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Transmittal Form for Engineering Review – *Attn. John Tindall*

Consultant/Engineer: DEQ has implemented a statewide program for tracking engineering submittals. Please fill out all sections (required) and return a completed form with each submittal to DEQ. ***Failure to include this completed form will result in administrative rejection of the project.*** *Only one set of plans/specs/reports/etc is necessary per submittal.*

Date: **June 27, 2012** ☐ Standard Review ☒ Grant/Loan ☐ Consent Order/Compliance ☐ QLPE Review

Project Title: **Cave Bay Community Services, Inc. (CBCS), Draft Wastewater Facilities Plan**

New project name? ☐ Old name: _____

Summary of Project: **Facilities Planning for wastewater collection and treatment system improvements/expansion.**

City and County: **Kootenai County**

Water Purveyor: **CBCS**

Sewer Purveyor: **CBCS**

Included in this submittal: ☐ Checklists ☐ Silvicultural Plan ☐ Specs ☐ Record Drawings ☒ Facility Plan
☐ Prelim Engineering Report ☐ O&M Manual ☐ NP Study ☐ TFM
☐ Will Serve Letter(s) ☐ Data/Calculations ☐ Well Site Eval ☐ P&Z App

Owner Contact Name: **Dave Kinkela, President**

Owner / Developer Company: **CBCS**

Address: **P.O. Box 115**

City / State / Zip: **Worley, ID 83876**

Phone: **(253) 229-4824**

Email: **davekink@aol.com**

☐Water ☒Sewer ☐Water Treatment
☒Wastewater Treatment ☐Biosolids/Sludge
☐ Other _____

# of Connections: **151**

Please Leave Blank. For Official DEQ Use Only.

T-O Engineers, Inc.
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CAVE BAY COMMUNITY SERVICES, INC.

KOOTENAI COUNTY, IDAHO

Wastewater Facilities Plan

DRAFT
June 27, 2012

Prepared By:
T-O ENGINEERS
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Table of Contents

Appendices

1. Introduction

1.1. Purpose and Need

The purpose of this report is to review and evaluate Cave Bay Community Services (CBCS) existing sewer collection and treatment facilities for deficiencies and develop alternatives to resolve the problems found and meet the long-term needs of the community. The most cost effective and environmentally sound alternative will be recommended as the final alternative and facility plan. The primary focus of this report is to develop a long-term plan that ensures compliance with Idaho Department of Environmental Quality (IDEQ) Rules, preserve the health of the public, and result in an overall benefit to the environment.

1.2. Plan of Study

This facilities plan identifies a recommended alternative to address deficiencies found with the existing wastewater treatment facilities and sewer collection system. It has been prepared utilizing the IDEQ Facility Plan Outline and Checklist and covers the following items which are broken down in the table of contents:

- Existing Conditions
- Existing Collection and Treatment Facilities
- Projected Future Conditions
- Development and Initial Screening of Alternatives
- Final Screening of Principal Alternatives and Plan Adoption
- Selected Plan Description and Implementation

1.3. Background

The CBCS wastewater collection and treatment system was constructed in 1977 and has been serving the Cave Bay Community since that time. The system consists of individual septic tanks, which pump effluent through a septic tank effluent pump (STEP) collection system, which then discharges to a pair of un-lined lagoons. The lagoons were designed and have historically operated to dispose of wastewater through evaporation and seepage.

In February 2011, CBCS notified IDEQ that wastewater in their lower lagoon was close to breaching a low portion of the embankment. After stabilizing the situation and notifying IDEQ, CBCS implemented an emergency action plan, including building up the

embankment with sand bags and plastic, notifying community members to curtail their water usage, and hauling effluent to the City of Worley's wastewater treatment facility. CBCS was also granted a temporary Reuse Permit Waiver to begin land application of their lagoon effluent on adjacent forest land owned by CBCS. The waiver was contingent on CBCS entering into a Compliance Agreement Schedule (CAS) with IDEQ to include an enforceable schedule for upgrading the CBCS wastewater system to meet the applicable Idaho Wastewater Rules. A CAS was submitted to IDEQ on June 3, 2011 and was last updated on November 29, 2011.

In summary, deficiencies with the current system include:

- No approved method of reuse/disposal for lagoon effluent.
- Lagoons that may not meet current seepage requirements.
- Inadequate lagoon capacity with potential for overflow.

2. Existing Conditions

2.1. Planning and Project Area Boundaries

The planning area is located approximately 6 miles north of Worley in Kootenai County on the west side of Lake Coeur d'Alene, near Cave Bay. It is located in Township 48 North, Range 4 West, Sections 29 and 32. See **Figure 2-1** for a map showing CBCS's existing service area and the location of the proposed project planning area.

Cave Bay is primarily a seasonal community consisting of approximately 146 single family residences currently connected to the sewer system, with about 60 of those being full-time. The wastewater system serves the original subdivision plus all of the additions to Carroll's Cave Bay Homesites. Projected build-out for the community is 218 single-family residences. No additional connections, outside the subdivision, are anticipated

2.2. Existing Environmental Conditions

2.2.1. Physiography, Topography, Geology, and Soils

The CBCS planning area sits on a peninsula that extends into Coeur d'Alene Lake between Cave bay and 16 to 1 Bay. The topography of the area consists of mostly steep terrain with some flat and mild slopes near the top of the peninsula where the existing CBCS treatment facilities are located. **Figure 2-1** includes topography for the planning and surrounding areas.

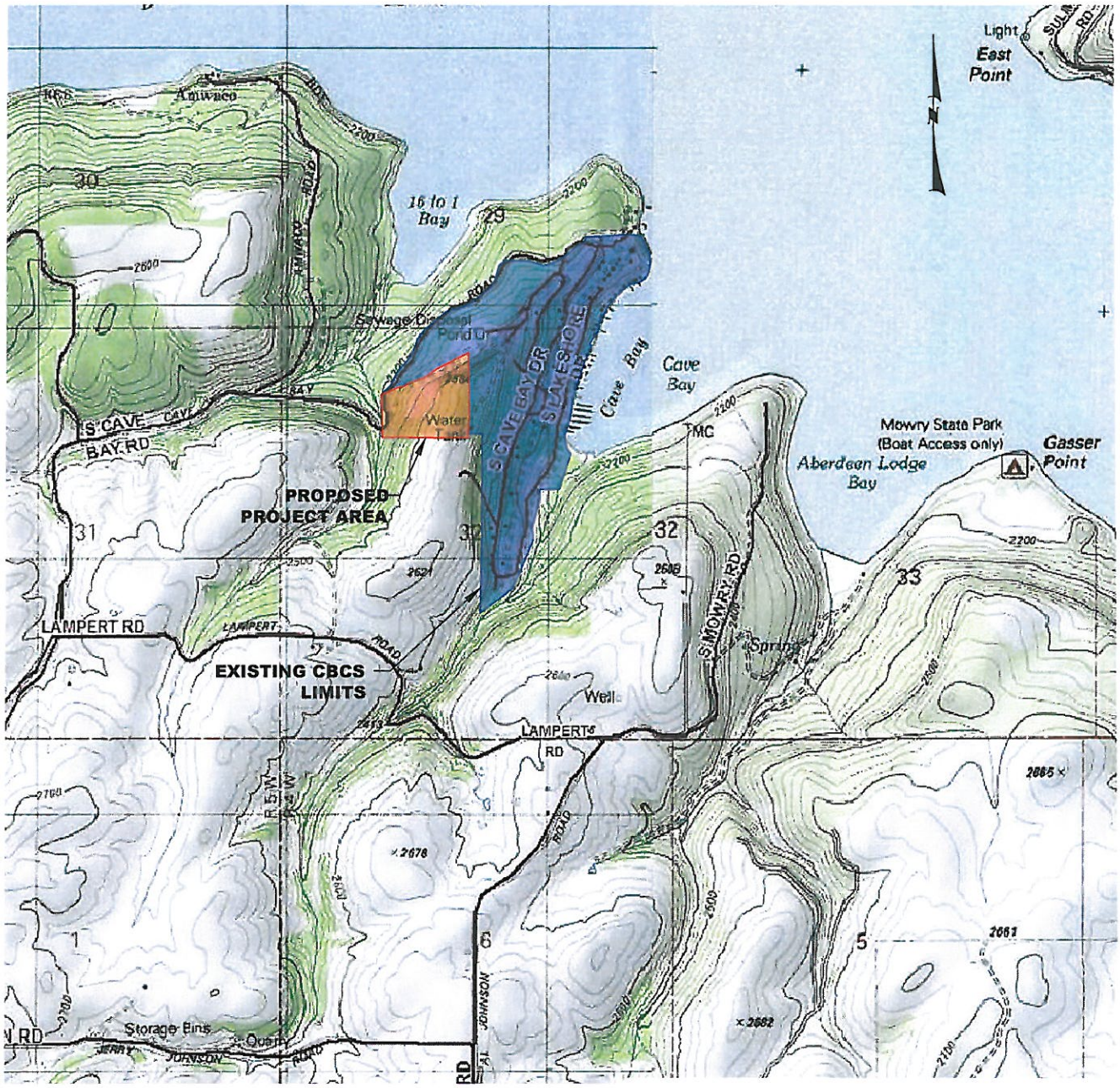

FIGURE 2-1 VICINITY MAP

0 1000 2000 4000 6000

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E-FILE: X:\nnnnn\XXXXXXXX.DWG DATE: Month 2009 JOB: 09xxx

A hydrogeologic characterization, prepared by Monks-Hydrogeoscience, includes detailed descriptions of the geologic nature of the planning area. A copy of this report can be found in **Appendix A**. The existing CBCS facilities and proposed planning areas are located near the eastern edge of the Columbia River Basalt Plateau and generally lie on flood-scoured basalt that is covered by a relatively thin layer of colluvium and flood deposited sediments.

The Natural Resource Conservation Service (NRCS) Web Soil Survey maps and soil descriptions indicate that the soils in the project area consist mainly of Lacy-Rock outcrop complex and Lacy-Bobbit association. These map unit compositions include Lacey and similar soils, Bobbit and similar soils, and rock outcrops. The Lacey soil is a shallow, well-drained soil consisting of a stony loam surface soil and stony clay loam subsoil. The Bobbit soil is moderately deep, well drained soil consisting of stony loam surface soil and stony to very stony clay loam subsoil. The soil survey descriptions indicate a depth to bedrock of 10-30 inches and depth to water table of more than 80 inches. These soils have moderate to low susceptibility to erosion. Copies of the NRCS soils maps for these areas and detailed descriptions of the soils can be found in **Appendix B**.

Field exploration of the existing and proposed treatment sites shows that there are some inaccuracies in the NRCS soil survey classification related to rock outcroppings and depth to bedrock in these specific areas. There are very few rock outcrops within the existing and proposed treatment sites and the sites are generally heavily forested indicating adequate soil depth for tree growth. ALLWEST Testing and Engineering completed several soil exploration pits throughout the project area. In conjunction with the site exploration ALLWEST prepared a preliminary geotechnical evaluation which can be found in **Appendix C**. The geotechnical evaluation describes the geology of the area as Colombia River Basalt with Latah Formation interbeds. The subsurface conditions from the soil explorations show in general that topsoil ranges from 4-9 inches in depth. Soils in the existing treatment facility area consist of colluvium described as silty gravel, sandy silt, silt with gravel and some silty clay. Subsurface conditions for the proposed land application area included colluvium consisting of sandy silt, gravel with silt, poorly graded gravel and gravel with silt and sand. All test pits were excavated to at least 6 feet without encountering bedrock or other impervious layers. No groundwater was encountered during the site exploration. Groundwater monitoring piezometers were installed in all of the test pits for continued monitoring of groundwater levels.

2.2.2. Surface and Ground Water Hydrology

Coeur d'Alene Lake is adjacent to the Cave Bay community. The existing treatment facility site is located approximately 800 feet from the shore of 16 to 1 Bay and approximately 800 feet from an un-named ephemeral stream, which flows into 16 to 1

bay. Coeur d'Alene Lake has a TMDL for the trace heavy metals lead, cadmium and zinc, which are present on the lake bottom. In an effort to protect and improve lake water quality, the Coeur d'Alene Tribe and IDEQ collaboratively developed a Lake Management Plan in 2009. The goal of the plan is to limit basin wide nutrient inputs that can impair lake water quality, which in turn can influence the solubility of metals contamination found in lake sediments.

According to the 2011 Addendum and update to the Coeur d'Alene Lake and River Subbasin Assessment, the Coeur d'Alene River is an impaired water body. Mining and ore processing activity in the past 100 years, primarily in the South Fork Coeur d'Alene River Subbasin, has resulted in extensive deposits of metals (lead, cadmium, zinc)-contaminated sediments along the bed, banks, and floodplain of the North and South Forks of the Coeur d'Alene River, the Coeur d'Alene River, the eleven lateral lakes, numerous wetlands located along the lower Coeur d'Alene River, the lakebed of Lake Coeur d'Alene, and the headwaters of the Spokane River. Annual precipitation and spring snowmelt runoff events continue to redistribute these contaminated sediments throughout the entire system.

Well driller's reports around the area indicate a depth to groundwater from 12 to 350 feet below the surface, depending on well location and depth. Data from well driller's reports suggests that there is a downward component to groundwater flow in the Cave Bay area, and the area is in a regional groundwater recharge zone. Data also indicates that there is an upper basalt, upper interflow zone, middle basalt, middle interflow zone, and lower basalt, deep interflow zone. The upper interflow zone may include a perched aquifer with some horizontal groundwater flow. However, based on the downward hydraulic gradient that exists in this area, most of the flow through the upper interflow zone is likely downward through the middle and deep interflow zones. If there is horizontal groundwater flow in the upper or middle interflow zones, that flow would be expected to discharge to surface water. See the Hydrogeologic characterization in **Appendix A** for more specific discussion of the groundwater hydrogeology.

2.2.3. Fauna, Flora, and Natural Communities

The project area is primarily mature mixed coniferous forest dominated by firs (*Abies sp.*), ponderosa pine (*Pinus ponderosa*) and western larch (*Larix occidentalis*) approximately 30-50 ft in height. The undergrowth is moderate to low density and is dominated by ocean spray (*Holodiscus discolor*), alder (*Alnus sp.*), snowberry (*Symphoricarpos albus*), and service berry (*Amelanchier alnifolia*). Groundcovers include grasses, weeds and other herbaceous plants.

The project area supports general wildlife species including deer, small mammals, and song birds. Requests for species occurrence data were made to USFWS and the Idaho

Department of Fish and Game (IDFG) Conservation Data Center (CDC) on February 7, 2012. Review of the database and follow up conversation with agency staff indicated that there are no known occurrences of species of greatest conservation need, federally listed or proposed threatened and endangered species in the project area. In addition, there is no proposed listed critical habitat in the project area. See **Table 2-1**, Kootenai County List of Federally Threatened, Endangered and Designated Critical Habitat.

Table 2-1 Kootenai County List Of Federally Threatened, Endangered And Designated Critical Habitat

Common Name	Latin Name	Federal Status
Canada Lynx	*Lynx canadensis*	Threatened
Bull Trout	*Salvelinus confluentus*	Threatened
Spalding's catchfly	*Silene spaldingii*	Threatened
Water Howellia	*Howellia aquatilis*	Threatened
Bull Trout	*Salvelinus confluentus*	Critical Habitat
Yellow-billed cuckoo	*Coccyzus americanus*	Candidate
Wolverine	*Gulo gulo*	Candidate

According to the 2011 Coeur d'Alene Subbasin Assessment, native fish that occur in the Lake Coeur d'Alene watershed include: Bull trout (*Salvelinus confluentus*), Largescale sucker (*Catostomus macrocheilus*), Longnose dace (*Rhinichthys cataractae*), Mottled sculpin (*Cottus bairdi*), Mountain whitefish (*Prosopium williamsoni*), Northern pikeminnow (*Ptychocheilus oregonensis*), Redside shiner (*Richardsonius balteatus)*, sculpin (*Cottus* sp.) and Westslope cutthroat trout (*Oncorhynchus clarki*).

Non-native fish species that occur in the Lake Coeur d'Alene watershed include Brook trout (*Salvelinus fontinalis*), Chinook salmon (*Oncorhynchus tshawytscha*), Kokanee salmon (*Oncorhynchus nerka*), Rainbow trout (*Oncorhynchus mykiss*), Largemouth bass (*Micropterus salmoides*), Smallmouth bass (*Micropterus dolomieu*), Brown bullhead (*Ictalurus nebulosus*) Tench(*Tinca tinca*), Yellow perch (*Perca flavescens*) and Northern pike (*Esox lucius*).

2.2.4. Housing, Industrial and Commercial Development

With the exception of the CBCS maintenance facility and fire substation, all connections to the sewer system are single-family including year-round as well as seasonal residential dwellings. There is no industrial or commercial development in the service area and none is anticipated.

2.2.5. Cultural Resources (including tribal consultation)

Under Section 106 of the National Historic Preservation Act, the Coeur d'Alene Indian Tribe's Historic Preservation Officer (THPO) is the lead preservation office because the project is within the Coeur d'Alene Indian Reservation. The Idaho Department of Environmental Quality (IDEQ) has the responsibility under Section 106 to conduct government consultation with the Tribe.

Based on a review of records at the Idaho State Historic Preservation Office (SHPO), there are no previously recorded archaeological, historical, or cultural resources within project study area. There are, however, two resources, an historic railroad and a pre-contact (Native American) site, within one mile of the project study area. The THPO will be contacted to assist in identifying additional historic properties in the Area of Potential Effects (APE) when the cultural resource survey is completed.

2.2.6. Utility Use

The only utility utilized by the collection and treatment system is power. Power, supplied by Kootenai Electric Cooperative (KEC), is used to power the pumping and aeration systems as well as the facility buildings.

2.2.7. Floodplains/Wetlands

There are no designated floodplains within the project planning area based on an evaluation of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps panel number 16055C070E.

Based on the review of the USFWS National Wetland Inventory Maps reviewed in February 2012 and a site visit, there are no wetlands located in the project study area. Lake Coeur d'Alene is a considered a traditional navigable water and a water of the US.

2.2.8. Wild/Scenic Rivers

Based on the list of National Wild and Scenic Rivers updated on August 2011, there are no Wild/Scenic Rivers in the project vicinity.

2.2.9. Existing Drinking Water Systems in Proposed Project Area

CBCS also owns and operates a Public water system (PWS #1280041), which serves all of the residences in the Cave Bay community. This system supplies groundwater from two (2) water production wells. The two (2) public wells are located approximately 1,600 feet east of the existing treatment facility. IDEQ performed a source water assessment area delineation in 2009, which shows that the existing and proposed wastewater treatment areas are outside the delineated zone of influence for the wells. These wells are located in the Cave Bay watershed, while the proposed wastewater treatment areas are in the 16 to 1 Bay watershed. Well Driller's reports for these public wells can be seen in **Appendix D**.

