL
Unknown	UNK

Table A7. CoBI Location Data Dictionary

Field Title	Field Description	Format	Valid Values	Valid Value Descriptions and Examples / Comments
Horizontal Collection Method Code	Technique used to collect the horizontal coordinates of a Location.	**REQUIRED.** 2 numeric.	01-28, 99	01 address match-block face; 02 address match-house #; 03 address match-street centerline; 04 address match-unknown; 05 air photo-rectified; 06 air photo-unknown; 07 air photo-unrectified; 08 cadastral survey (conventional land survey); 09 census block 1990 centroid; 10 census block group 1990 centroid; 11 conversion from STR; 12 digital or manual raw photo extraction; **13 digitized/ captured from computer screen - digital data;** 14 digitized from paper map; 15 GPS carrier phase (employs the satellite code's carrier signal to improve accuracy); 16 GPS code phase (measurements based on the pseudo random code broadcast by the satellite); 17 GPS kinematic (tracking location while moving using carrier phase); 18 GPS unknown; 19 hand measured-paper map interpolation; 20 LORAN-C; 21 orthophoto-digital; 22 orthophoto-paper; 23 satellite imagery-Landsat MSS (multi-spectral scanning); 24 satellite imagery-Landsat TM (thermatic mapper); 25 satellite imagery-other; 26 satellite imagery-SPOT panchromatic; 27 satellite imagery-SPOT multi-spectral; 28 zip code centroid.
				29 GPS differential code phase (base station used to make real-time or post-processing corrections). 30 LIDAR (airborne laser) 99 unknown
				**** If you've used a GPS but don't have info about the unit's specific precision, use: 18- GPS Unknown.**

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Page:	1 of 3
Date:	~~HT~~ 1/11/06
Time:	1252

LOCATION INFORMATION:

Location ID:		Primary Site Code:	SW	Secondary Site Code:	CRK
CoBI Site Area:	NEGH - Winslow	CoBI Watershed Code:	NEGH	CoBI Site Owner Type:	CTLG ①
Location Description:	SE#1A Ravine Crk at north side Winslow ave				
Location Name:	Ravine Crk - main branch			Loc Coord. Ref System:	SPCS
Lat. / Northing:	232586.82			Long. / Easting:	1225586.74
Horizontal Ref. Datum Code:	NAD 1983 WA - North 4601			Horizontal Collection	13 - EIM Method Code
Other Location Info:	Original SE#1 moved to Ravine Crk at Winslow ave crossing (north side)				

ACCESS INFORMATION:

Site Access (Driving Directions, Vehicle, Personnel, etc.)	Winslow Ave West (address 554), pull into driveway for Diamond Public Parking, park near pay box, access trail is at corner of drive-way and public sidewalk over side of ~~four~~ guard rail
General Logistics:	Site may be accessed 24-hr/day, walk down steep access trail to concrete culvert area where creek is conveyed beneath Winslow Ave - Parking near pay box
Traffic Control:	Cones needed while parked - partially blocks ~~exit~~ exit from pay lot
Confined Space:	None at "normal" site access & sampling points - but a walking pipe entrance CSE may be required during flow equip. placement
Health and Safety Concerns:	Deep, fast moving creek flow - working near culvert entrance. Steep access pathway, cars entering/exiting parking lot

Cell Reception:	YES ✓ NO ____	Site Owner Info:	① PRVT (Levon) w/ CoBI ROW to street

SITE PHOTOS

Photo No. 1	~~View~~ View from west to east ~~across~~ across creek
Photo No. 2	Close up of hexagonal culvert
Photo No. 3	View facing upstream (north) from atop culvert area
Photo No. 4	View facing down the access path

CoBI Water Quality and Flow Monitoring Program
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Page:	2 of 3
Loc ID:	#1A

WATER QUALITY AND SAMPLE COLLECTION:	
Tidal Influence / Site Effects:	NO
Location for Sampling Gear:	Yes, a number of adjacent locations, however, NE corner of culvert strux is ideal
Sampling Gear / Speciality Equipment:	Any selected, LTM rec'd
Outfall Sampling Location Description:	Sampling at inlet side of culvert
FLOW MONITORING:	
Channel Type / Description	Hexagonal (48" side drawing 002) smooth bore concrete
Flow Equipment:	Any desired, A-V rec'd
Tidal Influence / Site Effects:	No

SITE TECHNICAL SPECIFICATIONS:

Technical Measurements Collected ?		YES ✓ NO ___	If Yes, Report Measurements on Page 3
Site Drawing #:	002	Other Tech. Info.	

WATERSHED AND SITE LU/LC

General LU / LC Description: LU: residential, commercial, retail, urban

LC: steep ravine, wooded, forest w/ some underbrush

GENERAL SITE NOTES:

- Good flow measurement and sample collection location
- Best Ravine creek access location
- Logistics + Health and Safety good

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LOCATION ID:	SE#1A	Page 3 of	3

VAULT SPECS

Outfall / Pipe ID	Vault Entrance Dia (IN)	Maximum Vault Depth to Grade (FT)	Vault Dia at Working Depth (IN)	Main Inlet Pipe Dia (IN)	Main Outlet Pipe Dia (IN)	~~Outlet~~ Piping Type	No. of Other Inlet Pipes Intersecting Vault / Dia Range (IN)	Tidally Influenced Y/N	Flow or Standing Water Thickness (IN)	Measured/ Estimated Flow Velocity F/S	Channel Geometry at or Near Measurement Point	Sediment / Gravel Thickness in Pipe (IN)
Ravine Crk #1	NA	NA	NA	48" hexagonal	48"	SBC	1 (12" CMP)	N	7"	Mod to high	trapezoidal ⏢ Straight	0-~1"

STREAM SPECS

Stream WRIA No.	Stream Width (IN / FT)	Ave. Stream Depth (IN)	Channel Geometry	Channel Bottom	Culvert Entrance Description	Comments / Other
Ravine Crk	6-7'	6"	curved, hummocky rocky	rocky	transition from natural creek course to box culvert (across concrete deck bottom ~7' leading to entrance	• great flow measurement location • several weir struc's inside culverted pipe run.

