ADDENDUM NO. 2

SAMPLING AND ANALYSIS PLAN
&
HEALTH AND SAFETY PLAN
FOR THE
LITTLE SQUALICUM PARK
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

BELLINGHAM, WASHINGTON

Prepared for

City of Bellingham
Parks & Recreation Department
3424 Meridian Street
Bellingham, Washington 98225

For submittal to

Washington Department of Ecology
Bellingham Field Office
1204 Railroad Avenue
Bellingham, Washington 98225

U.S. Environmental Protection Agency
Brownfields Program
1200 Sixth Avenue
Seattle, Washington 98101

Prepared by

integral consulting inc.

1201 Cornwall Avenue, Suite 208
Bellingham, Washington 98225

January 24, 2006

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I, Mark J. Herrenkohl, a professional engineering geologist in the State of Washington, certify that I have reviewed the geosciences portions of this addendum to the Work Plans.

Signature of Geologist: ______________________Name: Mark J. Herrenkohl Date: 1/24/06

1 INTRODUCTION

This document is Addendum No. 2 to the Sampling and Analysis Plan (SAP) and Health and Safety Plan (HASP) for the Little Squalicum Park (Park) Remedial Investigation/Feasibility Study (RI/FS) located in Bellingham, Washington (Integral 2005a). It includes information on samples collected at the site from November 7 – 17, 2005 which show petroleum contamination within both existing and historical channels of Little Squalicum Creek (the creek) and the presence of municipal landfill materials in the northeastern portion of the site adjacent to the Bellingham Technical College (BTC) parking lot. This addendum outlines additional sampling and testing activities proposed for the site supplementary to the September 30, 2005 Little Squalicum Park RI/FS Work Plans (Integral 2005a) and the November 15, 2005 Addendum No. 1 (Integral 2005b[1]). In addition to providing information on the rationale and objectives for the proposed sampling and testing, this document also details how work described in the original project work plans (Integral 2005a) – halted on November 17, 2005 – will recommence in concert with the sampling described in this addendum. It also contains information on proposed changes to the project HASP as it relates to worker and visitor safety during sampling activities.

Integral is conducting this work under contract No. 2004-014 with the City of Bellingham, Parks and Recreation Department (City), with direction from both the Washington State Department of Ecology Toxics Cleanup program (Ecology) and U.S. Environmental Protection Agency, Region 10 Brownfields program (EPA). Site work is being conducted under the March 2005 *Agreed Order* between the City and Ecology and – for select portions of the site – an EPA Brownfields agreement with the City. Sampling and testing methods will follow those described and approved by Ecology and EPA in the original project work plans (Integral 2005a), unless otherwise noted in this addendum.

A summary of relevant field observations and a proposed investigation of the historical landfill are presented in Section 2. Section 3 summarizes relevant field observations and proposes a source investigation of the petroleum seep observed in the upper portion of the creek. Additional investigation of the historical creek channel is presented in Section 4. Section 5 discusses additional health and safety considerations for this sampling effort. The proposed sampling schedule is presented in Section 6 followed by references in Section 7.

[1] Addendum No. 1 provided information on the rationale and objectives for supplementary sampling and testing in identifying the location and boundaries of the historical creek channel within Little Squalicum Park and to determine the extent of the petroleum contamination in soils identified at station TP-6. Sampling was completed in November 2005.

2 HISTORICAL LANDFILL INVESTIGATION

The purpose of this investigation is to characterize the soils within and delineate the extent of the historical landfill located on the northeastern portion of the site.

2.1 Introduction and Field Observations

Test pits TP-1 and TP-2, located at the northeast corner of the Park near the BTC parking lot, were advanced on November 9th and 10th, respectively (see Figure 1). In both test pits, municipal garbage and debris were observed in the upper 4 feet (ft) of soils. Materials encountered include intact bottles possibly dating to the 1920's and 1930's, unidentifiable metal fragments, ash materials and concrete debris, among other materials. Material typical of municipal waste was observed to be more extensive in TP-1 including a distinct "garbage odor" in the upper portions of the excavation. After consultation with Tim Wahl of the City, this area of the Park has tentatively been identified as the Razore City Landfill which probably operated between 1936 and 1939.

City records indicate that in 1936 the Marietta Township litigated against the City of Bellingham, the City Sanitary Service, and the Razore's over the proximity of the landfill, located in the vicinity of Little Squalicum Park, to residential areas and potable spring water (No. 23970; Filed June 20, 1936 in the Superior Court in the State of Washington). According to court documents, the landfill material consisted of garbage and tin cans and was operating when the case was litigated in 1936. According to the Findings of Fact and Conclusions of Law (Filed August 1, 1936 in the Superior Court in the State of Washington), the garbage in the landfill was to be immediately covered with approximately 2 ft of earth, leaving an exposed end of the landfill not to exceed 25 ft in length and 6 or 7 ft in width. The depth of soil covering the garbage is consistent with observations from test pits TP-1 and TP-2.

2.2 Analytical Results Summary

Samples were collected from test pits TP-1 and TP-2 from ground surface to a depth of 5.0 and 5.3 ft, respectively. All samples were analyzed for metals and Northwest Total Petroleum Hydrocarbons – Gasoline Range Organics (Ecology Method NWTPH-GRO), – Diesel Range Organics, (Ecology Method NWTPH-DRO), and – Residual Range Organics (Ecology Method NWTPH-RRO). Selected samples were also analyzed for polychlorinated biphenyls (PCBs).