Well driller's reports obtained from the Idaho Department of Water Resources have been used to approximate well locations for the surrounding area. All wells located within ¼ mile of the existing and proposed treatment sites are noted on the USGS map in **Appendix D**. One (1) domestic drinking water well appears to be located within this ¼ mile zone. This well is an estimated 600 feet southwest of the existing treatment site, at an elevation approximately 200' above the site. According to the Well Driller's report, the depth of this domestic well is 520 feet. A copy of this Well Driller's report can be seen in **Appendix D.**

2.2.10. Public Health Considerations

As discussed previously, in February 2011 CBCS notified IDEQ that their lower lagoon was close to overflowing the embankment. IDEQ granted CBCS a temporary Reuse Permit waiver allowing them to irrigate up to 10,000 gallons per day on forest land owned by CBCS.

On February 11th, 2011 IDEQ sent a letter to CBCS concurring that overtopping of the lagoons would be detrimental to the integrity of the lagoon dikes and public health. This letter can be found in **Appendix E**. CBCS entered into a Compliance Agreement Schedule (CAS) with IDEQ in order to develop a schedule to bring the existing system into compliance with applicable Idaho Wastewater Rules. Long term upgrades to the existing treatment facilities are required to maintain compliance with IDEQ Rules and preserve the health of the public.

2.2.11. Prime Agricultural Land Protection

The nearest land available for agricultural use is the property owned by Lampert Land Company, which is pasture grass, located approximately 1000 feet south of the existing treatment site. There are no prime or unique agricultural lands in the project area.

2.2.12. Proximity to Sole Source Aquifer

The EPA Region 10 Sole Source Aquifer Program reviewed in February 2012 indicates there are no sole source aquifers in the project planning area. The Spokane Valley Rathdrum Prairie Aquifer is the closest sole source aquifer which is approximately 14 miles to the north.

2.2.13. Land Use and Development

The current zoning for the CBCS planning area includes Restricted Residential and Rural. The Kootenai County Comprehensive plan designates the planning area as Shoreline, Suburban and Country.

2.2.14. Environmental Justice

The Cave Bay Community currently has approximately 146 single family residences, approximately 60 of which are full-time. The project planning area is located in Census Tract 9400, Block Group 2 and Tribal Census Tract T002 which includes Coeur d'Alene Tribal Reservation lands. Block Group 2 has a population of Native Americans which is greater than the average for Kootenai County. **Table 2-2** shows the percentages of races in the project area compared to Kootenai County.

Table 2-2 Percentage of Races in the Project Area

Race	Block Group 2	Kootenai County
White	90.5	94.5
Black	0.2	0.3
American Indian/Alaska Native	6.7	1.3
Asian	0.3	0.7
Native Hawaiian and Other Pacific Islander	0.3	0.1
Other	2	3.1
Source: US Census Bureau, American Fact finder, 2012		

Low income populations are those populations that fall below the Human and Health Services poverty level, which in 2012 was $23,050 for a family of four and $11,170 for an individual. The median household income in Worley in 2009 was $34,789 which was lower than the statewide average of $44,926. According to the Cave Bay Homeowner's

Association members, seniors who rely on social security, reside in the Cave Bay Community. There are also families and individuals that would be considered low income and minority individuals near the project vicinity.

The project would provide an overall benefit to the community and will improve wastewater treatment and water quality of the area. Therefore, there would be no disproportionately high and adverse impacts to minority or low income populations.

2.3. Existing Collection and Treatment Facilities

2.3.1. Treatment Facility Description, Condition and O&M Considerations

The existing treatment facility consists of a 0.5 million gallon (MG) aerated lagoon (Lagoon #1) providing secondary treatment, followed by a final storage lagoon (Lagoon #2) with an estimated capacity of 2.6 MG. Surface aeration has also recently been added to Lagoon #2. The lagoons typically operate in series, but lagoon piping is set up to allow bypassing of Lagoon #1 with flow directly to Lagoon #2. The lagoons were designed and have historically operated to dispose of wastewater through evaporation and seepage. The design seepage rate for the lagoons was ¼ inch per day, which was the allowable rate at the time of construction. There is a vertical pipe in Lagoon #2 that serves as an overflow box, connected to a sub-surface outlet, which discharges to the forested area below.

As mentioned previously, IDEQ issued a temporary Reuse Permit waiver and CBCS constructed a temporary irrigation system for land application of lagoon effluent on forest land adjacent to the lagoons. The waiver allowed for irrigation of up to 10,000 gallon per day (gpd) through April 15, 2011. This waiver was re-issued in August 2011 to allow irrigation to continue through the end of October 2011, and again starting in May 2012. The existing irrigation system consists of a submersible pump in Lagoon #2, a small control building with a hypochlorite injection system, approximately 900 LF of PVC irrigation pipe laid on the ground surface, and ten (10) impact sprinklers. The existing irrigation pumping system has a capacity of approximately 30 gpm.

CBCS made application for a Wastewater Reuse Permit to IDEQ on September 9, 2011. A completeness determination and Preliminary Decision letter was issued by IDEQ on January 12, 2012. Issuance of a Final Permit is expected by the end of July, 2012. CBCS has also been approved for a Conditional Use Permit (CUP) from Kootenai County to allow for the development of an interim land application system. The interim land application system includes 3.29 acres of forest irrigation on the existing CBCS property. Construction plans for the interim system were submitted to IDEQ on March 16, 2012, with construction expected to be completed by the end of July. This interim system will allow CBCS to operate for the 3-4 years while facilities

planning, land acquisition, expansion and long-term system upgrades are completed. For the purposes of this facilities plan the interim phase will be considered as an existing facility. A copy of the interim system plan can be seen in **Appendix F.**

2.3.2. Sewer System Description, Condition, and O&M Considerations

The sewer collection system consists of individual septic tanks which pump effluent into a septic tank effluent pump (STEP) collection system with small-diameter, low pressure transmission lines. Flows from particular areas are pumped to one of four (4) centralized lift stations. Each lift station collects from an area, and then pumps to the next lift station up the hill. Lift Station #3 is the final lift station, which collects all the flows from Cave Bay and pumps to a wet well at the top of the hill above the lagoons. From this point, the wastewater flows via gravity to the wastewater treatment lagoons. All of the lift stations have pump run time meters and the lift stations were recently refurbished, including replacement of pumps, installation of water tight hatches and interior coating of the wet wells. A flow meter was installed on Lift Station #3 in April 2011. See **Figure 2-2** for an overview of the existing treatment and collection facilities.

2.3.3. Wastewater Flows and Volumes for Existing Facilities

Wastewater flows have been calculated based on lift station pump run time records for the years 2006 through 2011 from Lift Station #3. Flow data for April through December 2011 was obtained from the flow meter that was installed at Lift Station #3. Pump run times multiplied by the measured operating capacity of the pumps (28 gpm) were utilized to estimate flows to the lagoon. Pump run times for 2011 were compared to metered flow data to verify accuracy. Estimated flows are then compared with connected equivalent residential units (ERUs) for calculation of a design unit flow rate. Average unit flow rate over these six (6) years is 44.0 gpd/ERU. A summary of monthly wastewater influent flow and unit flow calculations can be seen in **Table 2-3**. A calculation of the average percentage of total annual wastewater flow for each month of the year is also presented in **Table 2-3**.

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LS #3 SUBBASIN

LS #4

LS #3

LS#2

LS #1

LS #4 SUBBASIN

LS #1 SUB-BASIN

LS #2 SUBBASIN

3 PS

Carroll's Cave Bay 6th Add

Carroll's Cave Bay Homesites 3rd Add (C-1150)

Carroll's Cave Bay 7th Add (C-1205)

Carroll's Cave Bay 4th Add (C-1205)

Carroll's Cave Bay 3rd Add (C-1180)

Carroll's Cave Bay 2nd Add

Carroll's Cave Bay Homesites 2nd Add (C-1160)

Carroll's Cave Bay 6th Add (C-1205)

Carroll's Cave Bay 5th Add (C-1291)

5th Add to Carroll's Cave Bay Homesites (C-1207)

GOVT LOT 1
37.83 AC

GOVT LOT 2
38.65 AC

GOVT LOT 5

#12922

#11901

#12976

#22469

#4133

#21166

CAVE BAY RD

CAVE BAY DR

CARROLL DR

CARROLL TR

LAKESHORE TR (PRIVATE)

MADRONA LOOP

MONTOLA CT

EX PLTD PT

0 150 300 600 900

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E-FILE: DATE: November 2011 JOB: 110058

Table 2-3 - Monthly Wastewater Lagoon Influent (from Lift Station #3)

Month	Year 2006 (gal)	Year 2007 (gal)	Year 2008 (gal)	Year 2009 (gal)	Year 2010 (gal)	Year 2011 (gal)	Avg. (mgal)	% Total
January	271,824	119,616	318,360	133,190	88,872	166,303	0.183	8.09%
February	219,576	108,192	74,038	106,142	67,586	208,975	0.131	5.78%
March	126,000	123,312	103,354	120,708	125,093	188,395	0.131	5.79%
April	118,944	123,816	104,765	159,550	212,369	148,226	0.145	6.39%
May	150,696	123,816	282,055	163,934	180,046	144,746	0.174	7.70%
June	183,960	169,008	255,578	158,021	234,326	246,505	0.208	9.19%
July	474,264	169,008	393,809	253,243	554,467	272,647	0.353	15.59%
August	543,648	240,072	226,951	167,026	374,354	242,351	0.299	13.21%
September	264,264	149,520	177,190	127,394	206,976	235,440	0.193	8.55%
October	159,936	121,968	157,164	124,404	130,586	132,568	0.138	6.09%
November	115,584	115,920	127,344	79,666	131,158	242,351	0.135	5.98%
December	203,784	*	174,182	129,175	185,186		0.173	7.65%
TOTAL	**2,832,480**	**1,564,248**	**2,394,790**	**1,722,454**	**2,491,020**	**2,228,508**	**2.263**	**100.00%**
ERUs	**134**	**140**	**147**	**148**	**149**	**151**		
gpd/ERU	**57.9**	**33.5**	**44.6**	**31.9**	**45.8**	**44.2**	**43.0**	

*Pump problems, no data available. Std. Dev. = 9.5

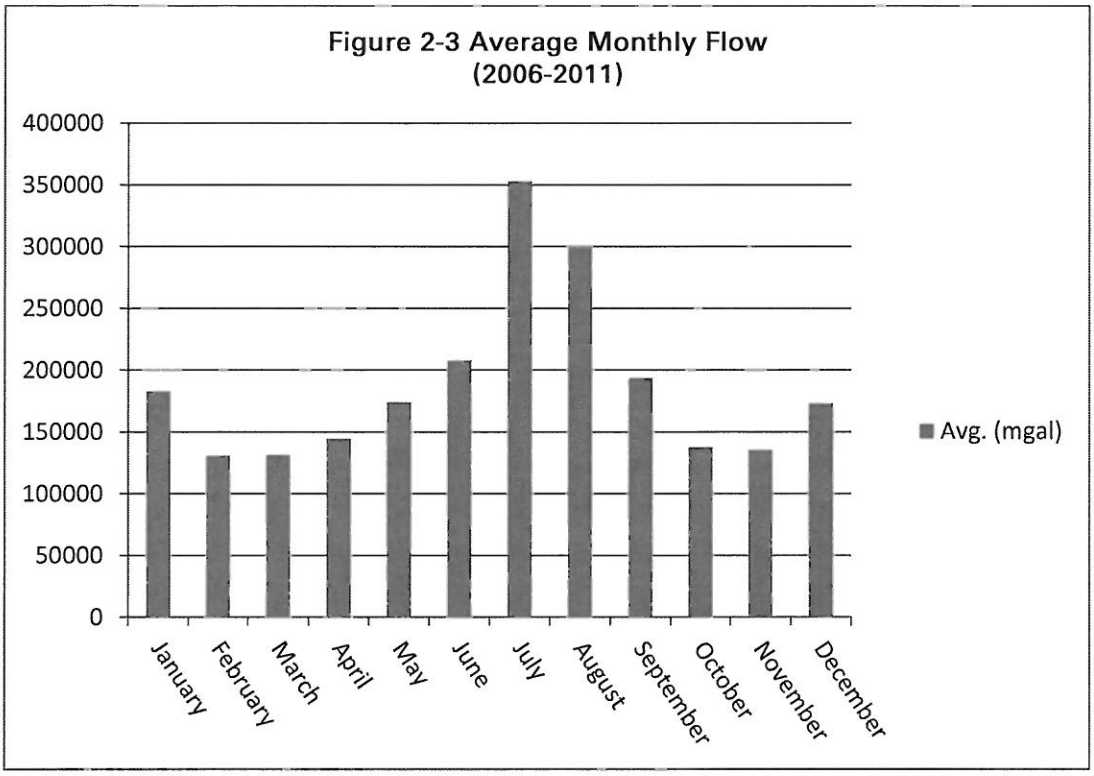
The average day flow for the observed years (2006-2011) was calculated based on the above flow data and was determined to be 6,203 gallons per day. The flow data shows that Cave Bay is primarily a seasonal community. Average monthly flow is highest in the summer months when more residences are occupied.

2.3.4. Infiltration/Inflow Conditions

Infiltration and Inflow (I/I) is commonly experienced in sewer collection facilities, especially in older systems. Most commonly I/I is associated with high ground water levels, storm events and wet conditions during the spring and winter months.

The CBCS collection system consists of septic tanks with individual pumps, pressurized sewer lines and lift stations. The likely sources of I/I in a pressurized system such as this would be at the septic tanks or lift stations. Considering the flow data provided in **Table 2-3,** I/I does not appear to have a significant impact on the CBCS system. The data does not show a spike in flows during the usually wet spring and snow melt periods. However, CBCS suspects that there are some waterfront septic tanks that periodically flood in April and May, when lake levels are high. There is also an increase in flows during the winter months of December and January, which generally are not

associated with I/I. This may be attributed to increased occupancy during the Holidays. See **Figure 2-3** for average monthly flow data.



In October 2011 a walkthrough of the CBCS site was completed for inspection of potential I/I points throughout the collection system. All Lift Stations were visually inspected and photographs taken. Cycle times for the lift station pumps and overall measured volumes have been relatively consistent over the years which would indicate that I/I is not a significant problem. The Lift Stations were refurbished within the last 5-years including new watertight lids and coating inside the wet wells. Although it appears I/I is not a significant problem based on the flow data, CBCS has concerns with some septic tanks on lots along the lakefront. During high-water periods in the spring, surface water may be entering these tanks, and CBCS has noted higher flows in years when the lake level is up. It is recommended that a plan be formulated for inspections/tests during the spring when groundwater and surface water are high for individual septic tanks throughout the CBCS community. Tanks found to be a problem should be modified or replaced.

In addition, it is recommended that pump run time meters be installed on selected residential systems to identify systems that are operating more than normal after rain events or during snow melt. CBCS is also attempting to curtail the practice by seasonal homeowners of running water in the winter to protect pipes from freezing. Installation of run time meters will help identify and stop this from occurring.

2.3.5. Lift Station Capacity Analysis

Lift station capacity was analyzed by looking at existing run time data for each lift station. By looking at the average day and peak week run times, it can be determined if the lift stations are being overworked. **Table 2-4** summarizes average and peak run times for all of the lift station.

Table 2-4 Lift Station Run Time Summary

Lift Station	Cumulative Existing Connections	Existing Average Run time hrs/day	Peak Week Runtime Hrs/day
1	33	0.7	4.3
2	66	1.9	3.8
3	146	3.9	7.1
4	17	0.3	0.6

Note: Cumulative connections indicates the total connections flowing to the lift station from upstream lift station(s).

Results of the run time investigation indicate that the existing lift stations are operating at acceptable run times. With an estimated build-out of 218 lots, or an increase of approximately 50%, it is anticipated that significant upgrades to the lift stations will not be required.

2.3.6. Wasteload Allocation and NPDES Permits

As discussed previously, the CBCS system was constructed in 1977 as a non-discharging facility, in which evapotranspiration and seepage were considered acceptable means of disposal. The CBCS system does not operate under a National Pollutant Discharge Ellimination System (NPDES) permit (surface water discharge permit) so it does not have a designated Wasteload Allocation.

2.3.7. Bylaws and Articles of Incorporation

CBCS is a non-profit cooperative corporation formed in 1979 to enforce the Covenants of Restriction of Carroll's Cave Bay Homesites and all additions to Carroll's Cave Bay Homesites, and to acquire, hold title, operate and maintain the water supply system, sewer system, boat docks, private roadways, and common areas. CBCS operates under a set of bylaws administered through their Board of Directors. A copy of the Articles of Incorporation and Amended Bylaws for CBCS can be found in **Appendix G**. Within the bylaws is a financial program that includes a capital fund for their water and sewer systems, including replacement as well as normal operation and maintenance costs.

2.3.8. User Charges and Budget

A general assessment of $565 per year is charged to all lot owners, of which approximately 20% ($113) is dedicated to routine sewer operation and maintenance. CBCS also charges a water and sewer improvements assessment of $300 per year, of which 85% ($255) is dedicated to nonstandard sewer maintenance or sewer improvements. These assessments are paid by all lot owners, including undeveloped lots. The Board of Directors determines the assessment annually at the same time it establishes the budget for the succeeding year. The current capital fund is not adequately funded for major upgrades or expansion projects in lieu of the costs associated with the recent upgrades and emergencies mentioned in Section 1.3. **Table 2-5** summarizes CBCS's sewer assessments and projected income for 2012. A copy of the current Fee Schedule can be found in **Appendix H**.

Table 2-5: CBCS Sewer Fees and Projected Income (2012)

Description	Annual Fee	Monthly Fee	Assesed Connections/ Properties	Annual Income
General Assessment (Sewer Portion)	$113.00	$9.42	218	$24,634
Improvements Assessment (Sewer Portion)	$255.00	$21.25	218	$55,590
Total Annual Sewer Assessment	**$368.00**	**$30.67**		**$80,224**

2.3.9. Violations of Clean Water Act and Idaho Water Quality Standards and Wastewater Treatment Requirements

As discussed previously, IDEQ issued a temporary Reuse Permit Waiver for emergency irrigation of lagoon effluent as outlined in the letter in **Appendix E**. Furthermore the un-lined lagoons do not conform with the current IDEQ Wastewater Rules.

2.3.10. List and Status of Defects or Deficiencies

The following is a list of the treatment and collection facilities deficiencies:

- The existing treatment lagoons were designed to be non-discharging. As stated in the IDEQ correspondence referenced in **Appendix E,** conditions in North Idaho "do not allow a total containment lagoon system to function indefinitely without a discharge". Also, seepage is not an acceptable means of discharge.
- Without an accepted method of reuse or disposal of treated lagoon effluent, the lagoons do not provide adequate storage for the existing or projected wastewater flows. This was evident from the 2011 event described in Section 2.2.10.

- Some lakefront residencies may be incurring I/I into their septic tank systems when ground and surface water from spring runoff is high.
- The CBCS system is currently operating under a temporary Reuse Permit waiver contingent upon meeting and implementation of a Compliance Agreement Schedule, which includes completion of the facilities plan.

3. Future Conditions

3.1. Projected Growth

Projected growth in the Cave Bay community is expected to be approximately 3 ERU's per year or about 2.0% annually, this is based on historical growth data for the community. The United States Census Bureau shows a 27.4% population change from 2000 to 2010 for Kootenai County which amounts to about 2.7% per year. This is relatively close to the 2.0% assumed for planning and design purposes. Ultimately, proposed upgrades and expansion will be designed to serve projected build-out of the CBCS service area.