CB = catch basin
CLV = culvert pipe
CMP = corregated metal pipe
CRK = creek
DD = drainage ditch
F = flow to an undetermined depth
Grated = grated entrance to measuring site
High = high flow velocity (>10 f/s)
Low = low flow velocity (<1 f/s)
MH = manhole
Mod = moderate flow velocity (1-10 f/s)
NA = not applicable
NM = not measured
Offset = indicates vault entrance is partially obstructed such that its true entrance diameter is reduced to a smaller size
OTB = outfall to beach front or back bay area
SAVH = varied pipe geometry, sharp entry angles and various inflow heights
SLAC = entrance pipes slightly angled into a convergence
SBC = smooth bore concrete
ST = straight pipe run
TC = terracotta pipe
TeD = pipe Tee divertor
TG = tide gate, flush preventor
UND = undetermined
V = vault
WS = weir structure

City of Bainbridge Island
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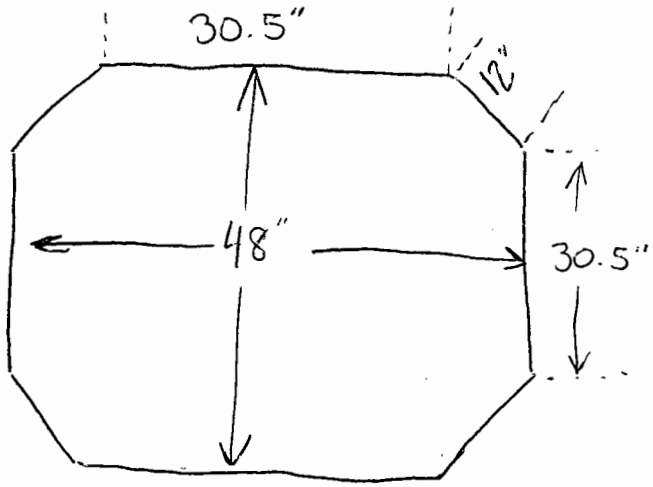
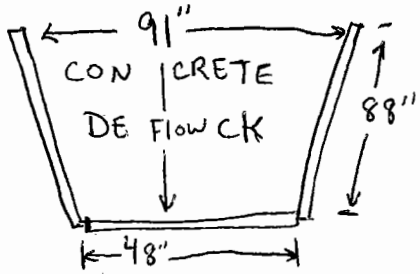
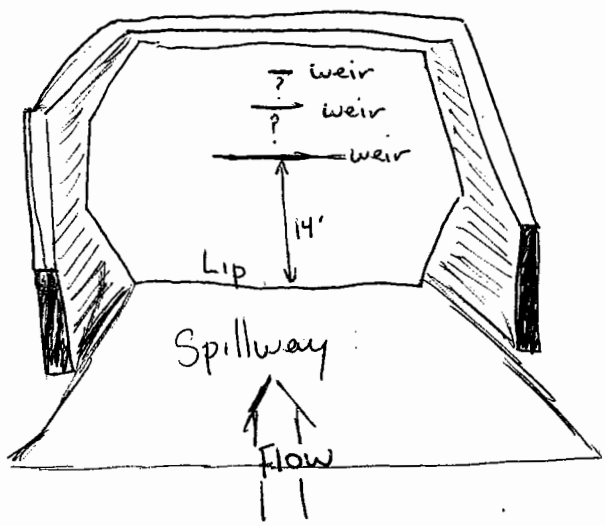
Site Evaluation Event



Head-on



Top View - looking down onto entry spillway (culvert enterance)



weir plates (4x4" timbers) at step down points

Drawing No. 002	**Drawing Date:** 1/11/06
Site Location: #1 SE	**Drawing By:** DCM

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Page:	1 of 2
Date:	1/11/2006
Time:	0903

LOCATION INFORMATION:

Location ID:		Primary Site Code:	NS ISW	Secondary Site Code:	CRK
CoBI Site Area:	EGLH	CoBI Watershed Code:	NEGH	CoBI Site Owner Type:	CTLG
Location Description:	SE #2, mouth of Ravine crk, viewed from ferry Maint yrd foot bridge				
Location Name:	Winslow ravine crk near Mouth	Loc Coord. Ref System:	SPCS		
Lat. / Northing:	232311.95	Long. / Easting:	1225689.49		
Horizontal Ref. Datum Code:	NAD 1983 WA - North 4601	Horizontal Collection	13 (EIM Method Code)		
Other Location Info:	Loc #2 is on North side of foot bridge				

ACCESS INFORMATION:

Site Access (Driving Directions, Vehicle, Personnel, etc.)
turn South onto Bjune St. off of Winslow Ave, travel south - downhill staying left, come to common parking area (basketball hoop) at dead-end

General Logistics: Parking area will accumodate van, 24-hr access, public property, easy access could sample from shoreline or from small boat, no foot access - Lites at parking area and on foot bridge and another near flat spot grassy area

Traffic Control: None needed, ample parking, low traffic volume area

Confined Space: No

Health and Safety Concerns: Steep rocky; loose, slippery shoreline, NS environment, working near water, possible need for PFD

Cell Reception:	YES ✓ NO ____	Site Owner Info:	City - State owned property

SITE PHOTOS

Photo No. 1	Facing north looking directly towards stream mouth
Photo No. 2	Facing South looking at wider channel area near west side of maint yard
Photo No. 3	Facing ~~west~~ east - northeast looking at grassy knoll area
Photo No. 4	Facing south looking at parking area

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Site Evaluation Form
Land Locations

Loc ID: SE#2

WATER QUALITY AND SAMPLE COLLECTION:	
Tidal Influence / Site Effects:	Yes, very tidally influenced site, high tide all stream features covered low tide stream bar features exposed
Location for Sampling Gear:	Possible flat spot on west side of bridge (grassy area)
Sampling Gear / Speciality Equipment:	May need to sample/access site via small boat, could be a "grab" site from bridge
Outfall Sampling Location Description:	No outfall, creek mouth area

FLOW MONITORING:	
Channel Type / Description	Very hummocky, pronounced rocky bar features in channel, then opens to very wide area abruptly - not a good flow monitoring site
Flow Equipment:	Possibly install a staff gauge and note tide height and stage
Tidal Influence / Site Effects:	Very tidally influenced

SITE TECHNICAL SPECIFICATIONS:			
Technical Measurements Collected ?		YES ___ NO ✓	If Yes, Report Measurements on Page 3
Site Drawing #:	NA	Other Tech. Info.	