Analytical results for NWTPH-GRO/DRO/RRO were below the TPH screening level of 100, 200, and 200 milligrams per kilogram dry weight (mg/kg dw), respectively. PCB Aroclors were below detection limits of 19 to 20 micrograms per kilogram (µg/kg) dw.

Metal results exceeded screening levels for arsenic, lead, cadmium, zinc, copper, mercury, and silver (Tables 1 and 2). The highest metals concentrations were found in the sample collected from test pit TP-1 at a depth of 1-2 ft below ground surface (bgs). The concentrations of lead (1,270 mg/kg dw) and zinc (1,270 mg/kg dw) in this sample are factors of approximately 25 and

14 times greater than the site screening values, respectively. Metals concentrations in the deepest samples collected from each test pit did not exceed the screening levels.

Table 1. Preliminary Unvalidated Soil Sample Results Exceeding Screening Values[a] for Test Pit TP-1 (mg/kg dw)

Sample Number	LSP0059[b]	LSP0061	LSP0062	LSP0063	LSP0064	Preliminary Screening Value
Depth	0-1 ft	1-2 ft	2-3 ft	3-4 ft	4-5 ft	
Arsenic	-	-	8	-	-	9.09/7[c]
Cadmium	-	3.1	-	-	-	2.39
Copper	-	124	106	61.9	-	50
Lead	121.5	1,270	107	-	-	50
Mercury	0.185	0.36	0.20	0.17	-	0.10
Silver	-	1	0.6	-	-	0.545
Zinc	163	1,230	638	87.4	-	86

[a]See Table A-3 of the Project QAPP for screening benchmark source;
[b]Average of sample and sample duplicate
[c]When a "/" is used to separate two values, the first value is for surface soil and the second is for subsurface soil
- Sample result did not exceed screening level

Table 2. Preliminary Unvalidated Soil Sample Results for Exceeding Screening Values[a] for Test Pit TP-2 (mg/kg dw)

Sample Number	LSP0065[b]	LSP0067	LSP0071	LSP0070	LSP0069	LSP0068	Preliminary Screening Value
Depth	0-1 ft	1-1.6 ft	1.6-2.9 ft	2.9-3.7 ft	3.7-4.2 ft	4.2-5.3 ft	
Arsenic	-	-	-	-	11	-	9.09/7[c]
Copper	-	63.2	-	50.4	92.6	-	50
Lead	106.5	74	-	233	-	-	50
Mercury	-	-	-	0.18	0.19	-	0.10
Zinc	110.5	128	-	168	235	-	86

[a]See Table A-3 of the Project QAPP for screening benchmark source
[b]Average of sample and sample duplicate
[c]When a "/" is used to separate two values, the first value is for surface soil and the second is for subsurface soil
- Sample result did not exceed screening level

2.3 Proposed Test Pit Locations and Methods

The historical landfill will be delineated by excavating small reconnaissance test pits up to 3 ft deep (depth of test pits dependent on depth of fill) and the width of the track-hoe bucket (approximately 18 inches). Each test pit will be excavated using a mini track-mounted excavator (Takeuchi TB135 or Kubota KX121). The track-mounted excavator has a smaller footprint than the backhoe used in earlier investigations and site work, allowing greater accessibility to areas in the Park with dense vegetation. The rubber tracks are not expected to disturb the surface soils as much as the rubber tires of a backhoe when moving through wetter areas of the site.

The excavated material will be examined by a field geologist for the presence of municipal garbage and debris. The test pits will be excavated on north-south transects from test pit TP-1 on 50 ft centers (Figure 1 shows the first four reconnaissance test pit locations), since test pit TP-1 had the most debris indicative of municipal landfill debris. If landfill materials are not encountered, reconnaissance test pits will be excavated on the transect 25 ft back toward TP-1. Additional test pits will be excavated at the discretion of the field geologist to delineate the extent of the historical landfill, including the area around test pit TP-2. Field notes will be taken with regard to whether or not municipal garbage or debris was encountered, but the soils will not be logged or collected for chemical analysis from the reconnaissance test pits. Once each reconnaissance test pit is completed, it will be backfilled and a stake will be placed at the location indicating whether or not the landfill was encountered. Each location will be surveyed following methods described in the project work plans (Integral 2005a).

Once the historical landfill area has been delineated, the field geologist will choose, in consultation with Ecology, a minimum of three test pit stations that are representative of the landfill to collect samples for chemical analysis. Additional test pits may by required depending on the extent of the landfill determined during the reconnaissance sampling. Each test pit will be excavated to a depth of approximately 4 ft bgs to evaluate the character of soils and collect samples for chemical analysis in accordance with standard operating procedure (SOP) 1 of the SAP (Integral 2005a).

The number of samples collected for analysis will depend on observations made in the field including visible sheen and odor. A photo ionization detector (PID) and flame ionization detector (FID) will be used in estimating the organic vapor concentration of each sample collected within the test pits.

2.4 Sample Analysis

Selected soil samples will be analyzed for total metals and NWTPH-DRO/RRO[2] following methods in the project work plans (Integral 2005a). The laboratory will analyze various petroleum standards (e.g., diesel, creosote) to assist in source identification. Sample results exceeding the preliminary screening level of 200 mg/kg dw TPH will be analyzed for semivolatile organics (SVOCs) by EPA Method SW 8270 (low level method if necessary). If volatile organic vapors are detected above background with the PID/FID, selected samples may be analyzed for NWTPH-GRO. A representative portion of each sample collected will be archived for future analysis, if necessary. Samples will be analyzed using the tiered testing approach described in the SAP (Integral 2005a).