3.2. Forecast of Flows and Wasteload (20-year period)

Assuming a growth rate of 3 ERU's per year, it will take an estimated 24 years to reach build-out of 218 ERU's. For the purposes of this facilities plan all related calculations will be based on a build-out of 218 ERU's. An annual average design unit flow rate of 44 gallons per day per ERU was calculated based on flow data from previous years. A conservative unit flow rate equal to the annual average unit flow rate plus three (3) standard deviations is used for planning and design which is equal to 74 gpd/ERU. This conservative flow rate is proposed since historic flow data from Cave Bay is significantly lower than typical published ranges for residential communities. It is also assumed that the average unit flow will see some increase as occupancy and full-time residency is expected to increase.

3.3. Wastewater Facilities Needed for a 20-year Period

As discussed previously, an interim phase is proposed for construction in June of 2012. For the purpose of this report it is assumed to be existing.

Projected lagoon and land application system capacity is estimated utilizing the water balances included in **Appendix I**. These water balances account for precipitation into the lagoon and estimated evaporation from the lagoon. Precipitation data is taken from ET Idaho for the Plummer 3 WSW weather station Gross Precipitation. Evaporation data is taken from ET Idaho for the Plummer 3 WSW weather station Basal

Transpiration for Open Water – Shallow Systems. This ET Idaho data can be seen in **Appendix I**. The original lagoon system was designed based on a seepage rate of 1/4 inch per day, which was the acceptable rate at the time. The proposed facility does not include seepage in the water balance. As shown in the water balance, an estimated total of 9.1 acres of irrigation area or 5.8 acres more than the interim system provides is required to serve the 218 ERU's projected for build-out. The water balance also indicates that the existing lagoons will not provide enough storage capacity for build-out.

To meet build-out conditions and comply with current IDEQ Rules the existing lagoons need to be expanded and lined with geo-membrane liner. The storage volume of the lagoons will need to be increased by about 400,000 gallons.

Other components of the system requiring upgrade include the irrigation pumping system, chlorination system, and chlorine contact piping.

3.4. Future Conditions without the Proposed Project

Without the proposed project the lagoons will reach capacity and the same hazards associated with the February 2011 event could occur. In addition the lagoons will continue to exceed acceptable seepage requirements.

3.5. Land Use Plans for Area Served by Existing and Future Sewer Facilities

As stated previously, the County's Comprehensive plan designated the service area as Shoreline and Suburban. The Shoreline designation encompasses lands generally within 500 feet of bodies of water. The primary purpose of this designation is to guard against water quality degradation through management of development, typically limited to single family housing. Suburban development may allow the development of residential, commercial or mixed uses. The primary purpose of the Suburban designation is to promote development of vacant and under used parcels within areas that are largely developed. The Suburban designation encompasses the existing wastewater facilities and surrounding area, more than 500 feet from the Lake.

Land use for a portion of the proposed sewer facilities planning area is classified as Country, and is mostly undeveloped. The primary purpose of this designation is to protect open space and promote agricultural activities compatible with rural residential development.

It is expected that the existing service area will continue to be developed with single-family residential dwellings all within the Carroll's Cave Bay Subdivision. Development will continue to include a mixture of both seasonal and year-round use. Several property owners have combined multiple contiguous lots to use for a single residence, and this practice is expected to continue as more of the vacant lots are developed. The

total number of lots within the Carroll's Cave Bay Subdivision and Additions is 225, however with combined lots, it is anticipated that build-out will not exceed 218 single-family dwellings.

4. Development and Initial Screening of Alternatives

4.1. Development of Alternatives

4.1.1. Class A Treatment and Groundwater Recharge

This alternative consists of constructing a new treatment facility to achieve Class A effluent quality. Class A treatment is the highest water reuse treatment option. The effluent from Class A can be used as a non-potable source of water, including but not limited to lawn irrigation, edible crop irrigation, park irrigation and groundwater recharge. There are no buffer requirements for this treatment option however discharge to surface waters is prohibited without an NPDES permit. For this alternative, groundwater recharge is analyzed as the most viable reuse option since lawn irrigation within the service area is too limited to provide adequate capacity.

Class A recycled water is required to be oxidized, coagulated, clarified, filtered and disinfected. Disinfection requirements include a minimum contact time designed to provide a 5-log inactivation of viruses. Sampling and testing on a daily basis for total coliform removal verification is required. Class A filtration can be accomplished by utilizing sand or other granular media to provide a maximum daily average turbidity measurement of less than two (2) NTU. Membrane filtration may also be used, and requires a maximum daily average turbidity of 0.2 NTU. Total Nitrogen cannot exceed ten (10) mg/L and Biochemical Oxygen Demand (BOD) cannot exceed five (5) mg/L for groundwater recharge applications.

Groundwater recharge would likely be achieved by a subsurface distribution system. As noted in the Hydrogeologic Characterization in **Appendix A**, subsurface distribution could result in degradation of groundwater quality and potential discharge of impacted groundwater to adjacent surface water.

The geologic and soil properties of the existing site and adjacent properties include the presence of soils that have low permeability and impermeable layers too shallow for groundwater recharge. A subsurface distribution system could also result in groundwater mounding.

The capital costs and operation and maintenance costs for Class A treatment systems are very high compared to more passive technologies such as lagoon treatment. The

CBCS community has limited funds and if other environmentally safe and viable options are available the community should exercise these options. Furthermore, private municipal wastewater treatment plants, other than passive technologies like lagoons, are typically discouraged under IDEQ's Wastewater Rules for systems with average day design flows of less than 25,000 gallons per day.

Environmentally, this alternative would reduce the seepage and potential overflow of lagoon effluent into groundwater and surface water. Water that would be distributed to groundwater would be improved over existing conditions; however it would still result in degradation of groundwater and surface water quality. This could adversely impact aquatic species. This alternative would not involve land application and would have less land acquisition, and potential for odors.

The following is a summary of the benefits and disadvantages for Class A treatment:

Benefits-

- Higher quality effluent
- Less land acquisition

Disadvantages-

- High construction cost
- High O&M cost
- High operator licensure requirements
- Shallow soils with low permeability
- Potential for groundwater mounding
- Potential for surface water impacts
- Potential for impacts to aquatic species due to water quality degradation
- Shallow impervious layers
- Additional hydrogeologic study required
- Unlikely acquisition of an NPDES permit for surface water discharge

4.1.2. Enhanced Treatment and Rapid Infiltration

Enhanced treatment requires nutrient and solids removal to levels that will not degrade groundwater quality. Enhanced treatment would require a mechanical treatment system optimized for nutrient removal, similar to a Class A treatment technology, but without the filtration requirement.

For this alternative rapid infiltration is analyzed as the effluent disposal option. As mentioned previously, the geologic and soil properties of the existing and proposed

project sites feature soils that have low permeability and relatively shallow impermeable surfaces.

The Hydrogeologic Characterization in **Appendix A** analyzes the dynamics of groundwater flow in the area. If groundwater flow is primarily downward, then rapid infiltration could be a viable option. An investigation to determine the areas specific hydro-geologic characteristics would be necessary, and would include drilling at least one monitoring/test well. This type of investigation can be costly and time consuming and the results would likely be unfavorable.

As discussed in the Hydrogeologic analysis, a rapid infiltration system could result in subsurface discharge to surface waters. This would require the appropriate NPDES permitting and would also be time consuming and costly. It is also unlikely that a surface water discharge permit would be approved for Lake Coeur d'Alene.

Since the subsurface discharge could still enter surface waters, this alternative could degrade water quality of surface waters which could adversely impact aquatic species. This alternative would not involve land application and would have less land acquisition, and potential for odors.

The following is a summary of the benefits and disadvantages for this Alternative:

Benefits-

- Lower treatment threshold than Class A
- Lower O&M Cost than Class A
- Less land acquisition

Disadvantages-

- High construction costs
- Shallow soils with low permeability
- Potential for groundwater mounding
- Potential for surface water impacts
- Potential for impacts to aquatic species due to water quality degradation
- Shallow impervious layers
- Additional hydrogeologic study required
- Unlikely acquisition of an NPDES permit for surface water discharge

4.1.3. Class C Treatment and Pasture Grass Irrigation

This alternative involves utilizing the existing treatment system with some upgrades including additional lagoon storage, lagoon lining, upgrades to the irrigation pumping

system and land acquisition for pasture grass irrigation. Class C treatment consists of providing adequate oxidation and disinfection. The median number of coliform for Class C treatment must be twenty-three (23) per one hundred (100) milliliters (ml) with no maximum single sample exceeding 230 /100 ml. Sampling of Class C treated water for total coliforms is required once per week. Class C treated effluent may be land applied but specific conditions regarding the application site must be met. In addition to site restrictions the land application site has buffer requirements to public and private facilities including but not limited to wells and residences.

By utilizing Class C treatment the cost of construction for new facilities is minimized, since a majority of the required facilities are already in place. This would require approximately 11.5 acres of pasture irrigation area plus appropriate buffers (8.2 acres additional to interim phase).

The nearest land for pasture grass Irrigation is owned by Lampert Land Company and is approximately 1000 feet south of the existing treatment site. It is important to note that this property does not border the existing site, and easements would be required to reach the site. Preliminary discussions with Lampert have taken place, and they have indicated that they are not interested in selling or leasing their property.

Environmental impacts resulting from this alternative include the greatest acreage of soil disturbance for piping, land application and easements. It would modify the use of active farmland and require crop rotation. However, reconstructing the lagoons to eliminate seepage and potential overflow will reduce impacts to groundwater and surface water; thereby reducing impacts to aquatic species. This alternative will involve land application which is the greatest distance from Lake Coeur d'Alene, streams and wells.

The following is a summary of the benefits and disadvantages for this Alternative:

Benefits-

- Lower treatment threshold for Class C
- Fewer upgrades to existing facilities
- Land Application site further from the lake
- Further from Residential development

Disadvantages-

- Significant land acquisition
- Further from existing treatment site
- Utility easements required to reach the site
- Significant upgrades to irrigation piping and pumping distribution system

- More intense crop management required
- Lack of property owner interest in sale or lease

4.1.4. Class C treatment and Forest Irrigation

This alternative is similar to the alternative discussed in Section 4.1.3. Instead of land application to pasture grass, irrigation to forest land would be performed. This would require approximately 9.1 acres of irrigation area (5.8 acres additional to interim phase) plus appropriate buffers. Less forest land is required due to the higher hydraulic and nutrient uptake for forest vegetation. This results in less land purchase as well as less modifications/upgrades to the irrigation conveyance system. Upgrades and expansion of the lagoon and irrigation pumping system, similar to those described above would be required.

The nearest land for forest irrigation consists of two parcels (see **Figure 4-1**), which are adjacent to the existing CBCS site. The most beneficial part of utilizing Class C treatment with forest irrigation is that an interim forest land application system will already be in place and a Reuse Permit for forest irrigation is pending. Major components of Class C treatment with forest irrigation will already be constructed and fewer upgrades to the existing system will be required. The upgrades for build-out conditions would simply involve more land purchase and new irrigation pumping and piping systems. This is significantly less costly than utilizing Class A treatment or Enhanced treatment with groundwater recharge or rapid infiltration.

Land application will occur at appropriate setbacks from Lake Coeur d'Alene, streams and wells. Reconstructing and lining the lagoon will prevent seepage and potential overflow of lagoon effluent to groundwater and surface waters; thereby reducing impacts to aquatic species.

The following is a summary of the benefits and disadvantages for this Alternative:

Benefits-

- Lower treatment threshold for Class C
- Fewer upgrades to existing facilities
- Less land acquisition than pasture irrigation
- Less intense crop management
- Close proximity to the existing site

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16-1 BAY

GOVT LOT 5

COEUR D'ALENE TRIBE PROPERTY

LAGOON #1 (LINING)

LAGOON #2 (EXPANSION AND LINING)

CBCS

200' Lagoon Buffer

CBCS

20' Ingress/Egress Easement

Coeur d'Alene Tribe

STEPHEN DREHER PROPERTY

500' Well Buffer

FOREST IRRIGATION 8.2 Ac. Irrigation

CAVE BAY

Carroll's Cave Bay 5th Add

Carroll's Cave Bay 4th Add

Carroll's Cave Bay 3rd Add

Carroll's Cave Bay 2nd Add

Carroll's Cave Bay 1st Add

Sapps Sd

FIGURE 4-1

N

0 150 300 600 900

T-O ENGINEERS

WEST 280 PRAIRIE AVENUE
COEUR D'ALENE, IDAHO 83815-7710
PHONE: (208) 762-3644 FAX: (208) 762-3708

E-FILE: DATE: November 2011 JOB: 110058

Disadvantages-

- Closer proximity to the lake than pasture land application
- Closer proximity to residential development
- Some land acquisition required

4.1.5. "No Action" Alternative

Flow projections estimate that by the year 2017 the interim phase project, utilizing 3.29 acres of forest irrigation, will not be adequate. The lagoons may reach capacity and pose the same public health risks mentioned in Section 2.2.10. Furthermore, the interim system relies on lagoon seepage, which is not allowed under the current rules. Also, CBCS has entered into a CAS with IDEQ to formulate and implement a treatment program, if a no action alternative is utilized it would result in violation of the terms of this agreement.

The No Action Alternative would not impact vegetation, result in soil disturbance or require acquisition of land. It will, however, continue to degrade surface water and groundwater quality through seepage and potential overflow of lagoon effluent. This would continue to degrade the water quality of Lake Coeur d'Alene which would adversely impact aquatic species.

4.2. Optimum Operation of Existing Facilities

Three (3) out of the four (4) existing lift stations do not include flow meters and the only method of flow estimating is from pump run-time meters. It is proposed that each lift station have a flow meter installed to accurately measure flow from each respective zone. As mentioned in *Section 2.3.4* , it is suggested that run time meters be installed on individual septic tanks, more specifically at residencies that are known or suspected to have I/I problems. This will help to identify sources of unwanted flow to the system. In addition, it is recommended that septic tanks found displaying I/I characteristics be replaced. There is currently only flow measurement for the potable water supply system at the wells. CBCS is considering more accurate methods of measuring residential water usage. Being able to compare potable water usage to wastewater flow rates would help to better determine I/I or water loss issues throughout the system.

4.3. Regionalization

The nearest municipal wastewater system to the Cave Bay Service area is in the City of Worley, approximately 6 miles to the south. Consolidation of the two systems is not practical due to the distance between, and the fact that Cave Bay is outside the City's limits.

4.4. Un-sewered Areas in and around the Community

There are currently an estimated five (5) un-sewered lots in the Cave Bay community that have residences on them. These residences are currently on individual septic systems, which were permitted before the community sewer system was in place. It is CBCS's policy that any expansions or improvements to these residences will trigger a requirement that they connect to the CBCS sewer system.

4.5. Board/Community Input

As part of the alternative selection process CBCS Board and public input and consultation will be considered. A preliminary discussion and presentation of alternatives was presented at a regular CBCS Board meeting on November 12, 2011. This discussion and Board direction was then used to move forward with preparation of the Draft Facilities Plan. Following IDEQ review of the Draft Facilities plan, the following public input process will be completed:

- Notice of Public Meeting will be issued following IDEQ review and approval of the Draft Facilities Plan.
- The Draft Facility Plan with recommended alternatives will be made available to the Public, followed by a 14-day Comment Period for public review and input.
- Explanation of the planning process and discussion of the proposed improvement alternatives will be presented at a Public Meeting.
- The Board will make a selection of the preferred alternative, considering public input.
- The Board will make a selection of the preferred alternative, considering public input.
- The selected alternative will be incorporated into the Facility Plan and the Final Facilities plan and EID will be submitted to IDEQ.

5. Final Screening of Principal Alternatives and Plan Adoption

The principal alternatives recommended for consideration are:

- Alternative #1 - Class C Treatment with Forest Irrigation
- Alternative #2 - Class C Treatment with Pasture Grass Irrigation

5.1. Evaluation of Costs

Cost estimates for the principal alternatives have been developed and are provided in **Appendix J**. Estimates are based on the most current available cost data for each related design alternative. The following sections compare and analyze different components of the principal alternatives.

5.1.1. Capital Costs

The Capital Cost is the one time "setup" or initial cost to purchase and install an item. The capital costs for the principal alternatives were estimated based on the most current estimating data. Capital cost excludes O&M. Each alternative is summarized in **Table 5-1**.

Table 5-1 Capital Cost of Selected Alternatives	
Class C Treatment Forest Irrigation	**Cost**
Mobilization	$42,000
Existing Lagoon Improvements	$427,000
Irrigation System	$291,500
Irrigation Land Acquisition	$72,000
Collection System Improvements	$79,000
Engineering/Permitting	$150,925
Contingency	$125,925
Total	**$1,188,350**
Class C Treatment Pasture Irrigation	
Mobilization	$46,000
Existing Lagoon Improvements	$427,000
Irrigation System	$367,100
Irrigation Land Acquisition	$104,000
Collection System Improvements	$79,000
Engineering/Permitting	$162,865
Contingency	$137,865
Total	**$1,323,830**

The following **Table 5-2** shows the total project capital cost per user for each primary alternative based on the build-out number of users for each alternative.

Table 5-2 Project Cost per User		
Project Cost	**Forest Irrigation with Class C**	**Pasture Irrigation with Class C**
Estimated Capital Cost	$1,188,350	$1,323,830
Estimated Build-out (ERUs)	218	218
Project Cost per User	**$5,451**	**$6,073**

5.1.2. Operation and Maintenance Costs

Operation and Maintenance costs (O&M) were developed based on the existing O&M costs plus the added costs for each alternative. The O&M costs for added features are based on similar systems and the most current available data for each respective item.

O&M costs are the total of the individual costs associated with each component of the proposed alternatives and are summarized in **Table 5-3**.

Table 5-3 Operation and Maintenance Costs Summary		
O&M Expense Description	**Class C with Forest Irrigation**	**Class C with Pasture Irrigation**
Electricity	$2,000	$3,000
CBCS Labor	$6,000	$6,000
Repairs/Maintenance	$12,000	$15,000
Operating Chemicals	$4,000	$4,000
Lab Testing	$2,000	$2,000
Licensed Operator and Consulting	$45,000	$60,000
Totals	**$71,000**	**$90,000**

5.1.3. Present Worth Analysis

A present worth analysis was performed on both principal alternatives. Present worth is used to compare dissimilar alternatives and should not be confused with capital cost. This assumes an interest/discounting rate of 3% which can be compared to an inflation rate in this application. The present worth for each alternative includes the capital cost plus the O&M costs over a 20-year period. No salvage or return values were assumed for this analysis. The results are summarized in **Table 5-4**.

Table 5-4 Present Worth Analysis			
Alternatives	**Capital Cost**	**O&M**	**Present Worth (20-yr)**
Class C with Forest Irrigation	$1,188,350	$71,000	$2,244,651
Class C with Pasture Grass Irrigation	$1,323,830	$90,000	$2,662,803

5.1.4. Reliability of Alternatives

Both alternatives provide the necessary treatment for Class C water reuse. Both options include reliability and redundancy measures. Since the Class C treatment will be achieved with lagoons the reliability of the system as a whole remains relatively high. Lagoons are simple to operate and require minimal mechanical equipment to achieve desired treatment. With less mechanical equipment the system is more reliable because fewer breakdowns or equipment malfunctions generally occur. The lagoons can also be maintained with dual cells allowing one to be taken offline while routine maintenance is performed on the other.