WATERSHED AND SITE LU/LC

General LU / LC Description: Vegetated and treed shoreline w/ dense underbrush, blackberries, vines, little exposed shoreline, Winslow area - urban (urban park) land use surrounding site

GENERAL SITE NOTES:

- Site is best suited as a nearshore sampling location, all other aspects are of low grade
- Site could be accessed by larger ~~boa~~ boat if sampling location were moved to somewhere south of bridge

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Page:	1 of 3
Date:	1/17/06
Time:	1000

LOCATION INFORMATION:

Location ID:		Primary Site Code:	PS	Secondary Site Code: OFL	MNH
CoBI Site Area:	NEGH - Lower Madison	CoBI Watershed Code:	NEGH	CoBI Site Owner Type:	CTLG
Location Description:	SE#3 Madison Ave South Discharge - Lower Madison				
Location Name:	Madison Ave S. Discharge			Loc Coord. Ref System:	SPCS
Lat. / (Northing):	231499.35			Long. / (Easting):	1224257.35
Horizontal Ref. Datum Code:	NAD 1983 SPC WA-North 4601			Horizontal Collection	13 (EIM Code)
Other Location Info:	Stormwater Manhole cover - rectangular grate next to curb				

ACCESS INFORMATION:

Site Access (Driving Directions, Vehicle, Personnel, etc.)
Access site via street or sidewalk - open access. Located at the corner of Madison Ave. S. and Parfitt Wy SW

General Logistics: Site is accessible 24-hr/day, public street. Site is lighted.

Traffic Control: None officially required; however the access point is located at a busy traffic intersection. Also, due to downtown location, in close proximity to many local businesses and marina there are many pedestrians walking close to the site.

Confined Space: Yes - if flow instruments are to be positioned here then Confined space entry will be required (CSE)

Health and Safety Concerns: High traffic flow of both vehicles and pedestrians and the need for a CSE (w/ a very narrow ingress/egress point) would be required for flow meter placement.

Cell Reception:	YES ✓ NO ____	Site Owner Info:	CoBI owned and City ROW

SITE PHOTOS

Photo No. 1	Facing east
Photo No. 2	Close up
Photo No. 3	Facing down into vault
Photo No. 4	View of outfall

CoBI Water Quality and Flow Monitoring Program
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Loc ID: SE#3

WATER QUALITY AND SAMPLE COLLECTION:	
Tidal Influence / Site Effects:	No tidal effects, vault bottom is above high tide elevation
Location for Sampling Gear:	No room IN-vault; possible space available along adjacent stretch of sidewalk
Sampling Gear / Speciality Equipment:	Grab sampling at this location would be the most convenient and most efficient to utilize. However, automated gear (i.e. ISCO) would be possible
Outfall Sampling Location Description:	Sampling at this Piped System would occur at the grated location previously described, the actual outfall is 60-70 yds further downstream
FLOW MONITORING:	
Channel Type / Description	Channel type is piped, smooth bore concrete – an adequate straight run exists on the inlet side of the vault
Flow Equipment:	Automated flow could be obtained using an A-V style meter – spot measurements could be easily obtained from the surface
Tidal Influence / Site Effects:	No tidal influence at the flow monitoring site

SITE TECHNICAL SPECIFICATIONS:			
Technical Measurements Collected ?		YES ✓ NO ___	If Yes, Report Measurements on Page 3
Site Drawing #:	~~NA~~ #003	Other Tech. Info.	NA

WATERSHED AND SITE LU/LC

General LU / LC Description: LU = Urban (commerical & retail shops) w/ high concentration of impervious surfaces

LC = w/in a 200' radius of the site most of the land cover is pavement building structures and some limited manicurred green-space areas

GENERAL SITE NOTES:

- Site has decent logistical qualities
- Some moderate health and safety concerns due to traffic and the potential for confined space entry
- Sampling and flow measurements can be collected at this location and would be representative of an urbanized drainage/outfall system

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LOCATION ID:	#3	Page 3 of	3

VAULT SPECS

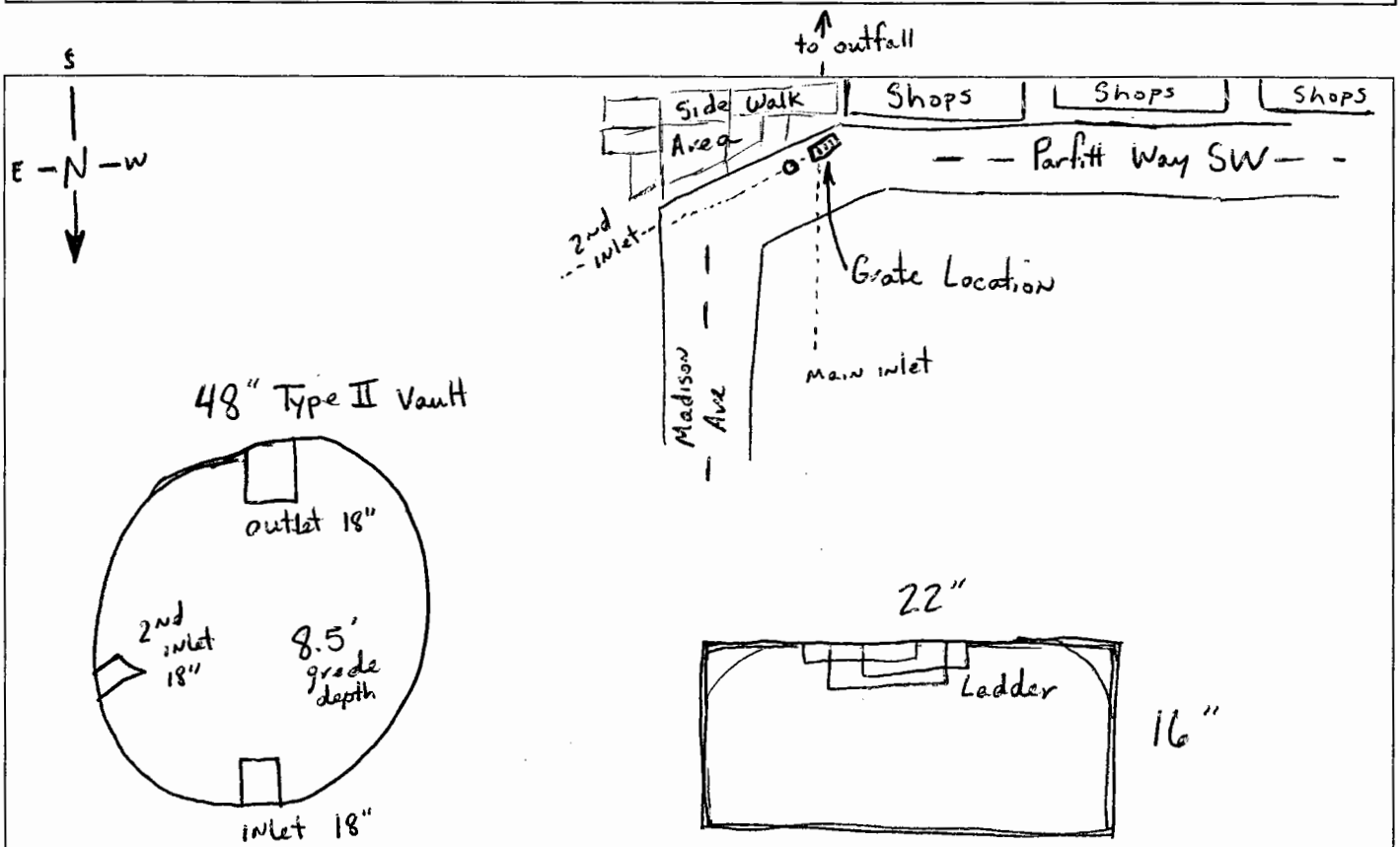
Outfall / Pipe ID	Vault Entrance Dia (IN)	Maximum Vault Depth to Grade (FT)	Vault Dia at Working Depth (IN)	Main Inlet Pipe Dia (IN)	Main Outlet Pipe Dia (IN)	Outlet Piping Type	No. of Other Inlet Pipes Intersecting Vault / Dia Range (IN)	Tidally Influenced Y/N	Flow or Standing Water Thickness (IN)	Measured/ Estimated Flow Velocity F/S	Channel Geometry at or Near Measurement Point	Sediment / Gravel Thickness in Pipe (IN)
#3	16X22 grate	8.5'	48" Type II	18"	18"	SBC	(1) 18"	N	Flowing, ~3'	low	ST	None to ~1"