---

[2] A silica gel cleanup will be conducted on all samples analyzed for petroleum hydrocarbons to remove natural organics before analysis.

Additional information on methodology, quality control, and reporting requirements can be found in the Quality Assurance Project Plan (QAPP) (Integral 2005a).

2.5 Potential Follow-up Investigations

Field observations and analytical data collected during the investigation of the former landfill will be evaluated and additional investigations may be proposed if appropriate.

3 SOURCE INVESTIGATION OF PETROLEUM SEEP IN UPPER PORTION OF THE CREEK

The primary objective of this investigation is to determine the source of the petroleum seeps discovered in the upper portion of the creek. This investigation will also help to more precisely delineate the nature and extent of contamination in this portion of the study area.

3.1 Field Observations

On November 7th, Integral personnel observed a non-aqueous phase liquid (NAPL) oozing from a permeable sand unit, above stiff clay. This observation was made at the base of the upper portion of the creek. The NAPL-entrained soil was observed to have a distinct creosote odor and heavy sheen. It produced a sheen on the water surface when disturbed. A heavy sheen and odor was observed on soils and sediments for at least 50 feet downstream from this initial observation along the northwest bank of the creek, in locations where the sandy unit daylighted at the creek bed. Integral did not observe sheen or odor along the south bank of this portion of the creek.

A representative sample (LSP0051) of the NAPL-contaminated soil was collected and analyzed for total petroleum hydrocarbons (NWTPH-DRO/RRO), extractable petroleum hydrocarbons (EPH), and SVOCs following methods described in the project work plans. The approximate location of where the sample was collected is shown on Figure 1. Analytical results for the sample are discussed in Section 3.2.

A reconnaissance survey of the creek was conducted by Integral personnel on December 8th to identify any additional NAPL seeps along the creek from the mouth to the Oeser/Birchwood and Birchwood/BTC outfalls. A small amount of NAPL or heavy sheen was observed in sediments and water at several isolated locations between the mouth of the creek and the Marine Drive Bridge. NAPL and heavy sheen was observed in sediments and water between the Marine Drive Bridge and the upper portion of the creek where the NAPL-contaminated soil sample was collected (Figure 2).

The origin and transport mechanism of the petroleum seep is unknown at this time. The petroleum may have been transported by groundwater, by historical surface water discharges from the Oeser/Birchwood and Birchwood/BTC outfalls, or by a combination of both mechanisms. However, the source of the contamination has not been confirmed at this time. What is known is that if the petroleum is a DNAPL, transport would likely follow the slope of the gray clay unit, regardless of the local shallow groundwater flow direction.

3.2 Analytical Results for Creek Bank Sample

Sample results for the NAPL-contaminated soil (LSP0051) are summarized in Table 3 with a comparison to the preliminary screening levels for the project. TPH (diesel- and residual oil-range) and carcinogenic polycyclic aromatic hydrocarbons (PAHs) were detected in the bank soil sample at levels above the corresponding screening levels.

Table 3. Preliminary Unvalidated Soil Sample Results for Creek Bank Sample Compared to Screening Values[a] (mg/kg dw)

Sample	Creek Bank Sample (LSP0051)	Preliminary Screening Values
Depth	Waters Edge	
TPH-Diesel Range	3,700	200
TPH-Oil Range	2,000	200
Pentachlorophenol	1.7 J	0.03/0.36[b]
PAHs (Carcinogenic)	36	1[c]

[a] See Tables A-3 and A-6 of the Project QAPP for screening benchmark source.
[b] Screening values for pentachlorophenol are EPA Region 9 PRG/Sediment Quality Standard.
[c] MTCA A Cleanup Level for Unrestricted Soils (based on concentrations of Benzo(a)pyrene only).

3.3 Proposed Shallow Borehole Locations

In addition to the 24 borings[3] already proposed in the original project work plans (Integral 2005a), approximately 6 additional shallow boreholes (5 to 10 ft bgs) will be advanced in the vicinity of where the NAPL-contaminated soil sample was collected from the bank in the upper portion of the creek (SB-25 through SB-30; Figure 1). The purpose of the shallow boreholes is to delineate the lateral extent of the petroleum seep adjacent to the creek. Borings will be drilled at locations beginning at the mouth and moving upstream to minimize disturbing the creek bed and surrounding bank soils.

Preliminary borehole coordinates are presented in Table 4. The location of some borings may be modified based on field conditions and observations. The target borehole depth is the top of the gray clay unit or refusal, whichever comes first. The gray clay might be an impermeable unit or aquitard on which a DNAPL may be transported. The gray clay unit is expected to be less than 6 ft bgs in the vicinity of the borehole locations.

Soil samples will be collected with a 2-inch diameter by 18-inch long standard penetration test (SPT) or equivalent sampler at approximate 1 ft intervals to the bottom of each shallow borehole. A PID and FID will be used in estimating the organic vapor concentration of each sample collected from the boreholes in accordance with SOP 8 of the SAP (Integral 2005a). The borehole will be logged in accordance with American Society for Testing & Materials (ASTM) D2488 guidelines.

[3] The 24 borehole locations may be moved or advanced with a portable hollow-stem auger rig or hand auger based on site conditions.