5.1.5. Implementability

Class C treatment with land application was selected in part due to the ease of implementability in conjunction with the existing system facilities. As mentioned previously CBCS is proceeding with development of a forest irrigation system and has been granted a Completeness Determination for their Reuse Permit application. This will make implementing additional forest land application easier and less costly.

5.2. Final Public Input

[To be completed following IDEQ Review of Draft Plan, Public Comment and Public Meeting]

6. Selected Plan Description and Implementation Arrangements

6.1. Justification and Description of Selected Plan

The CBCS Board's preferred alternative is Class C Treatment with Forest Irrigation. Class C treatment with Forest Irrigation and Pasture Grass Irrigation are very similar in operation however the forest irrigation option will cost less and suitable property is more readily available. Two properties have been considered for forest irrigation that are immediately adjacent to the existing site. The first is the Stephen Dreher property located southeast of the existing facility. The second property is owned by the Coeur d'Alene Tribe and is located northwest of the existing facility. Upon review of the properties it has been determined that the Dreher property is the most feasible alternative. The Tribe property is closer than the Dreher property however, based on current interaction/communication with the Tribe, it is expected that acquisition of their property is unlikely or will be a time consuming process that may affect the timely implementation of the selected alternative. The owner of the Dreher property has been responsive and appears agreeable to pursuit of land acquisition.

Forest Irrigation was selected due to cost, available property and relative ease of implementation. The Class C treatment and forest irrigation alternative will include use of the existing lagoons with upgrades that include lagoon lining, perimeter fencing and embankment buildup to provide more storage capacity. A pump house with a new irrigation pumping system will be required for this alternative. This alternative will meet the needs of the CBCS system as well as compliance with Idaho Wastewater and Recycled Water Rules. The system will provide adequate treatment and disposal capacity through build-out conditions.

6.2. Preliminary Design of Selected Plan

The preliminary layout of the selected alternative can be seen in **Figure 6-1**. The facility upgrades and required components for the new system at build-out are listed below.

- Additional Forest Land Application Area – 5.8 Acres (9.1 acres total)
- Additional Lagoon Storage Volume – 400,000 Gal. (minimum)
- Lagoon Lining – Both Lagoons
- New Irrigation Pumping System – 90 gpm

6.2.1. Wastewater Lagoons and Treatment Facilities

The treatment facility for this alternative includes the two existing lagoons. Both lagoons need to be lined and seepage tested in accordance with IDEQ rules. The large lagoon will be expanded by building up the embankment by about 2 feet, which will provide an additional 750,000 gallons of storage volume. Both lagoons have aeration systems which may be upgraded to further reduce odors and better facilitate treatment prior to land application. Perimeter fencing will be added around both lagoons and around the irrigation areas including warning signs and gates where appropriate.

6.2.2. Land Application Facilities

The Dreher property is the most desirable property for forest irrigation and consists of an estimated 8 acres suitable for irrigation area. The proposed land application system will consist of impact type sprinklers with flow control nozzles to provide for uniform application. A 4-inch pressure irrigation main will be extended from the interim phase piping to the Dreher Property. To meet the disinfection requirements for Class C, an oversized piping network will be installed to provide a minimum of 30 minutes of contact time prior to the first sprinkler head. A portion of this chlorine contact piping will be installed during the interim phase, with additional piping added to provide adequate contact time for the new irrigation pumping system. A new irrigation pump station, including two (2) irrigation pumps, with wet wells, housed inside an irrigation control building will be constructed.

Groundwater monitoring piezometers, similar to those included in the interim phase will be constructed. Locations of the monitoring piezometers will be determined during the design phase.

A 500' foot buffer from the neighboring domestic well will be maintained. In addition a 200' buffer from the lagoons to residential properties will be maintained. This buffer will require an easement from the owner of the Dreher property, which will be negotiated as part of the land acquisition process. **Figure 6-1** shows buffer zones to existing residences and wells.

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16-1 BAY

GOVT LOT 5

CAVE BAY

LAGOON #2
(EXPANSION AND LINING)

LAGOON #1 (LINING)

Carroll's Cave Bay 6th Add

CBCS

CBCS

1/4

1/4

1/4

200' Lagoon Buffer

CBCS
20' Ingress/Egress Easement

Coeur d'Alene Tribe

Stephen Dreher

500' Well Buffer

FOREST IRRIGATION
8.2 Ac. Irrigation

Carroll's Cave Bay 6th Add

Carroll's Cave Bay 5th Add

Carroll's Cave Bay 4th Add

Carroll's Cave Bay 3rd Add

Carroll's Cave Bay 2nd Add

Carroll's Cave Bay 1st Add

S 15th St

FIGURE 6-1

N

0 150 300 600 900

T-O ENGINEERS
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A Conditional Use Permit (CUP) for the acquired portion of the Dreher property will be required. This parcel will also need to go through the County's Subdivision process to split out the required portion for sale to CBCE. CBCS will also need a Wastewater Reuse Permit Modification to add irrigation of the additional forest irrigation into their pending permit. Any agreement that CBCS enters into for acquisition of the Dreher property should be contingent upon subdivision approval, receipt of the CUP and Reuse Permit Modification, as well as IDEQ approval of the Facilities Plan and EID.

6.2.3. Collection System Improvements

Septic tanks subject to flooding and/or excessive I/I will be identified and replaced with new concrete septic tanks. In some instances fiberglass tanks may be considered, however proper anchoring to protect from shallow groundwater conditions will be required. The decision to replace tanks will be based on visual inspection during high water/runoff periods and installation and monitoring of pump run time meters on suspected effluent pump systems. In addition, flow meters will be installed at the three (3) main lift stations that do not have meters.

6.2.4. Construction Phasing

Construction of improvements will need to be carefully planned and phased to allow for use of the existing lagoons and irrigation system during construction, so as not to interrupt sewer service. Following is a brief discussion of the construction activities and respective phasing that is anticipated. This phasing plan will be refined during the design stage of the project.

Phase 1 construction is anticipated to include expansion of the land application system to provide extra capacity to facilitate drawdown of the large lagoon (Lagoon #2) early in the irrigation season. It is anticipated that with full irrigation capacity available, Lagoon #2 can be drawn down to empty by the end of June. This will require a temporary rented irrigation pump, tied into the irrigation system, to pump the Lagoon down. Once the lagoon is emptied, Phase 2 construction can begin. Phase 2 will include construction of the wet wells, irrigation pump system, irrigation control building, as well as build-up of the Lagoon #2 embankment. This will conclude Phase 2 of construction at the end of the first construction season. Phase 3 will begin the following construction season with the new pump station and land application system on-line. Lagoon #2 will again be drawn down for installation of the geo-membrane liner. When lining of Lagoon #2 is completed, Lagoon #1 can be bypassed, drawn and lined as well. Upgrades to the Lagoon #1 aeration system will also be completed during Phase 3.

6.3. Cost Estimates for Selected Plan Including Monthly Charges

A preliminary cost estimate for the selected alternative was developed based on the most current estimating data, and can be seen in **Appendix J.** The estimated cost of construction, including engineering fees, is $1,188,350. Additional administration and legal fees for CBCS to implement the funding arrangements are assumed to be $50,000.

CBCS has made application for an IDEQ Clean Water Loan with terms of the loan to be determined. If annual user rates for residential customers exceed 1.5% of the applicant community's median household income CBCS will qualify for a disadvantaged loan. Based on the median household income for Kootenai County, this would mean adjustments to the loan terms or principal forgiveness may be available if projected sewer rates exceed $695 per year (debt service plus O&M). The project cost per user assuming a 20 year loan with 1.0% interest was analyzed and it was found that the cost per user will not exceed the 1.5% of median income; therefore CBCS will not qualify for IDEQ's disadvantaged loan program. A standard 20-year IDEQ loan with a 1.0% interest rate is therefore assumed. The following **Table 6-1** shows the estimated annual debt per user assuming a 20-year IDEQ loan with 1.0% interest plus annual O&M costs.

Table 6-1 Project Cost Analysis – IDEQ Loan

Project Annual and Monthly Cost Per User			
20-Year Loan @ 1.0 %	**Capital**	**O&M**	
	Cost	**Cost**	**Total**
Annual Total Expenses	$ 68,623.56	$ 71,000.00	**$ 139,623.56**
Annual Debt Service for Lot Owners (218 ERU's)	$ 314.79	$ 325.69	**$ 640.48**
Monthly Service Fee for Lot Owners (218 ERU's)	$ 26.23	$ 27.14	**$ 53.37**
Construction Project Total Cost (P&I)	**$ 1,372,471**		

Current sewer assessments are approximately $30.67 per month. It is estimated that these assessments will increase to $53.37 per month for all lot owners, if IDEQ Clean Water Loan funding is available.

Another funding alternative, which CBCS may consider, is a USDA Rural Development wastewater loan. USDA offers loans with terms ranging from 20 to 40 years, with an interest rate currently at 3.375%. The following **Table 6-2** shows the estimated annual debt per user assuming a 30-year USDA loan with 3.375% interest plus annual O&M costs.

Table 6-2 Project Cost Analysis – USDA Loan			
Project Annual and Monthly Cost Per User			
30-Year Loan @ 3.375 %	**Capital**	**O&M**	
	Cost	**Cost**	**Total**
Annual Total Expenses	$ 66,280.00	$ 71,000.00	**$ 137,280.00**
Annual Debt Service for Lot Owners (218 ERU's)	$ 304.04	$ 325.69	**$ 629.72**
Monthly Service Fee for Lot Owners (218 ERU's)	$ 25.34	$ 27.14	**$ 52.48**
Construction Project Total Cost (P&I)	**$ 1,988,400**		

USDA requires that 1/10 of the annual payment be placed in a reserve account every year (in addition to the regular payments) for the first 10 years. It is estimated that sewer assessments will increase to $55.01 per month for the first 10 years, then $52.48 thereafter with USDA Rural Development Loan funding.

6.4. Environmental Impacts of Selected Plan

The selected alternative would result in the least environmental impacts compared to the other alternatives. It would rehabilitate the lagoons preventing seepage of effluent to groundwater and surface water. It would also be constructed to handle predicted volumes and would be designed to prevent potential overflow of effluent to Lake Coeur d'Alene. Forestland has a higher nutrient uptake compared to the pastureland and therefore requires less land for application compared to land application on pasture grasses.

The selected alternative would involve the removal of minimal amounts of understory vegetation for the installation of pipes, sprinkler heads and for the lagoon rehabilitation and expansion. This alternative would have the least soil disturbance because much of the needed infrastructure and piping is already in place.

This alternative would improve effects to groundwater, surface water, aquatic species and other resources compared to the existing conditions and No Action Alternative. Expanding and lining the lagoons would prevent seepage of untreated effluent into groundwater and would avoid potential overflow to Lake Coeur d'Alene. This would reduce impacts to aquatic species.

There may be odor as a result of wastewater irrigation through the forested and grassy areas; however there are no nearby homes or facilities in the areas where the lagoon expansion and land application is proposed.

Land application will not occur on the steep talus slopes, within 100 feet of surface waters, or within 500 feet of wells. This will avoid adverse impacts to surface waters, aquatic species, and groundwater. Any disturbed soils will be re-vegetated with native

grass species to minimize erosion and weed establishment. Land application will eventually result in a more vigorous growth of the native plants and increase the nutrient uptake.

The construction of the selected alternative will result in an overall benefit to the environment and is not expected to result in substantial impacts to the natural or human environment.

6.5. Implementation

6.5.1. Inter-municipal Service Agreements

There are no inter-municipal service agreements proposed or required for this project.

6.5.2. Financing Arrangements

CBCS submitted a Letter of Interest for IDEQ's State Revolving Fund (SRF) Loan priority list for Fiscal Year 2013. Following submittal, CBCS was ranked 16th on the priority list for FY 2013, so funding for FY 2013 will not be available. Projects will be re-evaluated and ranked for FY 2014 early next year. With an approved Facilities Plan and EID, CBCS may be in a position to jump ahead of other projects that are not as far along in their planning process. SRF Loans typically have a 20-30 year term with interest rates ranging from 1.0% to 2.0%.

Another financing option may be a United States Department of Agriculture (USDA) Rural Development Water and Waste Direct Loan. USDA's current rates are 3.375% for loans with terms up to 40 years. These loans also require that 1/10 of the annual payment be placed in a reserve account every year (in addition to the regular payments) for the first 10 years. The significantly higher interest rate for this option, makes the IDEQ SRF loan more desirable, however the USDA loan is a viable backup option for financing if funding from IDEQ is not available.

One option for loan repayment includes CBCS holding the loan and charging its members monthly fees or an annual assessment for debt service. A second option would include the formation of a Local Improvement District (LID) to assess each lot a share of the improvement cost. LID assessments could be paid as a lump sum or in monthly installments. However, formulation of an LID would first require CBCS to form a utility district. An LID is formed through a public hearing process, and an LID bond/loan is paid by assessments against real property which is benefited by the improvements.

6.5.3. Operation and Maintenance Requirements

O&M costs were summarized for Class C treatment and irrigation in Section 5.1.3. Esitimated total annual O&M cost is $71,000. The costs associated with O&M include but are not limited to collection system maintenance, treatment facility maintenance, operator expenses, power, chemicals and testing costs.

With implementation of the proposed reuse system and an updated classification evaluation, projected Public Wastewater System Classifications are:

- Treatment – Class I
- Treatment – Land Application
- Collection – Class I

Completed Wastewater Collection and Treatment Classification worksheets can be seen in **Appendix K**.

The current licensed operator of the system is Brenda Morris who has the following operator's licenses:

- Wastewater Treatment Operator Class I
- Wastewater Treatment Operator Land Application
- Wastewater Collection Operator Class I

6.5.4. Project Schedule

Following is an anticipated Schedule for project completion. This schedule is subject to change dependent on IDEQ review, environmental determination, land acquisition, permitting, and availability of funding.

• Submit Final Facilities Plan to IDEQ	October 2012
• Submit EID to IDEQ	October 2012
• Implement Financing Arrangements	November 2012-January 2013
• Accept Loan Offer	February 2013
• Project Design/Review	February 2013-August 2013
• Application for Permit Modification	September 2013
• Application for CUP	September 2013
• Complete Property Acquisition	February 2014
• Advertisement for Bids	March 2014
• Construction	May 2014-October 2015

APPENDIX A

Hydrogeologic Characterization

January 6, 2012

MONKS HYDRO-GEOSCIENCE
Hydrogeological Consulting
P.O. Box 362, Sandpoint, ID 83864

T-O Engineers
280 W. Prairie Ave.
Hayden, Idaho 83815

Attention: Mr. Scott McNee, P.E.

RE: HYDROGEOLOGIC CHARACTERIZATION OF CAVE BAY COMMUNITY SERVICES, INC. WASTEWATER SITE, KOOTENAI COUNTY, IDAHO

Dear Mr. McNee:

Monks Hydro-Geoscience (MHGS) is pleased to present T-O Engineers this hydrogeologic characterization of the area around the Cave Bay Community Services, Inc. (CBCS) wastewater lagoon in Kootenai County, Idaho. This report is based on MHGS's *"Proposal For Hydrogeologic Characterization of Cave Bay Community Services, Inc. Wastewater Site, Kootenai County, Idaho dated June 28, 2011"*. MHGS concludes that forest land application of wastewater at agronomic rates is more suitable for the CBCS site than rapid infiltration or shallow subsurface infiltration.

Project Background

The CBCS wastewater system is located on a peninsula that extends into Lake Coeur d'Alene between Cave Bay and 16 to 1 Bay. The CBCS wastewater system consists of two lagoons, a 0.5 MG aerated lagoon and a storage lagoon with a 2.6 MG capacity. These lagoons currently have no permitted method of discharge, and have relied on evaporation and seepage as their method of disposal. CBCS contracted with T-O Engineers (T-O) to prepare a Wastewater Facilities Plan for their wastewater system. T-O contracted with Monks Hydro-Geoscience to conduct a hydrogeologic characterization of the area around the CBCS facilities and to evaluate potential nutrient impacts to ground and surface water from rapid infiltration and subsurface shallow drip wastewater treatment systems.

Regional Hydrogeology

The CBCS facilities are located near the eastern edge of the Columbia River Basalt Plateau. The Columbia River Basalt Plateau forms an extensive plateau between the Cascade Mountains on the west and the western flank of the Rocky Mountains on the east. Lake Coeur d'Alene (summer pool elevation 2125' asl) and the CBCS facilities are within the St. Maries embayment, the northernmost of three embayments that are present in western Idaho (Camp et al., 1984). The Columbia River Basalts were extruded from vents in what is now northeastern Oregon. The basalt flowed across the landscape and dammed rivers flowing westward out of the mountains of what is now north-central Idaho. Fine-grained lacustrine sediments were deposited in the lakes that formed behind the basalt dams, and coarser grained alluvial sediments were deposited in and on the lacustrine sediments as the basalt dammed lakes drained. Later basalt flows covered the sedimentary layers, resulting in interlayered basalt flows and sedimentary deposits.

Basalt, by the nature of its formational processes, is extremely heterogeneous with respect to its hydraulic properties. Within a single flow, vertical and horizontal hydraulic conductivity can vary over a wide range. A typical basalt flow is pictured in Figure 1 on the following page. A typical basalt flow consists of a flow base, a colonnade section (columnar basalt), an entablature section of fractured basalt, and a flow top. The colonnade section with its signature columnar basalt is in the center of a flow and cooled slowly. The entablature section cools more rapidly and is more fractured. The flow top may be highly vesicular and fractured by movement of

the cooling basalt flow. Highly fractured flow tops, the sediments deposited on top of the flow, and the base of the overlying flow constitute an interflow zone.

In general, interflow zones (which typically make up about 5 to 10 percent of total flow thickness) have the highest hydraulic conductivities and form a series of superposed aquifers (Lindholm and Vaccaro, 1988). Ground water flow through the entablature and colonnade portions of a basalt flow is controlled by fractures. Fracture assemblages in entablature and colonnade tend to be better connected in the vertical direction, allowing ground water to move vertically between interflow zones. Water moves three dimensionally through all parts of a basalt flow. Lateral ground water movement occurs primarily in interflow zones, and vertical movement predominates in the central parts of flows (Lindholm and Vaccaro, 1988).

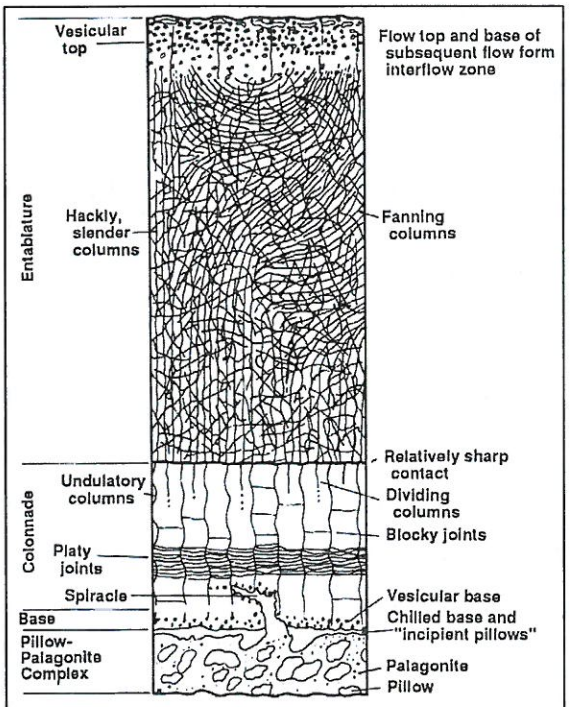


Figure 1. Intraflow structure in the Columbia River Basalt Group (Lindholm & Vaccaro, 1988)

The volcanic rocks and interlayered sediments of the Columbia River Basalt Plateau constitute a complex, heterogeneous and anisotropic ground water system. Permeable parts of basalt flows, and coarser-grained sedimentary deposits, constitute numerous small aquifers. Some of these aquifers are confined, others unconfined.