STREAM SPECS

Stream WRIA No.	Stream Width (IN / FT)	Ave. Stream Depth (IN)	Channel Geometry	Channel Bottom	Culvert Entrance Description	Comments / Other

CB = catch basin
CLV = culvert pipe
CMP = corregated metal pipe
CRK = creek
DD = drainage ditch
F = flow to an undetermined depth
Grated = grated entrance to measuring site
High = high flow velocity (>10 f/s)
Low = low flow velocity (<1 f/s)
MH = manhole
Mod = moderate flow velocity (1-10 f/s)
NA = not applicable
NM = not measured
Offset = indicates vault entrance is partially obstructed such that its true entrance diameter is reduced to a smaller size
OTB = outfall to beach front or back bay area
SAVH = varied pipe geometry, sharp entry angles and various inflow heights
SLAC = entrance pipes slightly angled into a convergence
SBC = smooth bore concrete
ST = straight pipe run
TC = terracotta pipe
TeD = pipe Tee divertor
TG = tide gate, flush preventor
UND = undetermined
V = vault
WS = weir structure

City of Bainbridge Island
Water Quality and Flow Monitoring Program
Site Evaluation Event



Drawing No. 003	Drawing Date: 1/17/06
Site Location: SE #3	Drawing By: Dcm

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CoBI Water Quality and Flow Monitoring Program
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Page:	1 of 3
Date:	1/17/06
Time:	1040

LOCATION INFORMATION:

Location ID:		Primary Site Code:	PS	Secondary Site Code:	MNH
CoBI Site Area:	NEGH - LMBB	CoBI Watershed Code:	NEGH	CoBI Site Owner Type:	CTLG
Location Description:	SE#4 Madrone Crk Stormwater Discharge - LMBB				
Location Name:	Madrone Crk - LMBB (Winslow Outfall)	Loc Coord. Ref System:	SPCS		
Lat. / Northing:	231941.18	Long. / Easting:	1224455.60		
Horizontal Ref. Datum Code:	NAD 1983 WA North 4601	Horizontal Collection	EIM Method #13		
Other Location Info:	Round Manhole cover (3rd) closest to water				

ACCESS INFORMATION:

Site Access (Driving Directions, Vehicle, Personnel, etc.)	of street, location at walking trail, ~ Byrne Rd., turn east off of Madison, south side 20' south of street curb
General Logistics:	Park at trail head, gravelly parking pad, somewhat lighted
Traffic Control:	None Required, off-street parking
Confined Space:	Yes - standard 24" dia
Health and Safety Concerns:	CSE, backing out of gravelly parking area onto street, construction site next door property

Cell Reception:	YES ✓ NO ___	Site Owner Info:	CoBI ROW

SITE PHOTOS

Photo No. 1	Facing South
Photo No. 2	Looking down into vault
Photo No. 3	Close up inside vault
Photo No. 4, 5, 6	Outlet area

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Page: 2 of 3
Loc ID: SE # 4

WATER QUALITY AND SAMPLE COLLECTION:	
Tidal Influence / Site Effects:	None
Location for Sampling Gear:	LTM sampling gear can be hung in vault on an Isco platform. Top vault ladder rung may need to be removed
Sampling Gear / Speciality Equipment:	Grab or LTM
Outfall Sampling Location Description:	Sampling location should be from within main culvert outlet pipe, however additional opportunities to sample with WQ and non-WQ pipes ~~exit~~ exists.

FLOW MONITORING:	
Channel Type / Description	Piping system - 42" HDPE, corregated (outlet)
Flow Equipment:	A-V meter rec'd
Tidal Influence / Site Effects:	No tide influence, but WQ strux pipe adds major influx to system

SITE TECHNICAL SPECIFICATIONS:			
Technical Measurements Collected ?		YES ✓ NO ___	If Yes, Report Measurements on Page 3
Site Drawing #:	004	Other Tech. Info.	