Table 4. Proposed borehole coordinates[1].

Boring[2] Number	Northing (ft)	Easting (ft)
SB-25	649128	1235006
SB-26	649150	1235034
SB-27	649174	1235067
SB-28	649196	1235097
SB-29	649219	1235122
SB-30	649241	1235153
SB-31	649182	1235008
SB-32	649250	1235078
SB-33	649307	1235139
SB-34	649364	1235199

[1] Station coordinates reference North American Datum 1983 (State Plane Washington North, U.S. Feet). Additional borings may be excavated and will be identified by continuing this numbering sequence.
[2] SB = soil or sediment boring.

Selected soil samples will be analyzed for total metals and NWTPH-DRO/RRO following methods in the project work plans (Integral 2005a). The laboratory will analyze various petroleum standards to assist in source identification. Sample results exceeding the preliminary screening level of 200 mg/kg dw TPH will be analyzed for SVOCs (low level method if necessary). If volatile organic vapors are detected above background with the PID/FID, selected samples may be analyzed for NWTPH-GRO. If sample volume is adequate, a representative portion of each sample collected will be archived for future analysis, if necessary. Samples will be analyzed using the tiered testing approach described in the SAP (Integral 2005a).

Additional information on methodology, quality control, and reporting requirements can be found in the QAPP (Integral 2005a).

3.4 Proposed Deep Borehole and Monitoring Well Locations

Three monitoring wells were previously installed on the former railroad grade (MWLSC01 through MWLSC03; Figure 1) as part of the Oeser RI. Each of these monitoring wells was screened at the top of the gray clay unit. Groundwater monitoring results in this study and the Oeser RI do not indicate the presence of petroleum NAPL in these wells. These monitoring wells, however, may be located cross-gradient from the NAPL seep observed in the creek.

A total of four deep (approximately 40 ft bgs) boreholes will be advanced on the former railroad grade north of the creek, in the vicinity of the NAPL-contaminated soil observed in the creek bank (SB-31 through SB-34; Figure 1). The purpose of the deep boreholes is to determine if shallow groundwater upgradient of the seep is impacted by petroleum and to also delineate the lateral and vertical extent of the petroleum seep. Each borehole will be drilled to the top of the gray clay observed daylighting in the upper portion of the creek bed or 50 ft, whichever comes first. Three stations will be located between well MWLSC03 and the Oeser/Birchwood outfall, and one station will be located upslope of the Oeser/Birchwood outfall. Monitoring wells will be installed in two of the deep boreholes, based on site conditions (see Section 3.6). Borehole coordinates are presented in Table 4.

Soil samples will be collected with a 3-inch diameter, 18-inch long Dames & Moore (D&M) or equivalent sampler at 1.5 ft intervals in each borehole. A PID and FID will be used in estimating the organic vapor concentration of each sample collected from the boreholes in accordance with SOP 8 of the SAP (Integral 2005a). The boreholes will be logged in accordance with ASTM D2488 guidelines.

Selected soil samples will be analyzed for total metals and NWTPH-DRO/RRO following methods in the project work plans (Integral 2005a). The laboratory will analyze various petroleum standards such as diesel and creosote to assist in source identification. Sample results exceeding the preliminary screening level of 200 mg/kg dw TPH will be analyzed for SVOCs (low level method if necessary). If volatile organic vapors are detected above background with the PID/FID and sample volume is adequate, selected samples may be analyzed for NWTPH-GRO. If sample volume is adequate, a representative portion of each sample collected will be archived for future analysis, if necessary.

3.5 Drilling Methods

Prior to commencing drilling operations, all proposed drilling locations will be cleared by the regional one-call utility locating service (1-800-424-5555).

The proposed locations will be shown to the drillers during a site walk prior to beginning the work. Any concerns about underground utilities will be discussed by the drillers and Integral. If the proposed well location is close to an underground utility, the driller will hand auger the first 5 ft to confirm the absence of the utility. Clearance of the locations will be documented in the field logbook and in digital photographs.

3.5.1 Track Hollow-Stem Auger Drill Rig

The deep boreholes will be advanced using a track hollow-stem auger (HSA) drill rig in accordance with SOP 6 of the SAP (Integral 2005a). The deep boreholes will be advanced with 8.25 inch outside diameter (OD) by 4.25 inch inside diameter (ID) hollow-stem augers.

3.5.2 Portable Hollow-Stem Auger Drill Rig

The shallow boreholes will be advanced using a portable HSA drill rig. The portable drill rig can either be wheeled or carried across the creek to advance boreholes in areas inaccessible to the track HSA drill rig. The portable drill rig operates using the same principals as a standard HSA drill rig, but has significant limitations on depths and materials it can drill. In addition, sample volume will be limited due to the small (2-inch diameter) sampler used with the portable drill rig[4]. The shallow boreholes will be advanced with 5.65 inch OD by 2.25 inch ID hollow-stem augers.

3.6 Monitoring Well Installation and Development

All monitoring wells will be installed by a well driller licensed in the state of Washington consistent with the regulations listed in Chapter 173-160 of the Washington Administrative Code (WAC). Well installation and development will follow the procedures described in SOP 12 (attached). All soil cuttings will be containerized in UN-approved 55 gallon drums for characterization in accordance with applicable local, state, and federal regulations prior to disposal. The drilling contractor will be responsible for supplying drums and transporting filled drums as specified[5].