The hydraulic conductivity of basalts ranges over thirteen (13) orders of magnitude (Wood and Fernandez, 1988). The highest hydraulic conductivities in sequences of basalt flows usually occur in interflow zones. The hydraulic conductivity of Columbia Basalt interflow zones ranges over approximately 11 orders of magnitude, from approximately 5×10^{-9} m/day to 5×10^{3} m/day, with a median value of approximately 1×10^{-4} m/day.

Aquifers in the Columbia River Basalt Plateau are recharged primarily by precipitation. The part of precipitation that does not run off, evaporate, or transpire is available to recharge the ground water system. Recharge is generally greatest at higher altitudes where precipitation is greatest (Lindholm and Vaccaro, 1988). Lateral water movement in Columbia River Basalt Plateau aquifers is from areas of higher altitude toward the center of the structural basin where altitude is lowest. In the uppermost basalt flows ground water movement is further influenced by surface water features such as small streams and lakes, which typically constitute local drains.

Local Hydrogeology

The geology of the Worley Quadrangle is described by Breckinridge and Othberg (2005) and is shown in Figure 2 on the following page:

"The Worley Quadrangle is located on the west side of Coeur d'Alene Lake at the edge of the Columbia River Basalt Plateau and the Coeur d'Alene Mountains. Lake Coeur d'Alene is dammed by glacial flood gravels at the northern end near the City of Coeur d'Alene and provides substantial subsurface recharge to the Rathdrum Aquifer. Catastrophic outbursts of ice-age floods from Glacial Lake

Missoula inundated the present Coeur d'Alene Lake Basin to at least 2,600 feet in elevation, creating floodways between some of the tributary bays. The Setters Floodway crosses the Worley Quadrangle and was scoured by water flowing from Windy Bay across the watershed divide and into Rock Creek. The lake is fed by the St. Joe and Coeur d'Alene River systems and the outlet is the source of the Spokane River. The plateaus west of the lake are underlain by Miocene lave beds of the Columbia River Basalt Group. Gneissic rocks of the Precambrian Belt Supergroup and associated intrusive rocks of Cretaceous age form buttes that rise above the plateau lavas and control the flow of basalts into embayments. The eastern margin of the Columbia Plateau is covered by Miocene sediments and soils that is in turn blanketed by Palouse Loess that are progressively thicker toward the west."

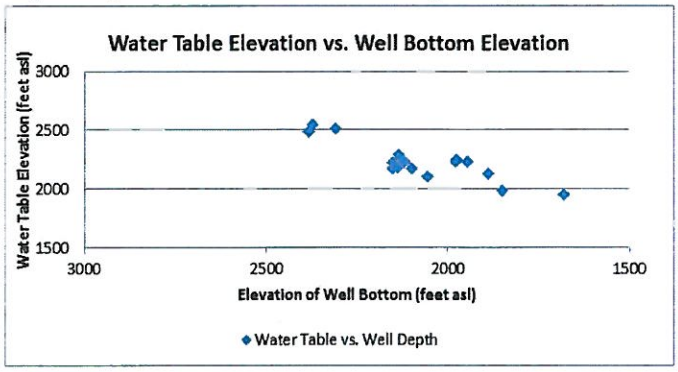
The CBCS wastewater facility and proposed wastewater re-use areas are located on flood-scoured basalt that is covered by a relatively thin layer of colluvium and flood deposited sediments. Breckinridge and Othberg (2005) describe the soils overlying the flood scoured basalt as stony clay loam of the Lacey-Bobbitt Association, 2 to 15 feet thick, with locally scattered flood erratics. Soil excavations described by ALLWEST Testing and Engineering LLC (2011) describe a thin (<0.7 foot thick) layer of topsoil overlying 1.5 to 6.5 feet of colluvium consisting of sandy silt and gravel. The top soil and colluvium overlie angular basalt cobbles that may represent fractured basalt bedrock. Ground water was not encountered in any of the test pits, and there were no indications that seasonal high ground water occurs in the vicinity of the pits. The soil samples were described as silty sand, sandy silt, and lean clay with sand.

Well Driller's Reports for wells drilled in the Cave Bay area describe unconsolidated sediments of varying thickness overlying basalt. Based on a review of Well Driller's Reports for wells drilled in the Cave Bay area, the stratigraphy in the Cave Bay area consists of an upper basalt, upper interflow zone, middle basalt, middle interflow zone, lower basalt, and deep interflow zone.

At the Genagco, Inc. well, about 3,300 feet west of the Cave Bay facilities, the uppermost of these interflow zones occurs at 270 to 345 feet below ground surface and the middle interflow zone at 437 – 450 feet. The top of the upper interflow zone occurs at an elevation of approximately 2315 feet, and the top of the middle interflow zone is at an elevation of approximately 2150'. At the Glen Miles well, approximately 1.7 miles south-southwest of the Cave Bay facilities, the top of the upper interflow zone occurs at an elevation of approximately 2350 feet, an elevation similar to that of the Cave Bay facilities.

The Virgil Carrol and Mowry State Park wells are collared at lower elevations and are drilled through the middle interflow zone, the lower basalt, and into the deeper interflow zone. In the Virgil Carrol and Mowry State Park wells, the top of the lower interflow zone occurs at an elevation of about 1980'.

Depth to water and water table elevation vary depending on well location and well depth. Depth to water ranges from 12 to 350 feet below ground surface. Plotting water table elevation versus well bottom elevation (see figure to right) shows that head decreases with depth. This suggests that there is a downward component to ground water flow in the Cave Bay area, and that the Cave Bay area is in a regional ground water recharge zone. This is consistent with the conceptual model for recharge and discharge described by Lindholm and Vaccaro (1988).



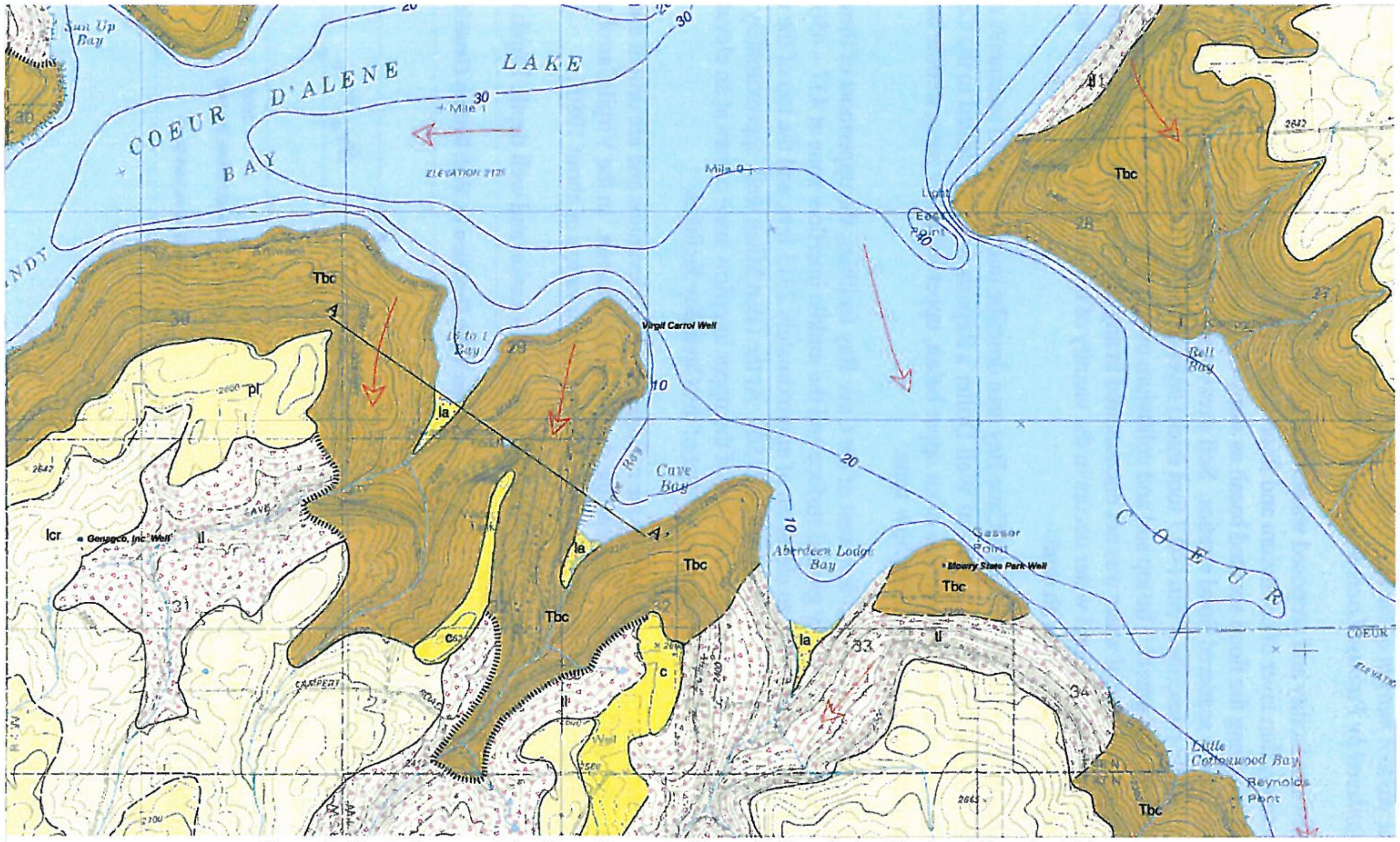


Figure 2. Geologic map of the Cave Bay area, Coeur d'Alene Lake, Kootenai County, Idaho.

DESCRIPTION OF MAP UNITS

ALLUVIAL AND LACUSTRINE DEPOSITS

a — Alluvium (Holocene)

la — Lacustrine sediments and alluvium (Holocene)

Ts — Lag sediments and gravels on relict alluvial surfaces (Tertiary)

EOLIAN DEPOSITS

pl — Palouse Formation loess (Pleistocene and Holocene)

lcr — Loess, colluvium, and residuum (Holocene and late Pleistocene)

COLLUVIUM AND LANDSLIDE DEPOSITS

Talus and landslide deposits of Columbia River Basalt Group (Holocene and late Pleistocene)

c — Colluvium and common small rock outcrops (Quaternary)

cb — Colluvium and bedrock that form linear, erosion-resistant ridges (Quaternary)

FLOOD-SCOURED BEDROCK

Tbc — Basalt scoured by Missoula Floods (Miocene)

Cave Bay Wastewater Facility Site Hydrogeology

The CBCS wastewater facilities and the adjoining areas investigated for this report are located on flood scoured basalts that are covered by a layer of colluvium. The bench the facilities lagoons are located on was likely formed by preferential erosion of an interflow zone during the Spokane Floods. The flood-scoured interflow zone and basalts have been covered by colluvium, talus, and possibly small landslide deposits. Based on Well Driller's Report for wells in the Cave Bay area, the stratigraphy consists of: the basalt flow that forms the steep hillside and ridge above the facilities; an eroded interflow zone that is covered with colluvium; another basalt flow; a middle interflow zone; a lower basalt; and a lower interflow zone (See Geologic Cross Section A – A' in Figure 3 to the right).

Precipitation and/or applied wastewater that is not evapotranspired is expected to move vertically through the unsaturated zone in the colluvium to the upper interflow zone, where a perched aquifer with some horizontal ground water flow may exist. However, based on the downward hydraulic gradient that exists in this area, most of the flow through the upper interflow zone is likely downward through the middle basalt, the middle interflow zone, and the lower basalt to the lower interflow zone. If there is horizontal ground water flow in the upper or middle interflow zones, that flow would be expected to discharge to surface water. Potential surface water receptors are the stream flowing into 16:1 Bay and/or Lake Coeur d'Alene at 16:1 or Cave Bay.

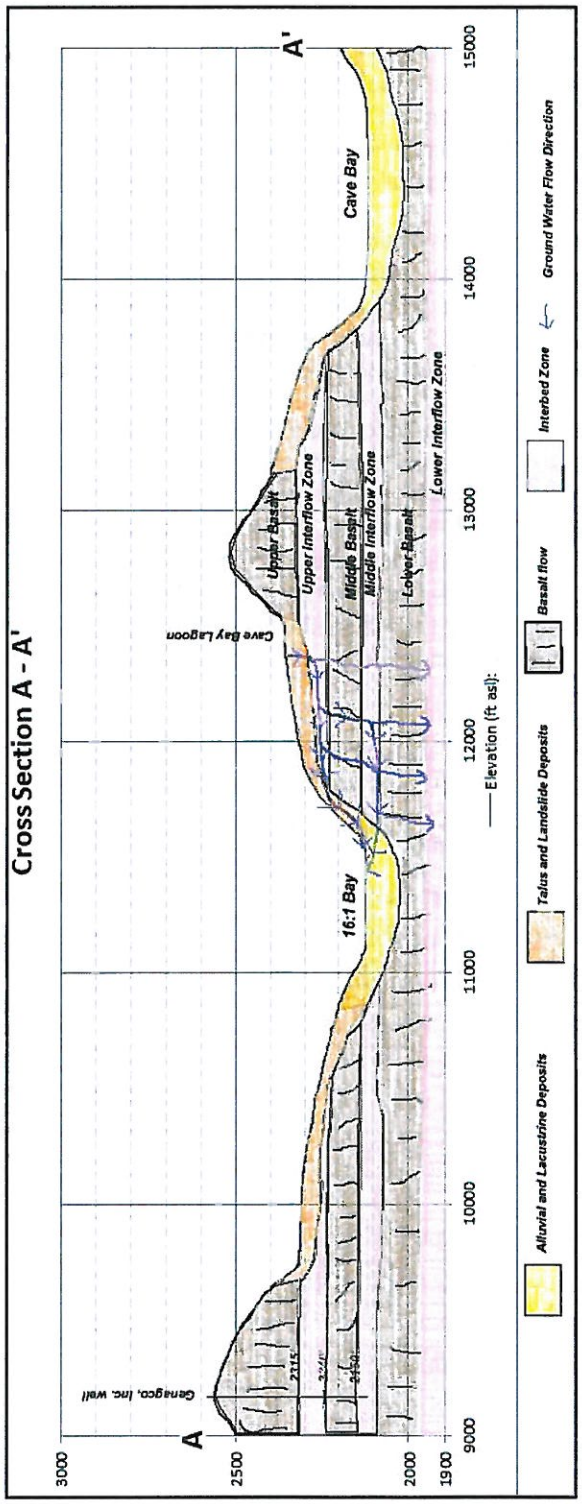


Figure 3. Geologic Cross Section A - A'

Nutrient-Pathogen Analysis

The DEQ Level 1 Nutrient-Pathogen Evaluation Nitrogen Mass-Balance Spreadsheet (DEQ, 2002) was used to model potential ground water impacts from subsurface wastewater disposal methods such as Rapid Infiltration and subsurface drip irrigation. The spreadsheet uses a mass-balance approach to calculate the average down gradient nitrate concentration in ground water after the wastewater effluent, recharge from natural precipitation, and ground water have mixed completely.

For the purposes of this Nutrient-Pathogen Analysis, wastewater is assumed to follow a flow path that is primarily vertical from the land surface, through the unsaturated colluvium, upper interflow zone, down through the middle basalt unit, to the middle interflow zone. Ground water flow in the middle interflow zone is assumed to be to the northeast, towards Lake Coeur d'Alene. The middle interflow zone is assumed to discharge to 16 to 1 Bay on Lake Coeur d'Alene north of the CBCS facility.

The parameters used to model potential impacts in the mass-balance spreadsheet are shown in Table 1 below. Four different hydrogeologic scenarios were modeled using four values for hydraulic conductivity and two values for hydraulic gradient. These three scenarios are referred to as "Low K", "Medium K", "High K", and "Very High K", where K is the symbol for hydraulic conductivity. The "Low" through "Very High" labels are relative to each other and are not relative to the full scale of the range of hydraulic conductivities for interflow zones from Wood and Fernandez (1988). The hydraulic conductivity values used in the N-P Evaluation are at the upper end of the full scale of the range of hydraulic conductivities for interflow zones from Wood and Fernandez (1988), representing a range of from 1 x 10^{-1} m/day to 1 x 10^{2} m/day.

The Nutrient-Pathogen Evaluation represents Projected Build-out conditions as specified by T-O Engineers (Scott McNee, personal communication).

Table 1. Parameters used in Nutrient-Pathogen Evaluation Spreadsheet

Parameter (units):	Value used:	Justification:
Hydraulic Conductivity (ft/day):	0.328 to 328	Wood and Fernandez (1988)
Hydraulic Gradient (ft/ft):	0.01 & 0.005	estimated
Mixing Zone Thickness (ft):	15	Default value
Aquifer Width (ft):	1250	½ of estimated cross section width
Parcel Area (acres):	15	estimated
Percent impervious (%):	1	estimated
# of ERUs:	220	T-O Engineers
Design Flow (gpd/ERU):	64	T-O Engineers
Natural Recharge Rate (in/yr):	3.84	Calculated using Plummer Precip data
Upgradient Groundwater N (mg/L):	1	estimated
Wastewater Effluent N (mg/L):	20	estimated value for treated effluent
Denitrification Rate (%):	0.4	Estimated (table 9.2 DEQ Guidance)
Nitrate in natural recharge (mg/L):	0.3	Default value

The results of the Nutrient-Pathogen Evaluation are summarized in Tables 2 and 3 below. In both tables, the results are presented as a percent of the annual budget for the parameter being modeled, either water volume or mass of Nitrogen. The yearly water budget is shown in Table 2. In the Low K scenario, the percent of the yearly water budget for ground water is very low, only 2.5%. Increasing hydraulic conductivity, as in the Medium, High, and Very High K scenarios, increases the volume of ground water flowing beneath the site. The volumes of effluent and natural recharge are fixed for all three scenarios. As the volume (and %) of ground water flow increases, the percent of the annual water budget represented by effluent and natural recharge both decrease. In the Very High K scenario the average down-gradient nitrate level is 1.6 mg/l, an increase of 0.8 mg/L above background. All of the modeled scenarios suggest that rapid infiltration or subsurface shallow drip wastewater treatment systems could result in statistically significant lowering of ground water quality.

Table 2. Yearly Water Budget for Modeled Scenarios.