WATERSHED AND SITE LU/LC

General LU / LC Description: LU: Urban, commercial, light industrial
LC: 75-85% impervious surface coverage, streets, parking lots
~15% green spaces

GENERAL SITE NOTES:

- Good urbanized flow & sampling location
- CSE require for initial set-up of flow & sample lines

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LOCATION ID:	#4 SE	Page 3 of	3

VAULT SPECS

Outfall / Pipe ID	Vault Entrance Dia (IN)	Maximum Vault Depth to Grade (FT)	Vault Dia at Working Depth (IN)	Main Inlet Pipe Dia (IN)	Main Outlet Pipe Dia (IN)	Outlet Piping Type	No. of Other Inlet Pipes Intersecting Vault / Dia Range (IN)	Tidally Influenced Y/N	Flow or Standing Water Thickness (IN)	Measured/ Estimated Flow Velocity F/S	Channel Geometry at or Near Measurement Point	Sediment / Gravel Thickness in Pipe (IN)
Winslow Outfall	24		~72"	42" CPP	42"	CPP	(1) ~18"	N	Flow ~2-3"	Mod	OTB, SLAC	None

STREAM SPECS

Stream WRIA No.	Stream Width (IN / FT)	Ave. Stream Depth (IN)	Channel Geometry	Channel Bottom	Culvert Entrance Description	Comments / Other

CB = catch basin
CLV = culvert pipe
CMP = corregated metal pipe
CRK = creek
DD = drainage ditch
F = flow to an undetermined depth
Grated = grated entrance to measuring site
High = high flow velocity (>10 f/s)
Low = low flow velocity (<1 f/s)
MH = manhole
Mod = moderate flow velocity (1-10 f/s)
NA = not applicable
NM = not measured
Offset = indicates vault entrance is partially obstructed such that its true entrance diameter is reduced to a smaller size
OTB = outfall to beach front or back bay area
SAVH = varied pipe geometry, sharp entry angles and various inflow heights
SLAC = entrance pipes slightly angled into a convergence
SBC = smooth bore concrete
ST = straight pipe run
TC = terracotta pipe
TeD = pipe Tee divertor
TG = tide gate, flush preventor
UND = undetermined
V = vault
WS = weir structure

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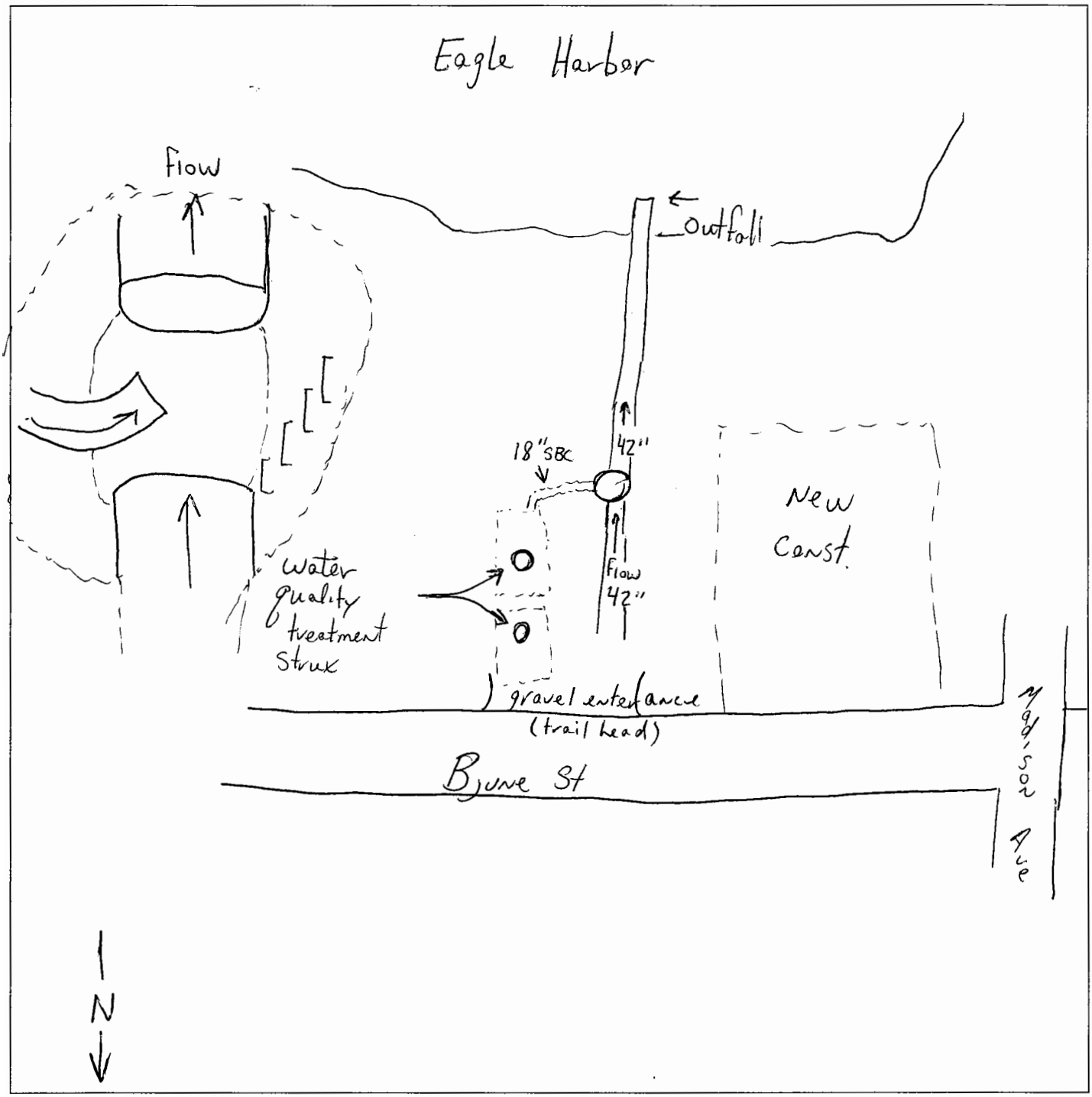
Water Quality and Flow Monitoring Program
Site Evaluation Event



Drawing No. 004 **Drawing Date:** 1/17/06

Site Location: SE#4 Madrone Crk **Drawing By:** DCM

CoBI Water Quality and Flow Monitoring Program
Site Evaluation Form
Land Locations

Page:	1 of 3
Date:	1/11/06
Time:	1430

LOCATION INFORMATION:

Location ID:		Primary Site Code:	SW	Secondary Site Code:	CLV-CRK
CoBI Site Area:	NEGH - Winslow	CoBI Watershed Code:	NEGH	CoBI Site Owner Type:	CTLG
Location Description:	SE#5A Weaver Crk culvert outfall at south-side Shepard Rd				
Location Name:	Weaver Crk at Shepard Rd	Loc Coord. Ref System:	SPCS		
Lat. / Northing:	233052.22	Long. / Easting:	1221882.89		
Horizontal Ref. Datum Code:	NAD 1983 WA-north 4601	Horizontal Collection	13 (EIM Method Code)		
Other Location Info:	Loc 5A is south (1 block) from original SE#5 loc (@ Wyatt)				

ACCESS INFORMATION:

Site Access (Driving Directions, Vehicle, Personnel, etc.)
Winslow Ave drive west from town center, north (rt) on Grow Ave., west (1ft.) on Wyatt Way W, south (1ft) on Weaver, east (1ft) onto Shepard. Walk from road edge, south ~50' to culvert outfall

General Logistics: Adequate and safe parking in gravel area (NE corner of Shepard/Weaver intersection) across from 333 (house) Weaver, not lighted, residential neighborhood

Traffic Control: Low traffic, 2-way street, 25-mph zone, no additional controls necessary

Confined Space: No

Health and Safety Concerns: Traffic

Cell Reception:	YES ✓ NO ___	Site Owner Info:	CoBI ROW

SITE PHOTOS

Photo No. 1	Facing into culvert at Weaver creek/culvert transition
Photo No. 2	Facing downstream at Weaver Crk location.
Photo No. 3	NA
Photo No. 4	NA

TEC ENVIRONMENTAL MANAGEMENT

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Loc ID: SE#5A

WATER QUALITY AND SAMPLE COLLECTION:	
Tidal Influence / Site Effects:	No
Location for Sampling Gear:	Adequate area to either ~~po~~ construct pad or place skid mounted gear enclosure
Sampling Gear / Speciality Equipment:	Any selected, LTM or grab
Outfall Sampling Location Description:	Culvert pipe (48"CMP) opening into natural stream course

FLOW MONITORING:	
Channel Type / Description	Straight run CMP, no obstructions or curves noted
Flow Equipment:	Any selected would work, A-V or Stand-pipe level logger rec'ed
Tidal Influence / Site Effects:	No

SITE TECHNICAL SPECIFICATIONS:			
Technical Measurements Collected ?		YES ✓ NO ___	If Yes, Report Measurements on Page 3
Site Drawing #:	No	Other Tech. Info.	

WATERSHED AND SITE LU/LC

General LU / LC Description: LU: Residential, neighborhood, recreational fields nearby
LC: semi-wooded, open area along creek course, creek at sampling area is wooded and partially covered w/ over-hanging vegetation

GENERAL SITE NOTES:

- Good overall site w/ enough room to place a gear enclosure for long-term sampling requirements - good flow monitoring assessment site as well
- Site 5A (south of original site) has better attributes than SE5

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TEC ENVIRONMENTAL MANAGEMENT

LOCATION ID:	Loc SE#5A	Page 3 of	3

VAULT SPECS

Outfall / Pipe ID	Vault Entrance Dia (IN)	Maximum Vault Depth to Grade (FT)	Vault Dia at Working Depth (IN)	Main Inlet Pipe Dia (IN)	Main Outlet Pipe Dia (IN)	Outlet Piping Type	No. of Other Inlet Pipes Intersecting Vault / Dia Range (IN)	Tidally Influenced Y/N	Flow or Standing Water Thickness (IN)	Measured/ Estimated Flow Velocity F/S	Channel Geometry at or Near Measurement Point	Sediment / Gravel Thickness in Pipe (IN)
Weaver Crk	NA	NA	NA	NA	48"	CMP	None	N	10"-11" (flow)	Mod	ST	~1"

STREAM SPECS

Stream WRIA No.	Stream Width (IN / FT)	Ave. Stream Depth (IN)	Channel Geometry	Channel Bottom	Culvert ~~Entrance~~ Outfall Description	Comments / Other
Weaver Crk	~3'	4-6"	Single, incised ~~winding~~ curving	rocky w/ other debris	Sharp transition from CMP to natural stream course	good water flow

CB = catch basin
CLV = culvert pipe
CMP = corregated metal pipe
CRK = creek
DD = drainage ditch
F = flow to an undetermined depth
Grated = grated entrance to measuring site
High = high flow velocity (>10 f/s)
Low = low flow velocity (<1 f/s)
MH = manhole
Mod = moderate flow velocity (1-10 f/s)
NA = not applicable
NM = not measured
Offset = indicates vault entrance is partially obstructed such that its true entrance diameter is reduced to a smaller size
OTB = outfall to beach front or back bay area
SAVH = varied pipe geometry, sharp entry angles and various inflow heights
SLAC = entrance pipes slightly angled into a convergence
SBC = smooth bore concrete
ST = straight pipe run
TC = terracotta pipe
TeD = pipe Tee divertor
TG = tide gate, flush preventor
UND = undetermined
V = vault
WS = weir structure

TEC ENVIRONMENTAL MANAGEMENT

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Page:	1 of 2
Date:	1/11/2006
Time:	0950

LOCATION INFORMATION:

Location ID:		Primary Site Code:	NS/SW	Secondary Site Code:	SHL
CoBI Site Area:	EGLH	CoBI Watershed Code:	NEGH	CoBI Site Owner Type:	CTLG
Location Description:	SE#10, Hawley crk below confluence, shoreline area where crk empties				
Location Name:	Hawley crk Mouth			Loc Coord. Ref System:	SPCS
Lat. / Northing:	232916.31			Long. / Easting:	1228241.31
Horizontal Ref. Datum Code:	NAD 1983 WA north 4601			Horizontal Collection	13 (EIM Method Code)
Other Location Info:	access shoreline via trial head				

ACCESS INFORMATION:

Site Access (Driving Directions, Vehicle, Personnel, etc.): End of Hawley rd - road narrows into more of a driveway just past STP, travel on Winslow Ave east, turn lf on Ferncliff and then right onto Hawley (first right - no street sign)

General Logistics: Limited parking (1 space only), adjacent to beachfront trailhead, 24-hr access, path turns into scramble over slippery loose logs, path not well defined to crk, site has no lights