3.6.1 Well Survey

Following installation, a professional land surveyor will survey the locations of the new wells to a horizontal accuracy of 0.5 ft. The reference elevation (typically top of casing) will be determined to an accuracy of 0.01 ft. In addition, the ground surface elevation adjacent to the well monument will be surveyed to an accuracy of 0.1 ft. The northing and easting coordinates will be provided in both North American Datum of 1927 (NAD 27) and 1983/with 1991 corrections (NAD 83/91). The elevations will be referenced to North American Vertical Datum of 1988 (NAVD 88) and the City of Bellingham coordinate system.

3.6.2 Well Sampling

Each well will be purged and sampled at least 72 hours following development activities in accordance with SOP 3 of the SAP (Integral 2005a). Groundwater samples will be analyzed for hardness, total suspended solids, total organic carbon, metals (including calcium and magnesium), NWTPH-GRO/DRO/RRO, SVOCs, dioxins and furans, and a sample will be archived for possible volatile petroleum hydrocarbons/extractable petroleum hydrocarbons (VPH/EPH) analysis, consistent with groundwater samples collected from other site wells (see Table 4-7 in the SAP; Integral 2005a).

Additional information on methodology, quality control, and reporting requirements can be found in the QAPP (Integral 2005a).

---

[4] Additional borings may be drilled at a station location to collect enough soil/sediment for analysis and archival.
[5] The drums will be transported offsite to a location determined by the City of Bellingham Parks Department for temporary storage pending waste characterization results.

4 HISTORICAL CREEK CHANNEL INVESTIGATION

As stated in Addendum 1 to the project work plans (Integral 2005b), the primary objective of the proposed sampling is to evaluate soils within the historic creek channel for the presence of contamination. The location of the historic creek bed has been determined based on existing topography and review of aerial photographs taken in 1955 and 1963 which Integral obtained from the Whatcom Museum of History in Bellingham. Additional historic information was evaluated from an aerial photographic analysis of the Oeser Company Superfund site (Mack 1998). The information obtained from these sources was used to overlay in Geographical Information System (GIS) an approximate boundary onto the project base map (Figure 1).

4.1 Field Observations

Integral excavated three test pits in the historic creek channel as part of the Addendum 1 investigation (TP-16, TP-17, TP-21[6]; Figure 1). A fourth test pit (TP-22) was not advanced during the Addendum 1 investigation due to standing water in the area. Additional test pits and hand auger or push core stations are necessary to more fully evaluate the soils within the historic creek channel for contamination.

Preliminary analytical results exceeding the screening levels for soil samples collected in test pits TP-16, TP-17, and TP-21 are presented in Table 5. The surface samples collected from each test pit contained NWTPH-DRO/RRO concentrations that exceeded the screening level of 200 mg/kg dw. A number of SVOCs were detected in both of these samples, including pentachlorophenol (PCP). Pentachlorophenol was detected at concentrations of 7.1 and 0.540 mg/kg dw in the samples collected from TP-16 (0-2 ft bgs) and TP-17 (1-2 ft bgs), respectively.

[6] Other test pits (TP-13 through TP-15 and TP-18 through TP-20) were also excavated and soils analyzed to delineate the boundaries of the historic creek channel.

Table 5. Preliminary Unvalidated Soil Sample Results for Exceeding Screening Values[a] for Test Pits TP-16 and TP-17 (mg/kg dw)

Sample Number (Test Pit)	**LSP0088 (TP-16)**	**LSP0090 (TP-17)**	**LSP0102 (TP-21)**	**Preliminary Screening Value (Surface Soil)**
Depth	0-2 ft	1-2 ft	1-2 ft	
Acenaphthylene	2.8	1.5	-	0.47
Anthracene	14	7.4	-	1.23
Benzo(a)anthracene	34	19		0.377
Benzo(a)pyrene	70	50	0.770	0.455
Benzo(b)fluoranthene	88	53	4	0.663
Benzo(g,h,i)perlene	38	47	1.6	0.422
Benzo(k)fluoranthene	58	38	2.3	0.241
Carbazole	0.840	-	-	0.6
Chrysene	160	54	3.5	0.628
Dibenz(a,h)anthracene	5.4	6.2	0.610	0.376
Fluoranthene	49	6.7	-	1.6
Fluorene	0.780	0.740	-	0.23
Indeno(1,2,3-cd)pyrene	38	40	1.7	0.612
NWTPH-DRO	490	-	-	200
NWTPH-RRO	760	480	390	200
Pentachlorophenol	7.1	0.540 J	300 U	0.03/0.36[b]
Phenanthrene	4	2.3	-	1
Pyrene	130	11	-	8.79
PAHs (carcinogenic)	70	50	-	1[c]

[a]See Table A-3 of the Project QAPP for screening benchmark source for surface soils.
[b] Screening values for pentachlorophenol are EPA Region 9 PRG/Sediment Quality Standard.
[c] MTCA A Cleanup Level for Unrestricted Soils (based on concentrations of Benzo(a)pyrene only).
- Sample result did not exceed screening level

4.2 Proposed Stations

At least two test pits (TP-22 and TP-23) and five cores or hand auger borings (HA-9 through HA-13) will be advanced to evaluate soils within the approximate boundaries of the historical creek channel (Figure 1). Test pit TP-22 is located in an area with standing water and may need to be excavated during the summer months when the site soils are dryer[7]. Test pit TP-23 is located between test pits TP-05 and TP-14 to further delineate the sandy material encountered in this area and the boundaries of the historic creek channel. Stations HA-9 through HA-13 are located in a wetland area that is believed to be part of the historic creek channel. This wetland area is not accessible to a track-hoe excavator. All of these stations are positioned within the assumed location of the historical creek channel and are spaced approximately 100 ft apart.