Scenario:	Yearly Water Budget			
	Ground Water %	Effluent %	Natural Recharge %	Average Down-gradient Nitrate Conc. (mg/L)
Low K (10^{-1} m/day)	2.5	75.0	22.6	9.1
Medium K (10^{0} m/day)	20.1	61.4	18.5	7.6
High K (10^{1} m/day)	71.5	21.9	6.6	3.4
Very High K (10^{2} m/day)	92.6	5.7	1.7	1.6

The annual nitrogen budget is shown in Table 3. Ground water in the lower interflow zone is assumed to have a concentration of 1 mg/L nitrate nitrogen and natural precipitation is assumed to have a nitrogen concentration of 0.3 mg/L nitrate nitrogen. As hydraulic conductivity and the volume of ground water flowing through the interflow zone increases, the percent of the total nitrogen budget represented by wastewater effluent decreases.

Table 3. Yearly Nitrogen Budget (%) for Modeled Scenarios.

Scenario:	% of Yearly Nitrogen Budget		
	Ground Water N %	Effluent N %	Natural Recharge N %
Low K	0.3	99.0	0.7
Medium K	2.6	96.6	0.7
High K	21.3	78.1	0.6
Very High K	57.5	42.2	0.3

Conclusions

Hydrogeologic conditions at the CBCS wastewater facility impose limits on wastewater treatment options. The presence of low permeability soils in the shallow subsurface and the presence of nearby surface water features may limit the use of a rapid infiltration and subsurface drip irrigation systems. Low permeability, near-surface soils may result in ground water mounding problems. Nearby surface

water features, if hydrologically connected with shallow ground water, may require expensive and time consuming permitting processes.

Some uncertainty exists regarding the hydrogeological conceptual model for the CBCS wastewater facility area. The flow path that wastewater discharged to the subsurface at the CBCS facility would take is dependent on site-specific conditions. Under certain conditions, some wastewater may discharge to nearby surface water features. Most ground water

Under the right site-specific conditions, some portion of the wastewater from a Rapid Infiltration system could discharge to nearby surface waters. Discharge to surface water would require an NPDES permit. Acquiring an NPDES permit would be an expensive and time consuming process. It is unlikely that an NPDES permit for discharge to Coeur d'Alene Lake would be issued.

Ground water flow beneath the site is most likely dominated by the regional downward hydraulic gradient. If this is the case, most of the wastewater would be expected to move primarily downward, through the sequence of basalt flows and interflow zones to a deeper, higher hydraulic conductivity interflow zone. If ground water movement is primarily downward to a deeper aquifer, then rapid infiltration could be a viable option. An investigation to determine site-specific hydrogeologic conditions would probably require drilling at least one monitoring/test well and would be fairly expensive.

Subsurface disposal of wastewater, whether by rapid infiltration or subsurface shallow drip irrigation, has the potential to impact water quality in surface and ground water at the CBCS facility. Mass-balance modeling indicates that rapid infiltration or subsurface shallow drip wastewater treatment systems could result in statistically significant lowering of ground water quality. Subsurface disposal of wastewater would likely require an expensive subsurface site investigation, the results of which could be unfavorable.

Forest land application of wastewater at agronomic rates may be a more suitable wastewater treatment method than rapid infiltration or shallow subsurface drip irrigation. If you have any questions please call me at 208-263-1991.

Sincerely,

John Monks, P.G.

Hydrogeologist

References Cited:

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Wood, W. W., and Fernandez, L. A., 1988, Volcanic Rocks, *in* Back, W., Rosenheim, J.S., and Seaber, P. R., eds., Hydrogeology, Boulder Colorado, Geological Society of America, The Geology of North America, v. O-2.

WELL DRILLER'S REPORTS

RECEIVED 3/3/00 dd

Form 238-7 11/97 FEB 07 2000

IDWR/North

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Inspected by _____
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D 0010939
DRILLING PERMIT NO. ____-____-____-____
Other IDWR No. 754964

2. OWNER:
Name State of ID Department of Parks & Rec
Address PO BOX 83720
City Boise State ID Zip 83720

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

POSTED

N / W / E / S — X

Twp. 48 North ☒ or South ☐
Rge. 04 East ☐ or West ☒
Sec. 32 NW 1/4 (10 acres) SE 1/4 (40 acres) ____ 1/4 (160 acres)
Gov't Lot ____ County ____
Lat: : : Long: : :
Address of Well Site Mowry State Park
City ____
(Give at least name of road + Distance to Road or Landmark)

Lt. ____ Blk. ____ Sub. Name ____

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ____

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
Cemment	5	21	20 bgs	Tremmy

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 21
Was drive shoe seal tested? ☒ Y ☐ N How? Air

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
8	.5	21	.322	Steel	☒	☐	☐	☐
6	2	195	.280	Steel	☒	☐	☐	☐
5	192	195	.280	Steel	☒	☐	☐	☐

Length of Headpipe 3 Length of Tailpipe ____

9. PERFORATIONS/SCREENS
Perforations Method ____
Screens Screen Type Stainless Steel

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
195	200	.030		5	S.S.	☐	☐
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
165 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices: ____

11. WELL TESTS:
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
20			

Water Temp. ____ Bottom hole temp. ____
Water Quality test or comments: ____
Depth first Water Encounter 165

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
12	0	4	Silt		X
12	4	7	Silty Sand		X
12	7	11	Sand and Gravel		X
12	11	14	Basalt Black AND Brown Fractured		X
12	14	21	Basalt Black Hard		X
8	21	22	Basalt Black Hard		X
8	22	25	Basalt Brown W/Clay		X
8	25	36	Clay Orange W/Basalt		X
8	36	42	Basalt Black And Brown Fractured W/Clay		X
8	42	60	Basalt Black Vesecular		X
8	60	146	Basalt Black W/Brown Medium		X
8	146	153	Basalt Grey Hard		X
8	153	158	Basalt Grey Medium		X
8	158	205	Sand	X	
8	205	265	Clay		X
8	265	270	Clay W/Sand		X
8	270	289	Clay		X
8	289	300	Basalt Black Vesecular		X
	250	300	Back Filled W/Pea Gravel		
	225	250	Back Filled Pea Gravel And Bentonite		
	220	225	Back Filled Bentonite Hole Plug		
	200	220	Back Filled Pea Gravel		

Completed Depth 200' (Measurable)
Date: Started 11-8-99 Completed 12-8-99

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Fogle Pump & Supply Firm No. 537

Firm Official ____ Date ____
and
Driller or Operator [signature] Date 1/12/2000
(Sign once if Firm Official & Operator)

48N 4W 32 FORWARD WHITE COPY TO WATER RESOURCES

Form 238-7 1/79

RECEIVED APR 5 1984 Department of Water Resources

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

USE TYPEWRITER OR BALLPOINT PEN

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1. WELL OWNER
Name Virgil Carroll
Address Box-141016 Spokane WA.
Owner's Permit No. @ 95-83-N-14

2. NATURE OF WORK
☑ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning) _____

3. PROPOSED USE
☑ Domestic ☐ Irrigation ☐ Test ☐ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☐ Other _____ (specify type)

4. METHOD DRILLED
☑ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION
Casing schedule: ☑ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
1/4 inches	6 inches +	1 feet	19 feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet

Was casing drive shoe used? ☑ Yes ☐ No
Was a packer or seal used? ☐ Yes ☑ No
Perforated? ☐ Yes ☑ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

Number	From	To
_____ perforations	_____ feet	_____ feet
_____ perforations	_____ feet	_____ feet
_____ perforations	_____ feet	_____ feet

Well screen installed? ☐ Yes ☑ No
Manufacturer's name _____
Type _____ Model No. _____
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Gravel packed? ☐ Yes ☑ No ☐ Size of gravel _____
Placed from _____ feet to _____ feet
Surface seal depth 19 Material used in seal: ☐ Cement grout
Bentonite ☑ Puddling clay ☐ Well cuttings
Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing
☑ Overbore to seal depth
Method of joining casing: ☐ Threaded ☑ Welded ☐ Solvent Weld
☐ Cemented between strata
Describe access port 1/4" Dia. pipe

MICROFILMED

6. LOCATION OF WELL
Sketch map location must agree with written location.

Subdivision Name _____
Lot No. _____ Block No. _____
County Kootenai 4W
NE¼ NE¼ Sec. 3, T. 48 N, R. 4 W.M.

7. WATER LEVEL
Static water level 246 feet below land surface.
Flowing? ☐ Yes ☑ No G.P.M. flow _____
Artesian closed-in pressure _____ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature _____ °F. Quality _____

8. WELL TEST DATA
☐ Pump ☐ Bailer ☑ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped

Approx-100 GPM

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
6"	0	2	Loamy Top Soil		
	2	8	Brn. Clay (Firm)		
	8	42	Basalt-Hard w/ Fractures		
	42	48	Brn. Clay - Firm		
	48	60	Cinders		
	60	140	Basalt-Hard w/ Fractures		
	140	225	Hard Basalt -		
	225	230	Brn. Clay Frag. Basalt		
	230	232	Gray Clay - Firm		
	232	235	Red & Brn. Clay		
	235	240	Brn. Clay - (Firm)		
	240	245	Yellow Clay - (Firm)		
	245	275	Lt. Gray Clay - Firm		
	275	322	Quarter Sand - Brown	—	
	322	360	Water Bearing		
	322	360	Dk. Brn Clay - Firm		
	360	405	Sandstone - Hard & Water	—	
	405	418	Hard Basalt		
	418	455	Basalt Fractured		
	455	520	Sand Stone		

RECEIVED MAR 29 Department of Water Resources Northern

10. Work started 4-4-83 finished 10-6-83

11. DRILLERS CERTIFICATION DR
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.
Firm Name J & J Drilling Inc Firm No. 319
Address 5613 S. Linka Rd Date _____
Spokane, WA. 99016
Signed by (Firm Official) _____
and
(Operator) _____

USE ADDITIONAL SHEETS IF NECESSARY — FORWARD THE WHITE COPY TO THE DEPARTMENT

RECEIVED
SEP 26 2008
IDWR/North

Form 238-7 **IDAHO DEPARTMENT OF WATER RESOURCES**
WELL DRILLER'S REPORT

Office Use Only
Well ID No
Inspected by
Twp ___ Rge ___ Sec ___
___ 1/4 ___ 1/4
Lot: Lots:

1. WELL TAG NO. D0855307
DRILLING PERMIT NO. 853308
Water Right or Injection Well No.
2. OWNER:
Name: Geltagle Inc.
Address: 271 Smyrna Road
City Bonners State: Ida Zip: 83178
3. LOCATION OF WELL by legal description.
Twp 48N
Rge. 04W
Sec 30 SE 1/4 SE 1/4
Gov't Lot County Kootenai
Address of well site: E Windy Bay, Flanders Road
City: Worley
4. USE: Domestic
5. TYPE OF WORK: New Well
6. DRILL METHOD: Air Rotary
7. SEALING PROCEDURES:

Seal Material	From	To	Wt/Volume	Seal Placement Method
Bentonite	0	98	750 lbs	pour

Was drive shoe used? yes Shoe Depth 98'
Was drive shoe seal tested? yes How? air

Diameter	From	To	Gauge	Material	Casing or Liner	Welded or Threaded
8"	+2	98	250	steel	casing	welded
4"	NO LINER			PVC	liner	glued

Length of Headpipe Length of Tailpipe
Packer? NO
9. PERFORATIONS/SCREENS PACKER TYPE:
Perforation Method NA
Screen Type & Method of Installation

From	To	Slot Size	Number	Diam.	Material	Casing or Liner
NO LINER					PVC	liner

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
280 ft below ground Artesian pressure lb
Depth flow encountered 250 ft.
Describe access port or control device: cap

12. WELL TESTS:
[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian

Yield gal/min	Drawdown	Pumping Level	Time
2			2 hr

Water Temp 51° Bottom Hole Temp
Water Quality test comments: good, slightly cloudy
Depth first water encountered 280

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: (Lithology, water quality & temp.)	Water Y/N
8"	0 ft.	2 ft.	Brown Dirt	
8"	2 ft.	7 ft.	Brown Clay	
8"	7 ft.	23 ft.	Broken Basalt	
8"	23 ft.	27 ft.	Brown Dirt and Basalt	
8"	27 ft.	59 ft.	Med. Hard Basalt	
8"	59 ft.	72 ft.	Broken Basalt	
8"	72 ft.	120 ft.	Hard Basalt	
8"	120 ft.	135 ft.	Med. Hard Basalt	
8"	135 ft.	245 ft.	Hard Black Basalt	
8"	245 ft.	270 ft.	Soft Decomp. Basalt with Voids	
8"	270 ft.	285 ft.	Brown clay & basalt	
8"	285 ft.	305 ft.	Brown clay and sand	
8"	305 ft.	345 ft.	brown clay and basalt	
8"	345 ft.	370 ft.	Broken Basalt	
8"	370 ft.	430 ft.	Hard Basalt	
8"	430 ft.	437 ft.	Soft basalt	
8"	437 ft.	450 ft.	fine brown sand	
			Note: Filled hole to 375 with basalt cuttings Customer did not want her	

Completed Depth 375 ft. Measurable 375
Date Started 9/5/08 Completed 9/15/08

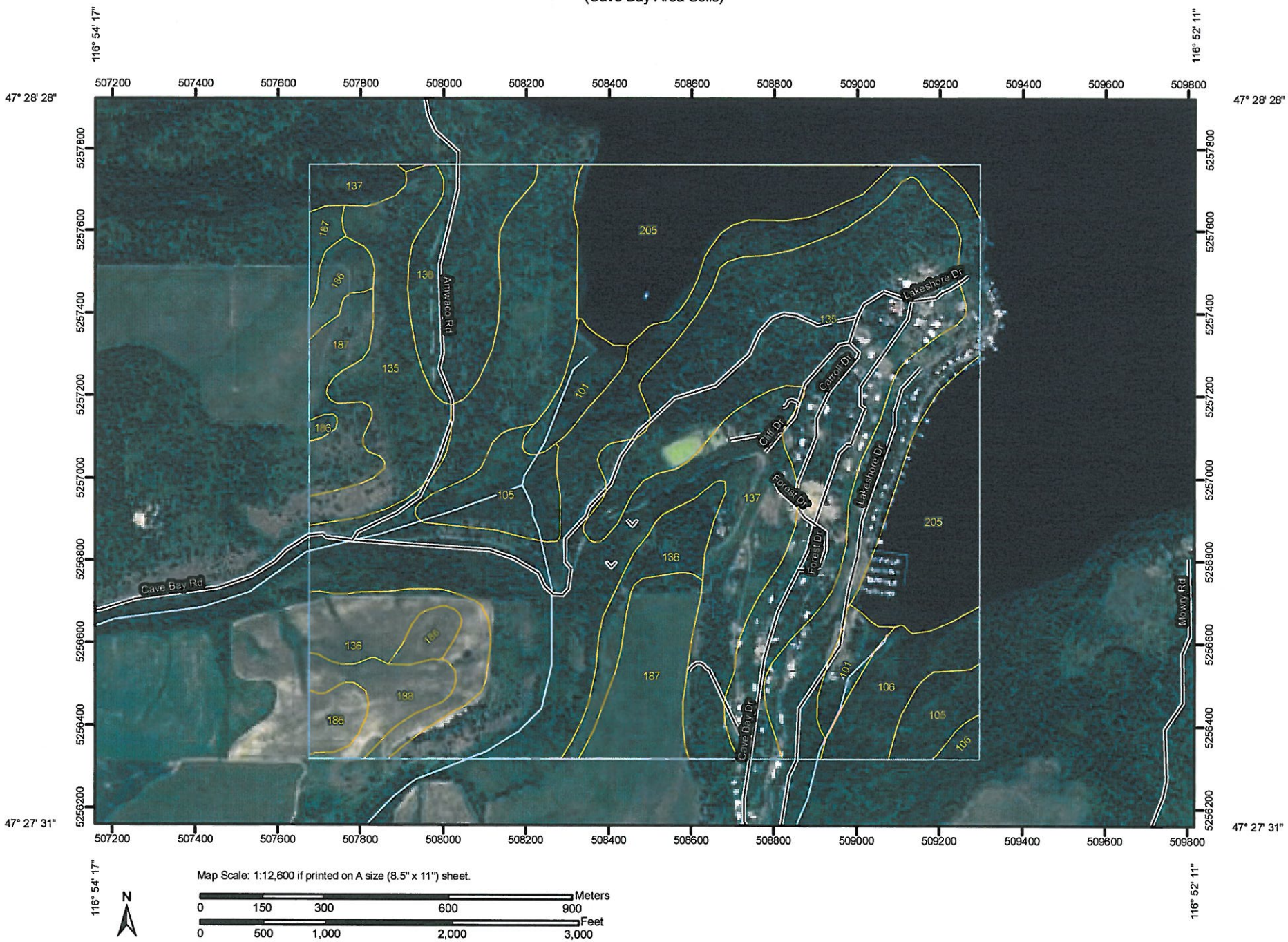
14. DRILLER'S CERTIFICATION
Company Name: ALL-WAYS DRILLING, INC
FIRM #: 510
Principal Driller [signature] Date 9/24/08
Driller or Operator 2 Date
Operator 1 [signature] Date 9/24/08

48N 04W 30

APPENDIX B

NRCS Web Soil Survey Information

Soil Map—Kootenai County Area, Idaho
(Cave Bay Area Soils)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:12,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kootenai County Area, Idaho
Survey Area Data: Version 6, Jan 31, 2008

Date(s) aerial images were photographed: 6/21/2004

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Kootenai County Area, Idaho (ID606)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
101	Aquic Xerofluvents, nearly level	13.4	2.3%
105	Blinn stony loam, 5 to 35 percent slopes	22.0	3.8%
106	Blinn stony loam, 35 to 65 percent slopes	17.0	2.9%
135	Lacy-Rock outcrop complex, 5 to 35 percent slopes	136.4	23.6%
136	Lacy-Bobbitt association, 5 to 35 percent slopes	58.4	10.1%
137	Lacy-Bobbitt association, 35 to 65 percent slopes	194.2	33.6%
186	Taney silt loam, 3 to 7 percent slopes	14.4	2.5%
187	Taney silt loam, 7 to 25 percent slopes	36.4	6.3%
188	Taney silt loam, 3 to 25 percent slopes, eroded	10.7	1.9%
205	Water	75.2	13.0%
Totals for Area of Interest		**578.1**	**100.0%**

Kootenai County Area, Idaho

135—Lacy-Rock outcrop complex, 5 to 35 percent slopes

Map Unit Setting

Elevation: 1,500 to 3,200 feet
Mean annual precipitation: 22 to 28 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 140 days

Map Unit Composition

Lacy and similar soils: 55 percent
Rock outcrop: 35 percent

Description of Lacy

Setting

Landform: Canyons, plateaus
Landform position (two-dimensional): Shoulder, summit
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess and/or colluvium over bedrock derived from basalt

Properties and qualities

Slope: 5 to 35 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability (nonirrigated): 6e

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 8 inches: Stony loam
8 to 15 inches: Stony clay loam
15 to 20 inches: Very stony clay loam
20 to 30 inches: Unweathered bedrock

Description of Rock Outcrop

Properties and qualities

Slope: 5 to 35 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability (nonirrigated): 8

Typical profile
0 to 60 inches: Unweathered bedrock

Data Source Information

Soil Survey Area: Kootenai County Area, Idaho
Survey Area Data: Version 6, Jan 31, 2008

Kootenai County Area, Idaho

136—Lacy-Bobbitt association, 5 to 35 percent slopes

Map Unit Setting

Elevation: 1,500 to 3,200 feet
Mean annual precipitation: 22 to 28 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 140 days