Traffic Control: One lane drive right at access/parking area limited turn-around capability (no-trailers!) lite amount of traffic - residential neighborhood

Confined Space: No

Health and Safety Concerns: Pathway very difficult to walk on, Semi-submerged even at low tide marshy area, working near open water, exposed to wave action

Cell Reception:	YES ✓ NO ____	Site Owner Info:	City beachfront park area

SITE PHOTOS

Photo No. 1	Facing west looking towards ferry dock
Photo No. 2	Facing west-northwest close up of creek outfall
Photo No. 3	Facing north - view of wetlands to north of site
Photo No. 4	Facing north - ~~here~~ view of access pathway area

TEC ENVIRONMENTAL MANAGEMENT

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Loc ID: SE #10

WATER QUALITY AND SAMPLE COLLECTION:	
Tidal Influence / Site Effects:	Site is at least tidally influenced at any stage above low tide line
Location for Sampling Gear:	No a very good LTM site, ~~neo~~ narrow beach front w/ large marshy wetlands behind (adjacent) beach, beach littered w/ large logs
Sampling Gear / Speciality Equipment:	Recommended for grab sampling
Outfall Sampling Location Description:	No outfall (man-made), however, stream channel well defined all the way to its exit point on beach

FLOW MONITORING:	
Channel Type / Description	Stream channel ~ 3.5' wide and ~ 4"-5" deep at low tide Strong flow ~ 3-4 fps
Flow Equipment:	rec. hand measurements only (at least at this location)
Tidal Influence / Site Effects:	tidally influenced

SITE TECHNICAL SPECIFICATIONS:			
Technical Measurements Collected ?		YES ___ NO ✓	If Yes, Report Measurements on Page 3
Site Drawing #:	NA	Other Tech. Info.	

WATERSHED AND SITE LU/LC

General LU / LC Description: Use: park, residential, wetlands - beach front

LC: dune + saw grass, cattails, rocky - sandy beach w/ numerous large logs, wetlands bordered by alder forest w/ dense undergrowth

GENERAL SITE NOTES:

- Site good for grab sampling and hand flow measurements, access health-safety concerns, tidally influenced most times, although low tide provides adequate sampling + flow measurement access
- ~ 300 yds east of ferry dock along beach front
- Site could easily be accessed by boat

CoBI Water Quality and Flow Monitoring Program
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Page:	1 of ~~2~~ 3
Date:	1 / 11 / 2006
Time:	1044

LOCATION INFORMATION

Location ID:		Primary Site Code:	SW	Secondary Site Code:	CRK
CoBI Site Area:	NEGH	CoBI Watershed Code:	NEGH	CoBI Site Owner Type:	CTLG
Location Description:	SE#11 Hawley crk west fork at Wing Pt Way				
Location Name:	West fork Hawley Creek			Loc Coord. Ref System:	SPCS
Lat. / Northing:	233759.29			Long. / Easting:	1228111.62
Horizontal Ref. Datum Code:	NAD 1983 WA North 4601			Horizontal Collection	13 EIM Method Code
Other Location Info:					

ACCESS INFORMATION

Site Access (Driving Directions, Vehicle, Personnel, etc.) North on Ferncliff, right on Wing Point Wy NE continue to bottom of hill (lowest spot, crk crossing), public access, 24-hr access, access crk from road shoulder

General Logistics: Parking along wide road shoulder on north side of road, no lights

Traffic Control: Two-lane road w/ moderate traffic flow, 25-mph zone although most traffic traveling faster, no additional controls required

Confined Space: No

Health and Safety Concerns: Traffic working near roadway, high visibility ~~vet~~ vests required, steep sloped bank to creek

Cell Reception:	YES ✓ NO ____	Site Owner Info:	CoBI ROW

SITE PHOTOS

Photo No. 1	Facing across & upstream from main channel inlet
Photo No. 2	Facing into concrete culvert pipe
Photo No. 3	Facing towards secondary 12" road run-off pipe
Photo No. 4	Facing across crk & uphill looking at access pathway

CoBI Water Quality and Flow Monitoring Program
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Loc ID: SE#11

WATER QUALITY AND SAMPLE COLLECTION:	
Tidal Influence / Site Effects:	No tide effects
Location for Sampling Gear:	Small flat area (~5X5') atop culvert area
Sampling Gear / Speciality Equipment:	Isco or similar or grab gear
Outfall Sampling Location Description:	Inlet side of pipe where natural creek flows into pipe (main); road run-off pipe ~3' upstream from main culvert (secondary)
FLOW MONITORING:	
Channel Type / Description	Natural creek channel, curvey, step'ed, rocky bottom flowing into 36" SBC pipe (road x-ing culvert) → 12" ~~CS~~ CMP pipe inflow above main
Flow Equipment:	Could use A-V meter or stream level / stilling well set-up
Tidal Influence / Site Effects:	No tide effects

SITE TECHNICAL SPECIFICATIONS:			
Technical Measurements Collected ?		YES ✓ NO ___	If Yes, Report Measurements on Page 3
Site Drawing #:	001	Other Tech. Info.	NA

WATERSHED AND SITE LU/LC

General LU / LC Description: LU: residential LC: Wooded, hanging vegetation, dense underbrush
steep creek valley

GENERAL SITE NOTES:

- Good site for both flow and sample collection
- Steep bank that accesses site has eroded and the City has undertaken temp. engineering measures to keep erosion effects minimized
- decent stream flow

TEC ENVIRONMENTAL MANAGEMENT

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LOCATION ID:	SE#11	Page 3 of	3

VAULT SPECS

Outfall / Pipe ID	Vault Entrance Dia (IN)	Maximum Vault Depth to Grade (FT)	Vault Dia at Working Depth (IN)	Main Inlet Pipe Dia (IN)	Main Outlet Pipe Dia (IN)	Outlet Piping Type	No. of Other Inlet Pipes Intersecting Vault / Dia Range (IN)	Tidally Influenced Y/N	Flow or Standing Water Thickness (IN)	Measured/ Estimated Flow Velocity F/S	Channel Geometry at or Near Measurement Point	Sediment / Gravel Thickness in Pipe (IN)
SE # 11	NA	NA	NA	36	36	SBC	1/12"	N	~6"	est. ~3-4 fps MOD	ST (pipe) Curved - Varied elev. Crk	0" - No gravel in Pipe