[7] Alternatively, hand sampling methods will be used to characterize this station.

Based on field observations, additional test pits and/or hand auger borings may be advanced to further delineate the nature and extent of contamination within the boundaries of the historic creek channel.

4.3 Sampling Methods

Three sampling methods will potentially be used to examine the soils within the historic creek channel**.** Portions of the site that have standing water or established wetland areas are generally inaccessible to a track-hoe excavator and will need to be investigated using either a hand auger or piston coring device. Table 6 presents the proposed station coordinates.

4.3.1 Test Pits

The test pits will be excavated, field screened, logged, and sampled in accordance with SOP 1 in the SAP (Integral 2005a) and Addendum 1 to the SAP (Integral 2005b). The test pits will be excavated to a depth of approximately 4 ft bgs.

4.3.2 Hand Auger Borings

Hand auger borings will be advanced in areas that are inaccessible to a track-hoe excavator and covered with only a limited amount of standing water. Hand auger borings will be advanced, field screened, logged, and sampled in accordance with SOP 2 of the SAP (Integral 2005a) and Addendum 1 to the SAP (Integral 2005b). The hand auger borings will be advanced to a depth of approximately 3 ft bgs or refusal. If auger refusal occurs, a second borehole will be advanced within approximately 10 ft of the first borehole.

4.3.3 Push Cores

Push cores will be advanced in areas that are inaccessible to a track-hoe excavator and are covered in a significant amount of standing water. Push cores will be field screened, logged, and sampled in accordance with SOP 2 of the SAP (Integral 2005a). The push cores will be advanced to a depth of approximately 3 ft bgs or refusal. If core refusal occurs, a second borehole will be advanced within approximately 10 ft of the first borehole.

4.4 Sample Analysis

Selected composite soil samples will be analyzed for total metals and NWTPH-DRO/RRO following methods described in the project work plans (Integral 2005a). Sample results exceeding the preliminary screening level of 200 mg/kg dw TPH will be analyzed for SVOCs. If volatile organic vapors are detected with the PID/FID, selected samples may be analyzed for NWTPH-GRO. A representative portion of each sample collected will be archived for possible future analysis, if necessary. Samples will be analyzed using the tiered testing approach described in the SAP (Integral 2005a). Additional information on methodology, quality control, and reporting requirements can be found in the QAPP (Integral 2005a).

Table 6. Proposed test pit and hand auger/core station coordinates[1].

Station Number	Northing (ft)	Easting (ft)
TP-22	648783	1235142
TP-23	649109	1235165
HA-9	648721	1235070
HA-10	648708	1234953
HA-11	648724	1234839
HA-12	648772	1234747
HA-13	648836	1234683

[1] Station coordinates reference North American Datum 1983 (State Plane Washington North, U.S. Feet) with 1991 corrections. Additional test pits may be excavated and will be identified by continuing this numbering sequence.

5 HEALTH AND SAFETY CONSIDERATIONS

Integral expects to advance some hand auger borings or push cores in a wetland area of the site. In addition, shallow boreholes will be advanced with a portable HSA drill rig that requires the drilling personnel to carry or wheel the equipment to each station. Therefore, it will be crucial for the field crew to follow the procedures identified in the project HASP (Integral 2005a) and Addendum 1 (Integral 2005b) with the following additions:

- Some hand auger borings or push cores may be advanced in wetland areas of the site. Field personnel will always use the buddy system and proceed slowly into the wetland area using a walking stick or similar device to probe the depth of water and firmness of the sediment. If the standing water is more than two feet deep, Integral personnel will retreat to dry land and discuss a safe way to proceed with the sampling.

- The shallow boreholes on the north side of the creek will be advanced with a portable HSA drill rig. The equipment will either be carried or wheeled to each station. The drilling personnel will exercise caution when lifting and carrying heavy materials across the creek. Some portions of the upper creek may be slippery if petroleum sheen is present.

- The former railroad grade in the vicinity of boreholes SB-31 through SB-34 is very narrow. As a result, the exclusion zone will require the former railroad grade trail to be closed in the vicinity of the drilling activities. This closure will be clearly marked with signs and caution tape. Personnel will police the area to make sure unauthorized personnel do not enter the exclusion zone.

6 FIELD SCHEDULE

Sampling described in Addendum 2 and the remaining work associated with the project work plans is tentatively scheduled (depending on subcontractor availability) to be completed January 30 through February 22, 2006. Hand auger borings HA-1 through HA-6 will be advanced as described in the original work plans when permission has been granted from Burlington Northern Santa Fe (BNSF) Railway.