Map Unit Composition

Lacy and similar soils: 55 percent
Bobbitt and similar soils: 35 percent

Description of Lacy

Setting

Landform: Canyons, escarpments
Landform position (two-dimensional): Summit, shoulder
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess and/or colluvium over bedrock derived from basalt

Properties and qualities

Slope: 5 to 35 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability (nonirrigated): 6e

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 8 inches: Stony loam
8 to 15 inches: Stony clay loam
15 to 20 inches: Very stony clay loam
20 to 30 inches: Unweathered bedrock

Description of Bobbitt

Setting

Landform: Mountain slopes, escarpments
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and/or loess over colluvium over bedrock derived from basalt

Properties and qualities

Slope: 5 to 35 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability (nonirrigated): 6e

Typical profile

0 to 1 inches: Moderately decomposed plant material
1 to 11 inches: Stony loam
11 to 36 inches: Very stony clay loam
36 to 46 inches: Unweathered bedrock

Data Source Information

Soil Survey Area: Kootenai County Area, Idaho
Survey Area Data: Version 6, Jan 31, 2008

Kootenai County Area, Idaho

137—Lacy-Bobbitt association, 35 to 65 percent slopes

Map Unit Setting

Elevation: 1,500 to 3,200 feet
Mean annual precipitation: 22 to 28 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 140 days

Map Unit Composition

Lacy and similar soils: 55 percent
Bobbitt and similar soils: 35 percent

Description of Lacy

Setting

Landform: Canyons, escarpments
Landform position (two-dimensional): Backslope, shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess and/or colluvium over bedrock derived from basalt

Properties and qualities

Slope: 35 to 65 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability (nonirrigated): 7e

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 8 inches: Stony loam
8 to 15 inches: Stony loam
15 to 20 inches: Very stony clay loam
20 to 30 inches: Unweathered bedrock

Description of Bobbitt

Setting

Landform: Mountain slopes, escarpments
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and/or loess over colluvium over bedrock derived from basalt

Properties and qualities

Slope: 35 to 65 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability (nonirrigated): 7e

Typical profile

0 to 1 inches: Moderately decomposed plant material
1 to 11 inches: Stony loam
11 to 36 inches: Very stony clay loam
36 to 46 inches: Unweathered bedrock

Data Source Information

Soil Survey Area: Kootenai County Area, Idaho
Survey Area Data: Version 6, Jan 31, 2008

Kootenai County Area, Idaho

187—Taney silt loam, 7 to 25 percent slopes

Map Unit Setting

Elevation: 2,300 to 3,900 feet
Mean annual precipitation: 24 to 27 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 100 to 130 days

Map Unit Composition

Taney and similar soils: 75 percent

Description of Taney

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Volcanic ash and/or loess

Properties and qualities

Slope: 7 to 25 percent
Depth to restrictive feature: 26 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.7 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 21 inches: Silt loam
21 to 26 inches: Silt loam
26 to 60 inches: Silty clay loam

Data Source Information

Soil Survey Area: Kootenai County Area, Idaho
Survey Area Data: Version 6, Jan 31, 2008

APPENDIX C

Geotechnical Evaluation

GEOTECHNICAL ENGINEERING EVALUATION
WASTEWATER FACILITIES PLAN
CAVE BAY COMMUNITY SERVICES, INC
KOOTENAI COUNTY, IDAHO

March 15, 2012

ALLWEST
Testing & Engineering

ALLWEST
Testing & Engineering

Materials Testing
Geotechnical Engineering
Environmental Services

March 15, 2012

Mr. Scott McNee, P.E.
T-O Engineers
280 W. Prairie Avenue
Coeur d'Alene, Idaho 83815

RE: Geotechnical Engineering Evaluation
Wastewater Facilities Plan
Cave Bay Community Services, Inc.
Kootenai County, Idaho
ALLWEST Project No. 111-224G

Dear Mr. McNee:

ALLWEST Testing & Engineering, LLC (ALLWEST) has completed the authorized geotechnical evaluation for the proposed improvements to the wastewater facilities for Cave Bay Community Services (CBCS) in Kootenai County, Idaho. The purpose of this evaluation was to assess the soil and geologic conditions for the potential expansion of the storage lagoons and the installation of a land application system. The expansion of the wastewater system will be completed on Cave Bay Community Services, Inc. (CBCS) property and adjacent properties.

SCOPE OF WORK

Our scope of work was completed in accordance with our proposal dated June 27, 2011 with a reduced number of test pits and corresponding laboratory tests. Specifically, we completed the following scope of work:

1. Completed a site reconnaissance by walking the project area and observing exposed soil conditions, vegetation, surface drainage and erosion features.

2. Reviewed the USDA Natural Resources Conservation Service and Idaho Geologic Survey mapping information for the project site area.

3. Observed the excavation of four test pits on the CBCS property and two test pits on the adjacent property owned by Stephen Dreher. Logged the soil profiles and collected bulk soil samples from the test pits.

4. Installed 2-inch-diameter piezometers in the test pits. Ground water was not encountered in the test pits at the time of excavation.

5. Performed laboratory tests to assess the gradation, Atterberg limits, maximum dry density and optimum moisture content for soil samples form the test pits.

6. Reviewed the results of the field evaluation and laboratory testing with respect to the proposed improvements to the wastewater facilities.

7. Prepared this final report.

PROPOSED CONSTRUCTION

We understand the improvements to the existing wastewater facilities will likely include the installation of a land application system and the expansion of the two lagoons. The expansion of the lagoons may include raising the height of the embankments or the construction of a new cell.

SITE CONDITIONS

The natural topography in the area of the existing lagoons and the Dreher property consists of gently to steeply sloping hillsides. Vegetation on the properties consists of a moderately dense stand of evergreen trees with an undergrowth of deciduous bushes and native grasses and weeds.

GENERAL GEOLOGIC CONDITIONS

The geologic conditions in the area of the CBCS and Dreher properties were mapped on the Idaho Geologic Survey Geologic Map of the Worley Qaudrangle, Idaho by Breckenridge and Othberg, 2005. The mapping indicates the bedrock geology is Columbia River basalt with Latah Formation interbeds. The surficial geology consists of colluvial deposits of basalt and aeolian deposits of loess.

GENERAL SOIL CONDITIONS

The USDA Natural Resource Conservation Service (NRCS) (formerly known as the Soil Conservation Service) has mapped the soils on and around the property in the Soil

Survey of Kootenai County, 1981 as Lacy-rock outcrop complex and Lacy-Bobbitt association. The Lacy-rock outcrop complex is located on rolling to steep mountainsides and canyon positions where basalt bedrock outcrops. The typical soil profile is very stony clay loam. The Lacy soil is described as shallow, well-drained soil formed in material weathered from basalt and a small amount of loess in the upper part of the profile. The permeability is estimated to be moderate and run-off is rapid. The water erosion hazard is very high. The rock outcrop is made up of exposures of bare basalt bedrock, with a few inches of soil over the bedrock in some areas. Crevices in the rock contain some soil material.

The soil conditions found on the Dreher property, where land application is anticipated, is mapped as Lacy-Bobbitt Association. The Lacy soils are described as shallow, well-drained soil formed in material weathered from basalt and a small amount of loess in the upper part of the profile. The permeability is estimated to be moderate and run-off is rapid. The water erosion hazard is very high. The Bobbitt soil is described as moderately deep, well-drained soil formed in material weathered from basalt and a thin mantle of loess and volcanic ash. The permeability is estimated to be moderate.

EXPLORATION AND SAMPLING

Six test pits were excavated on the property on October 25, 2011. The approximate locations of the test pits are shown on the Test Pit Location Map in Appendix A of this report. The test pits were excavated by a rubber-tired backhoe using a 30-inch-wide bucket. The soil conditions encountered in the test pits were visually described and classified in general accordance with ASTM D 2487 and D 2488 and the subsurface profiles were logged. Bulk soil samples were obtained from the test pits excavations. The test pits were loosely backfilled at the conclusion of the field evaluation. The backfill will consolidate with time. If the test pits are located within structural areas or within proposed lagoons, the backfill should be re-excavated and the materials replaced and compacted to a minimum of 92 percent of the maximum dry density as determined by ASTM D 1557 (Modified Proctor).

SUBSURFACE CONDITIONS

Topsoil was encountered at the ground surface in each of the test pit locations. The depth of topsoil ranged from 4 to 9 inches. Four test pits were completed in the area of the existing wastewater lagoons, TP-1 through TP-4. In those test pits, underlying the topsoil we encountered colluvium consisting of silty gravel, sandy silt and silt with gravel. The colluvium was light brown in color and the relative density ranged from medium dense to dense. The relative moisture content ranged from humid to moist. Underlying the colluvium in TP-2 and TP-3 is silty clay described as dark brown. The

relative density of the silty clay is stiff to very stiff. The color was described as dark brown and the relative moisture content was described as moist.

Two test pits were excavated on the Dreher property, TP-5 and TP-6. In those test pits, underlying the topsoil, we encountered colluvium ranging from sandy silt, gravel with silt, poorly graded gravel and gravel with silt and sand. The colluvium was described as light brown. The relative density of the colluvium was described as medium dense to dense with a relative moisture content ranging from humid to damp.

Ground water was not encountered in the test pits at the time of excavation. Piezometers were installed in the test pits to monitor ground water levels. The piezometers were 2-inch-diameter PVC pipes drilled with ¼-inch-diameter holes at approximately 6 inches on center. The test pits were back filled around the piezometers and the top of the backfill was capped with a lean concrete mix. The ground water levels in the piezometers have been recorded and are presented in the following table:

Date	TP-1	TP-2	TP-3	TP-4	TP-5	TP-6
10/25/2011	None	None	None	None	None	None
3/6/2012	None	-1.9	None	-3.0'	None	None
3/13/2012	None	-1.0'	None	-6.9'	None	None

Detailed descriptions of the conditions encountered in the test pits are presented on the Test Pit Logs attached with this report. The subsurface conditions may vary between test pit locations. Such changes in conditions would not be apparent until construction. If the subsurface conditions do change from those observed in the test pit locations, the construction timing, plans and costs may change

LABORATORY TESTING

Laboratory testing was performed to assess some of the soil engineering parameters. The particle-size distribution of four soil samples from the test pits were assessed in general accordance with ASTM C 136. Four samples were also tested to assess the liquid limit, plastic limit and plasticity index in general accordance with ASTM D 4318. The maximum dry density and optimum moisture content for two soil samples were assessed in general accordance with ASTM D 1557 (Modified Proctor). The results of the laboratory testing are attached to this report.

CONCLUSIONS AND RECOMMENDATIONS

The following recommendations are presented to assist the planning and design of the CBCS wastewater expansion and improvements in Kootenai County, Idaho. The recommendations are based on our understanding of the proposed construction and the

conditions encountered in the test pits. If the scope of the construction changes, or if conditions are encountered during construction which are different than those described in this report, we should be notified so we can review our recommendations and provide revisions if necessary.

Land Application

The soil conditions encountered in the two test pits on the Dreher property in the area of the proposed land application consisted of a thin mantle of topsoil overlying colluvial deposits of gravelly silt and silty gravel. Basalt bedrock was encountered below the colluvium at 72 to 78 inches below the ground surface. The NRCS estimates the permeability of the soils in this area (Lacy-Bobbitt association) ranges from 0.6 to 2.0 inches per hour.

Excavation Characteristics

The soils encountered in the test pits can generally be excavated with standard soil excavation equipment. Dense cobbles and boulders may be encountered and will likely require larger excavation equipment and may hamper the excavation of narrow trenches. Basalt bedrock will be encountered below the colluvium. The basalt is hard to very hard and will likely require drilling and blasting for excavation. Excavations deeper than four feet should be sloped no steeper than 1.5:1 (horizontal to vertical). Alternatively, the excavations can be shored or braced in accordance with OSHA requirements.

Site Preparation

Topsoil was encountered at the ground surface in each of the test pits. The thickness of the topsoil ranged from 4 inches to 9 inches. The topsoil should be excavated and removed from areas of lagoon expansion and fill placement. The topsoil should be removed from the proposed improvement areas and stockpiled and re-used for landscaping.

Structural Fill

Structural fill is defined as soil placed or moved on a site which will support any structural element including wastewater lagoon embankments, buildings, retaining walls, pavement or sidewalks. Structural fill includes the footprint area and 5 feet beyond the structural element. Non-structural fill is soil placed 5 feet beyond the structural element. Prior to placing structural fill, topsoil and organic material should be removed. The ground surface should be relatively level. Benching of existing slopes may be required to achieve a relatively level surface. The benches should be level with a bench width of 4 to 10 feet depending on the width of the planned compaction equipment. The maximum bench height should be 2 feet. Benching and structural fill placement should be initiated at the base of the slope. A Bench Fill Schematic is attached to this report. Structural fill should be placed on undisturbed native soil.

Structural fill should be placed in six-inch-thick loose lifts at near optimum moisture content and compacted to at least 92 percent of the maximum dry density as determined by Modified Proctor. Non-structural fill should be placed in twelve-inch-thick, loose lifts and compacted to at least 85 percent of the maximum dry density as determined by Modified Proctor.

We recommend the structural fill consist of sands or gravels (GW, GP, SW, or SP) with minor amounts of fines (material passing #200 sieve). Structural fill should be free of organic matter, frozen soil and deleterious debris. The on-site soils may be suitable for use as structural fill. However, due to the presence of silt, the moisture content may exceed optimum and it may be difficult to obtain required compaction in the native soils. It may be necessary to import material for structural fill.

Lagoon Construction

Expansion of the lagoon will require excavation and placement of structural fill. Grading of the lagoon should be designed for a slope of 2:1 (horizontal to vertical). Fill slopes should be constructed according to the structural fill section of this report. The slopes should be benched into the hillside to create a stable mass according to the Structural Fill section of this report. A bench fill schematic is included in the project plans for reference. The bench width will vary but should be wide enough to accommodate compaction equipment. The bench height should be the minimum practical to allow keying into the existing slope.

Tree stumps are present on the interior slope of the lagoon. We recommend the stumps be excavated and removed. The removal of the stumps will create a void space which will require backfill. The void should be backfilled and compacted in accordance with the structural fill section of this report. Access for compaction of the backfill will be limited. Alternative methods of compaction, such as a sheeps foot roller on a trackhoe, should be considered.

All exterior slopes should be re-vegetated as soon as possible after construction is complete. Minor sloughing should be expected until vegetation is established.

Wet Weather Construction

The site preparation and grading will be more effective if it is completed during dry weather conditions. If the site grading is undertaken during wet periods of the year, the native silt soils will be susceptible to pumping or rutting under rubber-tired equipment. Soft or pumping areas should be excavated and backfilled with structural fill in accordance with the recommendations in this report.

Additional Services Recommended

We recommend ALLWEST Testing & Engineering, LLC be retained to review the exposed soil and geologic conditions and to confirm our preliminary recommendations. Compaction testing should be performed by an experienced engineering technician at the time of construction to verify the recommended levels of compaction are achieved. If we are not retained to provide recommended construction monitoring services, we cannot be responsible for soil engineering related construction errors or omissions.

DEVIATIONS

Any proposed deviation from the attached schematics or construction notes must be approved by the design engineer prior to implementation. Any deviation in the materials, configuration, compaction levels, or source material for backfill should be reviewed to assess its impact on the project. If we are not informed of any intended changes, we cannot be held responsible for construction related errors or omissions resulting from the changes.

LIMITATIONS

This report has been prepared to assist the planning and construction of the proposed wastewater improvements for the Cave Bay Community Services, Inc. located in Kootenai County, Idaho. Our services consist of professional opinions and conclusions made in accordance with generally accepted geotechnical engineering principles and practices. This acknowledgement is in lieu of all warranties either expressed or implied.

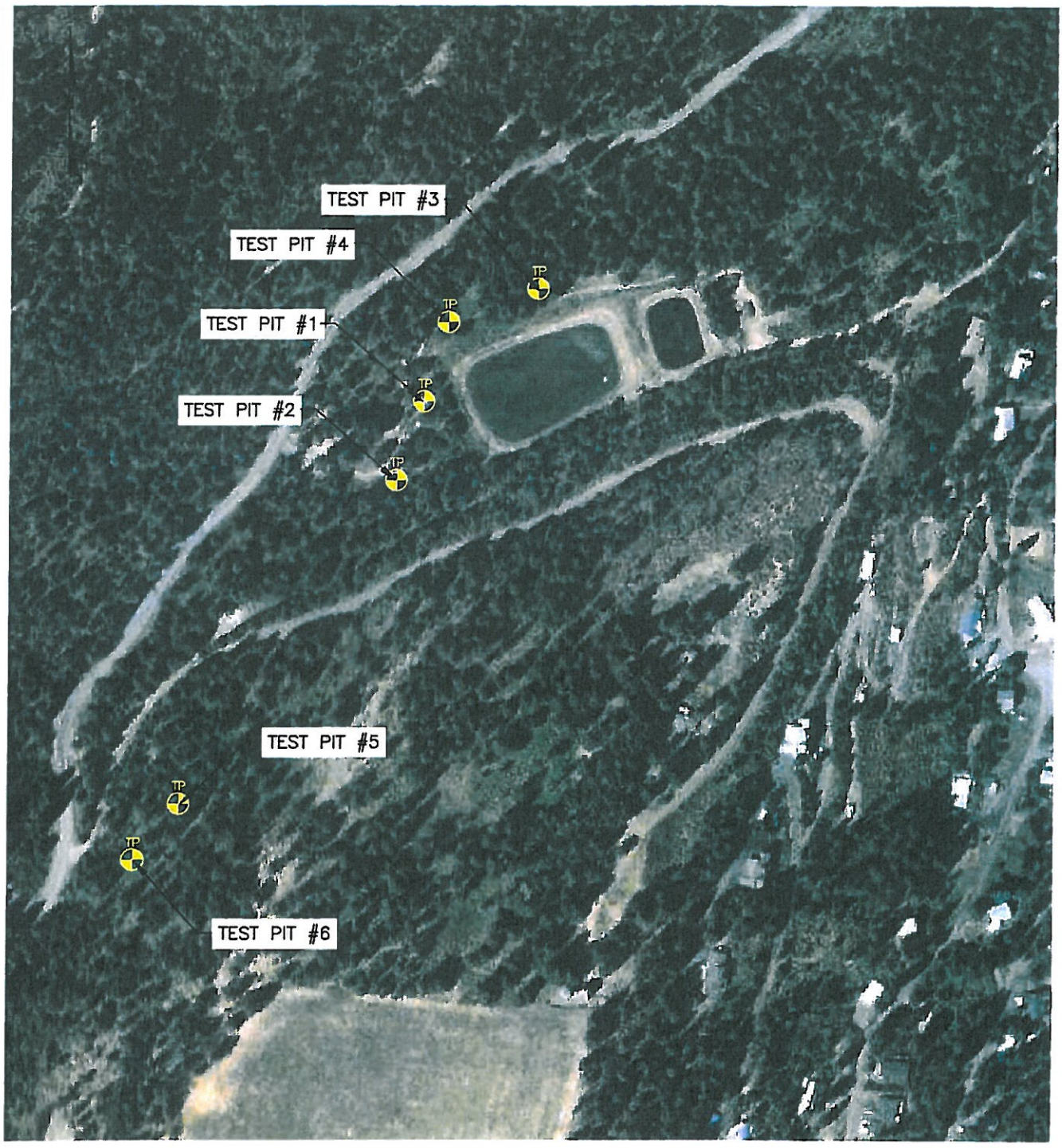
We appreciate the opportunity to perform the boulder retaining wall design services. If you have any questions or comments, please feel free to contact me at (208) 762-4721.