STREAM SPECS

Stream WRIA No.	Stream Width (IN / FT)	Ave. Stream Depth (IN)	Channel Geometry	Channel Bottom	Culvert Entrance Description	Comments / Other
West Fork Hawley	Ave ~2'	~6" at time of measurement	Varied, curvy	rocky, gravelly	Stream enters on a curving angle but straightens just at ~~entrance~~ entry point	Good, strong creek flow (moderate)

CB = catch basin
CLV = culvert pipe
CMP = corregated metal pipe
CRK = creek
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F = flow to an undetermined depth
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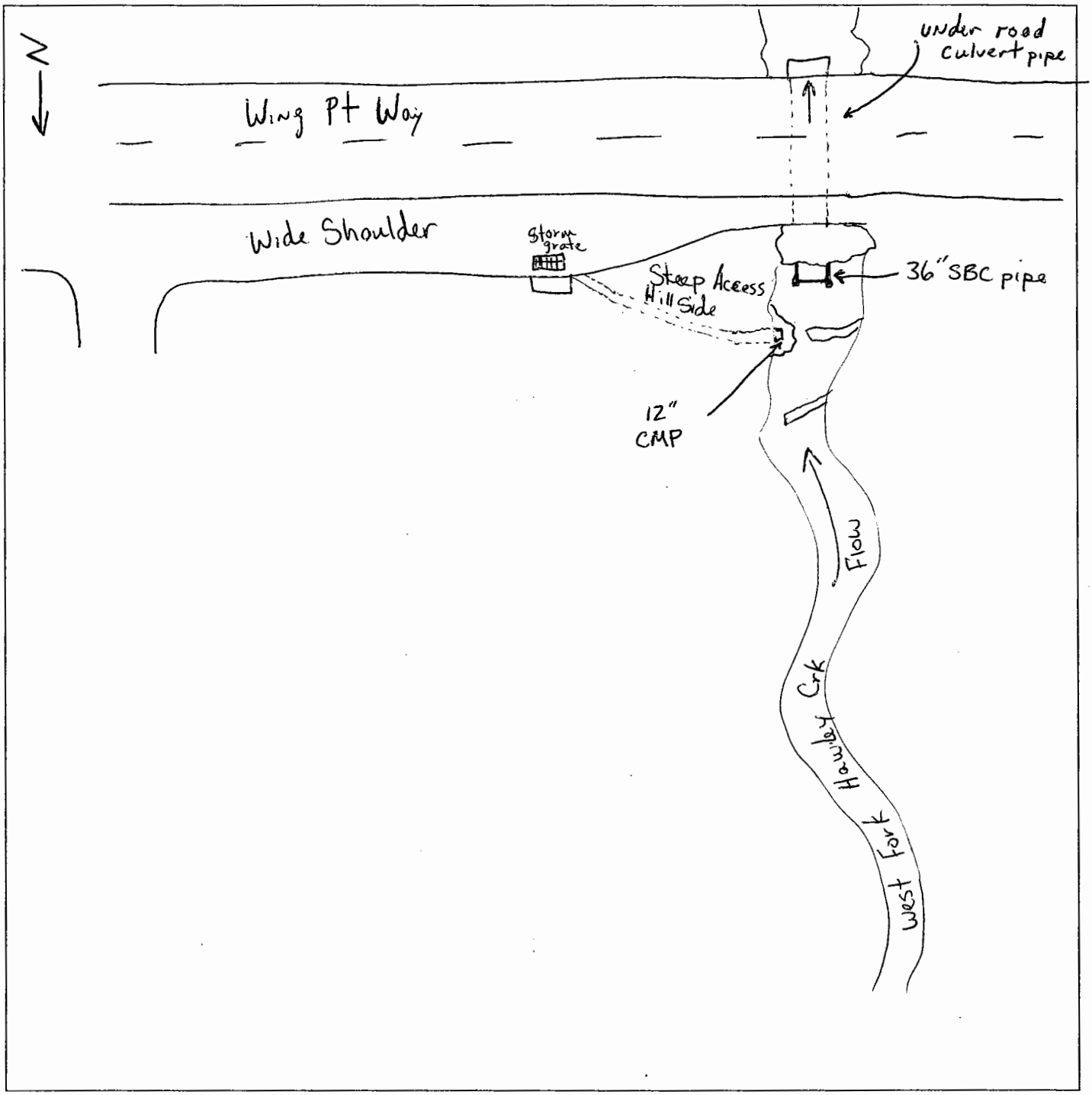
City of Bainbridge Island
Water Quality and Flow Monitoring Program
Site Evaluation Event



Drawing No. 001 Drawing Date: 1/11/06

Site Location: SE #11 Drawing By: DCM

TEC ENVIRONMENTAL MANAGEMENT

CoBI Water Quality and Flow Monitoring Program
Site Evaluation Form
Land Locations

Date: 1/11/2006
Time: 1145

LOCATION INFORMATION:					
Location ID:		Primary Site Code:	SW	Secondary Site Code:	CRK
CoBI Site Area:	NEGH - Wing point	CoBI Watershed Code:	NEGH	CoBI Site Owner Type:	CTLG
Location Description:	SE#12, Hawley Crk East Fork at Wing Point Way				
Location Name:	East fork Hawley Creek			Loc Coord. Ref System:	SPCS
Lat. / Northing:	233759.29			Long. / Easting:	1228457.46
Horizontal Ref. Datum Code:	NAD 1983 WA North 4601			Horizontal Collection	13 (EIM Method Code)
Other Location Info:	Actual access to east fork is 490' down trail from trailhead sign at trail bridge				

ACCESS INFORMATION:

Site Access (Driving Directions, Vehicle, Personnel, etc.) Located along south side of Wing Pt Way NE ~50yrds east of west fork location (SE#11)

General Logistics: Park either at SE#12 or park along Azalea Ave, parking at trailhead possible but not practical.

Traffic Control: None - only parking concerns

Confined Space: No

Health and Safety Concerns: None outstanding - parking issues, long walk to carry heavy coolers, gear, etc.

Cell Reception:	YES ✓ NO ____	Site Owner Info:	CoBI - park area

SITE PHOTOS

Photo No. 1	Facing downtrail towards bridge
Photo No. 2	Close up of east fork at bridge
Photo No. 3	Facing downstream at bridge
Photo No. 4	NA