Jan 30 – Feb 1:	Test pits TP-22 through TP-26 and reconnaissance test pits in former landfill area. Excavate access ramps to creek for drilling, if necessary.
Feb 2-6:	Borehole transects across the creek, boreholes SB-1 through SB-24
Feb 7-8:	Shallow boreholes SB-25 through SB-30
Feb 9-13:	Deep boreholes/monitoring wells SB-31 through SB-34
Feb 14-16:	Hand auger or push cores HA-9 through HA-13
Feb 17:	Develop wells installed in boreholes SB-31 through SB-34.
Feb 20-22:	Surface water and groundwater sampling (second round)

7 REFERENCES

Integral. 2005a. Final Work Plans. Little Squalicum Park Remedial Investigation/Feasibility Study, Bellingham, Washington. Prepared for the City of Bellingham, Parks & Recreation Department, Bellingham, Washington. Prepared by Integral Consulting Inc., Bellingham, Washington. September 30, 2005.

Integral. 2005b. Addendum 1 to the Sampling and Analysis Plan. Little Squalicum Park Remedial Investigation/Feasibility Study, Bellingham, Washington. Prepared for the City of Bellingham, Parks & Recreation Department, Bellingham, Washington. Prepared by Integral Consulting Inc., Bellingham, Washington. November 14, 2005.

Mack, W. M. 1998. Aerial Photographic Analysis, Oeser Company, Inc. Prepared for the U.S. Environmental Protection Agency, Region 10, Seattle, Washington. Prepared by Lockheed Environmental Systems & Technologies Company, Las Vegas, Nevada. August 1998.

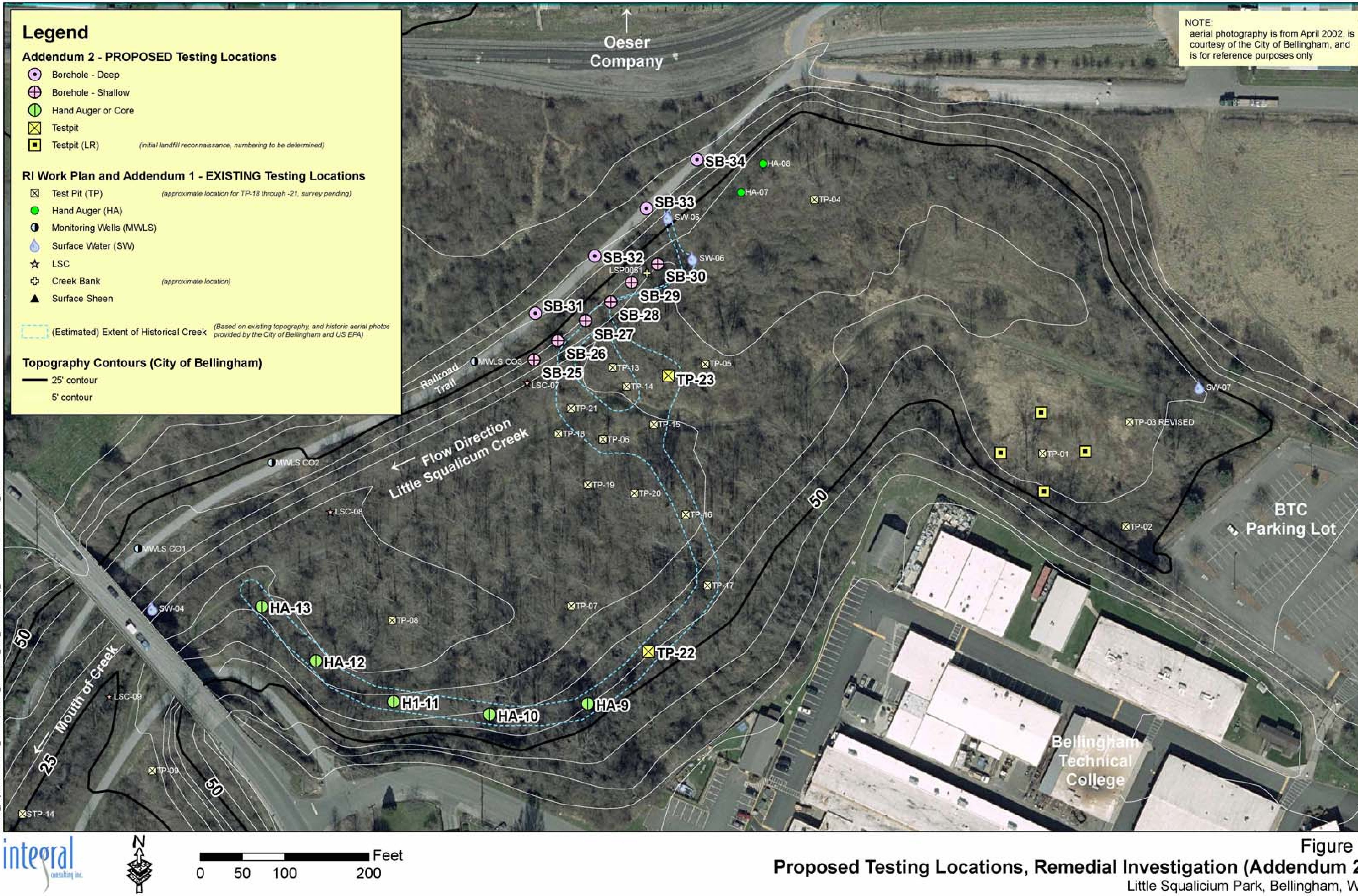

Figure 1
Proposed Testing Locations, Remedial Investigation (Addendum 2)
Little Squalicium Park, Bellingham, WA

GJC @ 12-07-05

C:\GIS_projects\C075-0303_Little-Squalicum_COB\C075_LS-locations-map_12-05-05.mxd

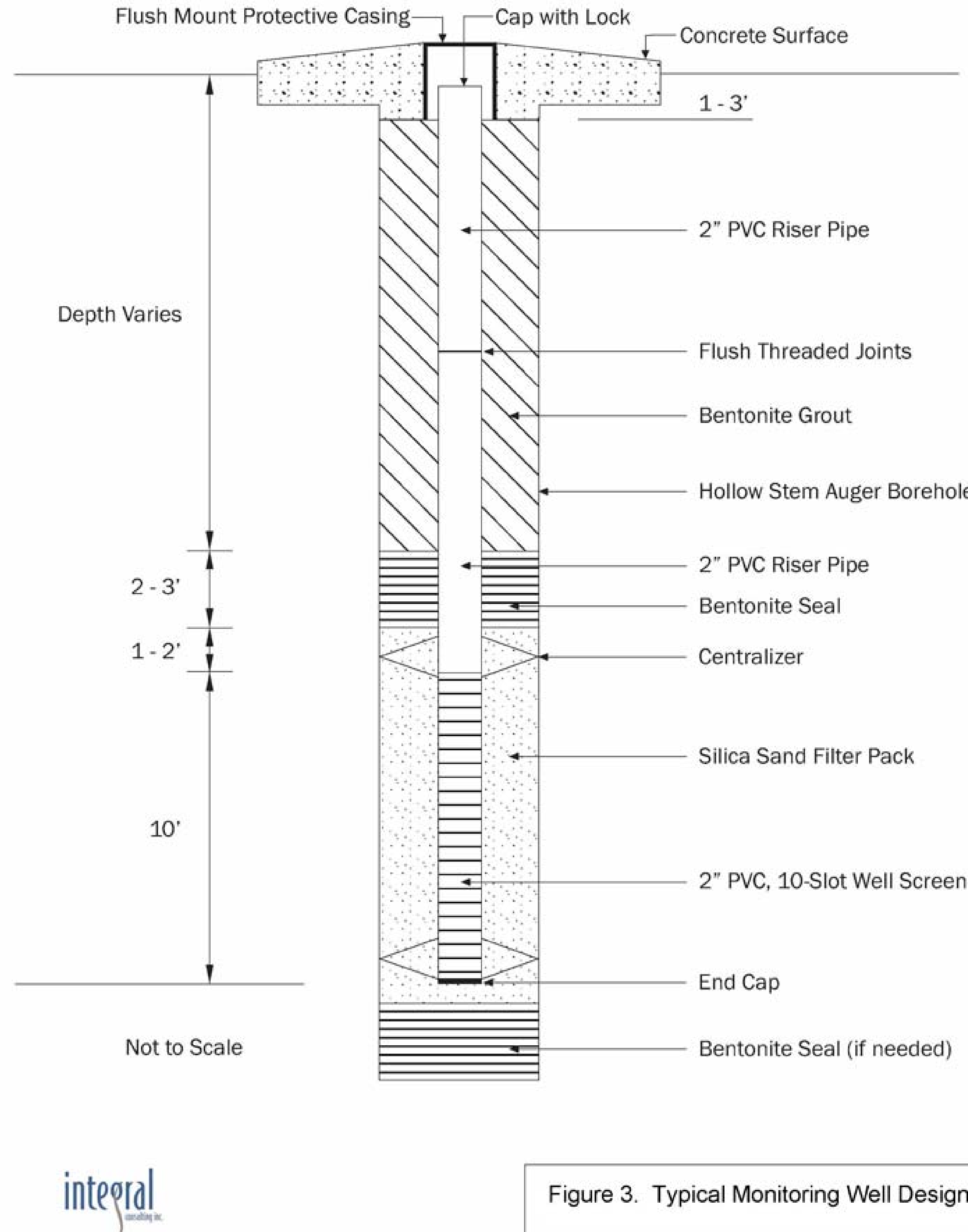

Figure 3. Typical Monitoring Well Design

\\Bouldorserver\SHAREDATA\C003_Blackwell\Workplans\
2003 Well Installation\Well Design.pdf

integral consulting inc
811 SW Naito Parkway, Suite 430
Portland, Oregon 97204
(503) 284-5545 FAX (503) 284-5755

BORING NUMBER ______
PROJECT ______
LOCATION ______
PROJECT NUMBER ______
LOGGED BY ______

North

Page __ of __

SAMPLE INFORMATION							STRATA	DESCRIPTION	Well	
Sample ID	Sample Type	Blow Counts	% Recov.	PID	Sheen	Depth Feet		USCS group name, color, grain size range, minor constituents, plasticity, odor, sheen, moisture content, texture, weathering, cementation, geologic interpretation, etc.		
										WELL CONSTRUCTION
										(all depths in feet bgs)
										Borehole Total Depth:
						5--				Borehole Diameter:
										Casing:
										Screen:
										Sump:
										Sand Pack:
						10--				Bentonite chips:
										Concrete:
						15--				
										WELL MATERIALS
										Monument:
										Cap:
						20--				Concrete:
										Bentonite:
										Casing:
										Well Screen:
						25--				
										Monoflex Mfg.
										Sand Pack:
										End Cap:

DRILLING CONTRACTOR ______
DILLING METHOD ______
SAMPLING EQUIPMENT ______
DRILLING STARTED ______ ENDED ______

COORDINATES ______
SURFACE ELEVATION ______
CASING ELEVATION ______
DATUM ______

Figure 4. Well completion field log sheet.