Sincerely,

ALLWEST Testing & Engineering, LLC

Chris C. Beck, P.E.
Principal Engineer

Attached: Test Pit Location Map
Test Pit Logs
Laboratory Results



0 150 300 600 900

T-O ENGINEERS
WEST 280 PRAIRIE AVENUE
COEUR D'ALENE, IDAHO 83815-7710
PHONE: (208) 762-3644 FAX: (208) 762-3708

E-FILE: J:\110058\Acaddwg\Exhibits\ DATE: November 2011 JOB: 110058

J:\110058\Acaddwg\Sheets\Exhibits\110058_TestPits.dwg , 11/8/2011 9:24:17 AM , Thompson, Zach , DWG To PDF 200 Dpi.pc3

LOG OF TEST PIT

ALLWEST Testing & Engineering

PROJECT: **Cave Bay Wastewater Facilities**	TEST PIT: **TP-1**
	LOCATION: **Cave Bay**
	DATE: **10/25/2011** SCALE: **1" = 2'**

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
0.7'	ML	TOPSOIL - Sandy SILT, Dark Brown, Loose to Medium Dense, Damp to Moist		
	ML	COLLUVIUM - Fine sandy SILT with trace gravel , Light Brown, Medium Dense, Damp to Moist		Bulk Sample
5.0'				
	GM	COLLUVIUM - Silty GRAVEL, Light Brown, Medium Dense to Dense, Humid to Damps		
7.0'				
		Bottom of Test Pit		Piezometer installed to a depth of 7.0'

(See Report and Standard Plates for elevation and descriptive terminology.)

LOG OF TEST PIT

ALLWEST Testing & Engineering

PROJECT: **Cave Bay Wastewater Facilities**	TEST PIT: **TP-2**
	LOCATION: **Cave Bay**
	DATE: **10/25/2011** SCALE: **1" = 2'**

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
0.7'	ML	TOPSOIL - Sandy SILT, Dark Brown, Loose to Medium Dense, Damp to Moist		
	GM	COLLUVIUM - Silty GRAVEL, Light Brown, Medium Dense, Humid		
6.0'				
	CH/MH	RESIDUUM - Silty CLAY, Dark Brown, Stiff to Very Stiff, Moist		
7.0'		Bottom of Test Pit		Piezometer installed to a depth of 7.0'

(See Report and Standard Plates for elevation and descriptive terminology.)

LOG OF TEST PIT

ALLWEST Testing & Engineering

PROJECT: **Cave Bay Wastewater Facilities**	TEST PIT: **TP-3**
	LOCATION: **Cave Bay**
	DATE: **10/25/2011** SCALE: **1" = 2'**

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
0.7'	ML	TOPSOIL - Sandy SILT, Dark Brown, Loose to Medium Dense, Damp to Moist		
3.0'	ML	COLLUVIUM - Fine Sandy SILT with Gravel, Light Brown, Medium Dense, Humid		
7.0'	CL/SC	RESIDUUM - Silty CLAY, Dark Brown, Stiff to Very Stiff, Moist		Bulk Sample
		Bottom of Test Pit		Piezometer installed to a depth of 7.0'

(See Report and Standard Plates for elevation and descriptive terminology.)

LOG OF TEST PIT

ALLWEST Testing & Engineering

PROJECT: **Cave Bay Wastewater Facilities**	TEST PIT: **TP-4**
	LOCATION: **Cave Bay**
	DATE: **10/25/2011** SCALE: **1" = 2'**

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
0.5'	ML	TOPSOIL - SILT, Medium Brown, Loose, Humid		
1.5'	ML	COLLUVIUM - SILT with Gravel and Cobbles, Light Brown, Medium Dense, Humid		
6.0'	GM	COLLUVIUM - GRAVEL with Silt, Light Brown, Medium Dense to Dense, Humid to Damp		
		Bottom of Test Pit		Piezometer installed to a depth of 6.0'

(See Report and Standard Plates for elevation and descriptive terminology.)

LOG OF TEST PIT

ALLWEST testing & Engineering

PROJECT: **Cave Bay Wastewater Facilities**	TEST PIT: **TP-5**
	LOCATION: **Cave Bay**
	DATE: **10/25/2011** SCALE: **1" = 2'**

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
0.5'	ML	TOPSOIL - SILT, Medium Brown, Loose, Humid		
2.0'	ML	COLLUVIUM - Sandy SILT with Gravel and Cobbles, Light Brown, Medium Dense to Dense, Humid to Damp		Bulk Sample
5.0'	GM	COLLUVIUM - GRAVEL with Silt and Cobbles, Light Brown, Medium Dense to Dense, Humid to Damp		
6.5'	GP	COLLUVIUM - Poorly graded GRAVEL, Cobbles and Boulders up to 24 inches		
		Bottom of Test Pit		Piezometer installed to a depth of 6.5'

(See Report and Standard Plates for elevation and descriptive terminology.)

LOG OF TEST PIT

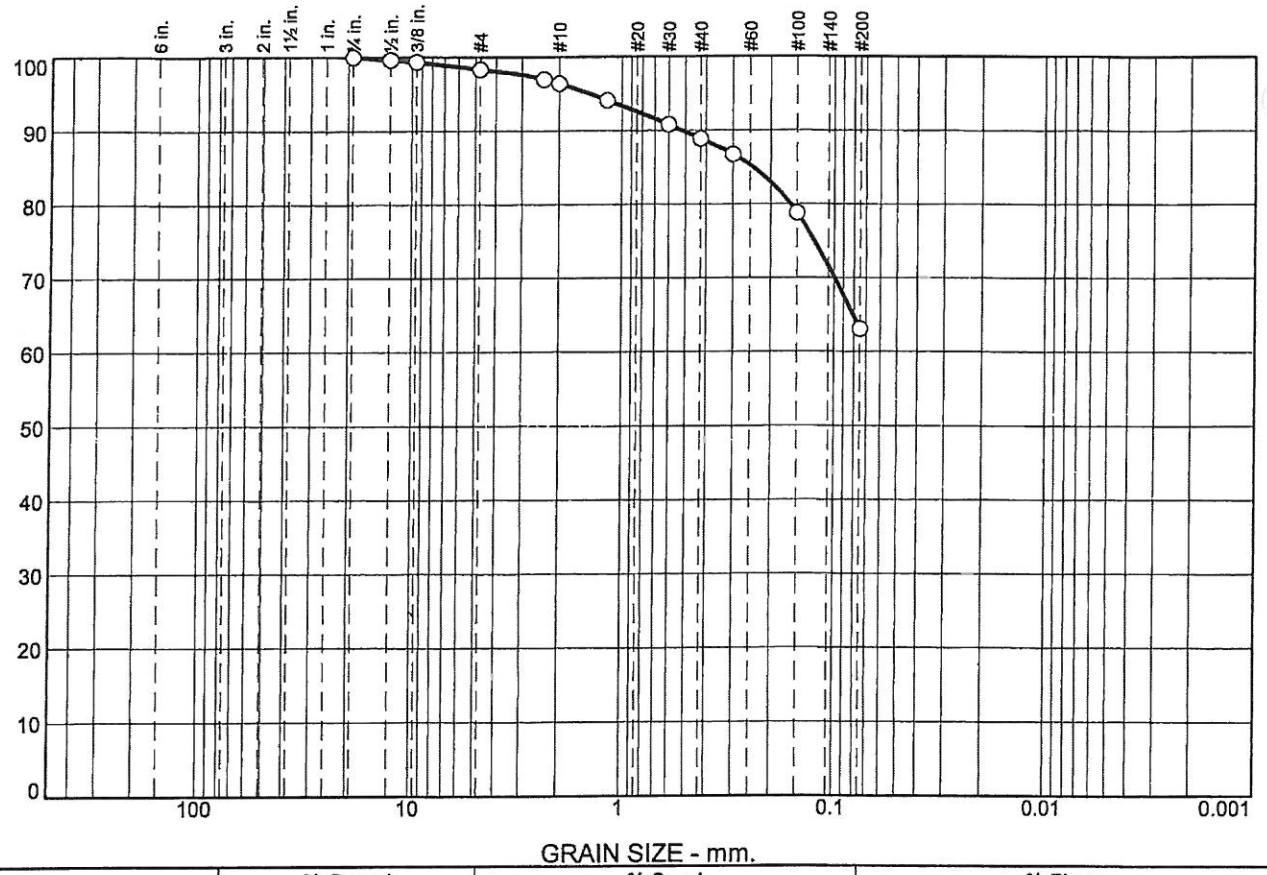
ALLWEST Testing & Engineering

PROJECT: **Cave Bay Wastewater Facilities**	TEST PIT: **TP-6**
	LOCATION: **Cave Bay**
	DATE: **10/25/2011** SCALE: **1" = 2'**

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
0.3'	ML	TOPSOIL - SILT, Medium Brown, Loose, Humid		
	GM/SM	COLLUVIUM - GRAVEL with Silt and Sand, Light Brown, Medium Dense to Dense, Humid to Damp		Bulk Sample
6.0'		Bottom of Test Pit		Piezometer installed to a depth of 6.0'

(See Report and Standard Plates for elevation and descriptive terminology.)

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	2	7	26	63	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
1/2"	100		
3/8"	99		
#4	98		
#8	97		
#10	96		
#16	94		
#30	91		
#40	89		
#50	87		
#100	79		
#200	63		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= 22 LL= 21 PI= NP

Coefficients

D_{90}= 0.5185 D_{85}= 0.2413 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Sampled By: C. Beck
Sample Date: 10/25/2011

Location: Test Pit 1
Sample Number: S111-931

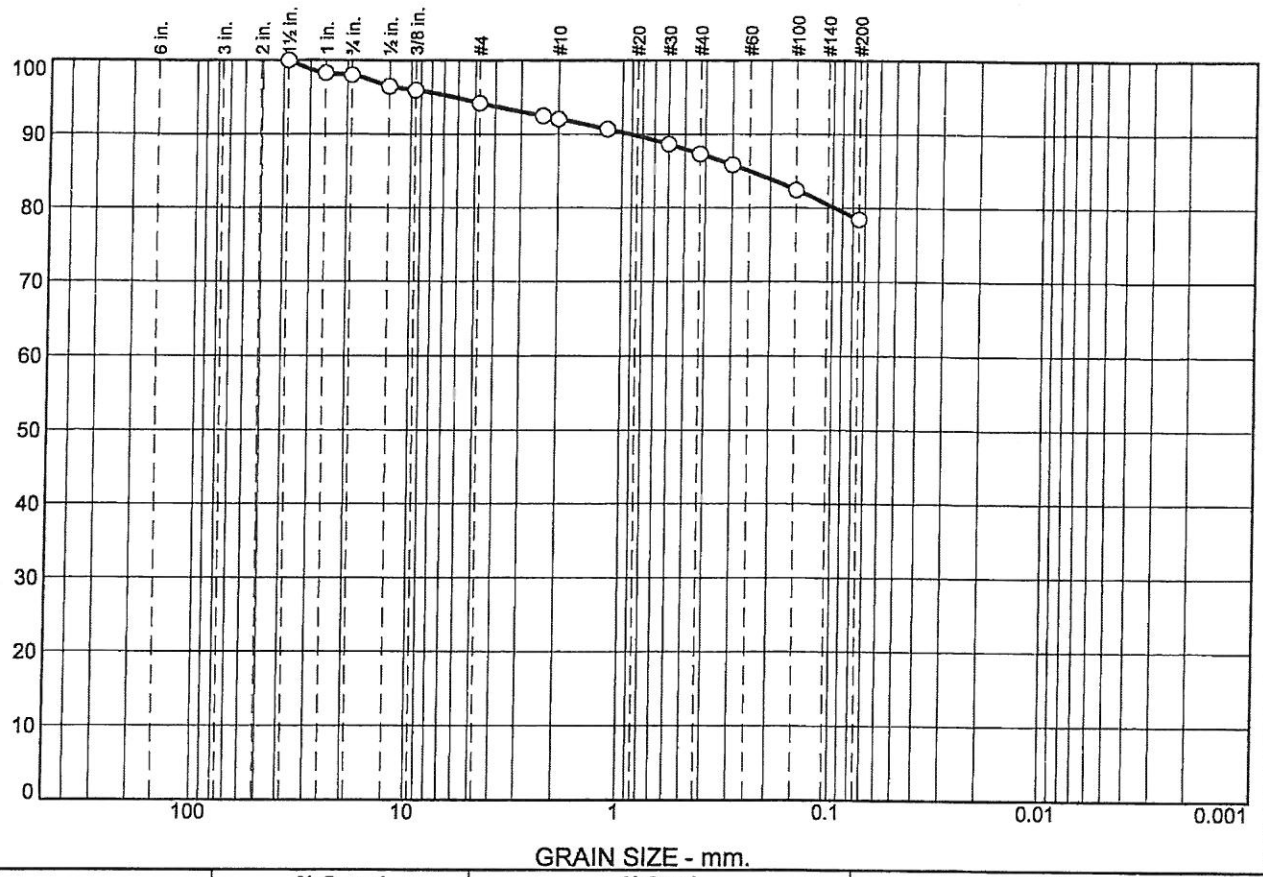
Date: 11/2/2011

ALLWEST TESTING & ENGINEERING Hayden, ID

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project No: 111-224G **Checked By:**

Tested By: S Brady **Checked By:** C McKissen

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	4	2	5	9	78	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100		
1"	98		
3/4"	98		
1/2"	97		
3/8"	96		
#4	94		
#8	92		
#10	92		
#16	91		
#30	89		
#40	87		
#50	86		
#100	82		
#200	78		

* (no specification provided)

Soil Description

lean clay with sand

Atterberg Limits

PL= 21 LL= 33 PI= 12

Coefficients

D_{90}= 0.9231 D_{85}= 0.2506 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(8)

Remarks

Sampled By: C. Beck
Sample Date: 10/25/2011

Location: Test Pit 3
Sample Number: S111-932

Date: 11/3/2011

ALLWEST TESTING & ENGINEERING
Hayden, ID

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project No: 111-224G **Checked By:** CM

Tested By: S Brady **Checked By:** C McKissen

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	3	5	4	9	16	63	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100		
1"	97		
3/4"	97		
1/2"	95		
3/8"	94		
#4	92		
#8	89		
#10	88		
#16	85		
#30	81		
#40	79		
#50	77		
#100	72		
#200	63		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 3.2669 D_{85}= 1.1243 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Sampled By: C. Beck
Sample Date: 10/25/2011

Location: Test Pit 5
Sample Number: S111-933

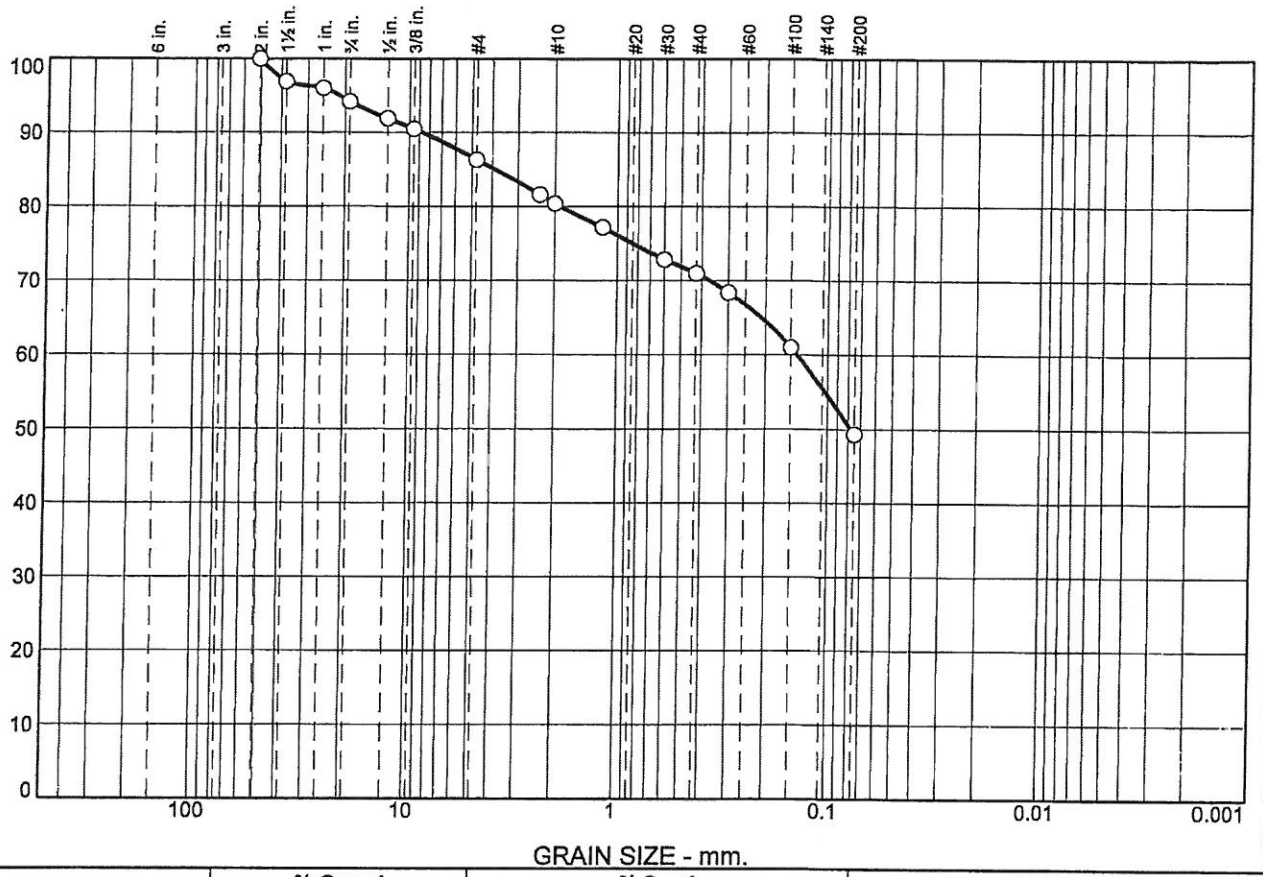
Date: 11/3/2011

ALLWEST TESTING & ENGINEERING Hayden, ID

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project No: 111-224G **Checked By:**

Tested By: S Brady **Checked By:** C McKissen

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	8	6	9	22	49	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100		
1 1/2"	97		
1"	96		
3/4"	94		
1/2"	92		
3/8"	90		
#4	86		
#8	82		
#10	80		
#16	77		
#30	73		
#40	71		
#50	68		
#100	61		
#200	49		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= 22 LL= 23 PI= 1

Coefficients

D_{90}= 8.7018 D_{85}= 3.8791 D_{60}= 0.1401
D_{50}= 0.0777 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sampled By: C. Beck
Sample Date: 10/25/2011

Location: Test Pit 6
Sample Number: S111-934

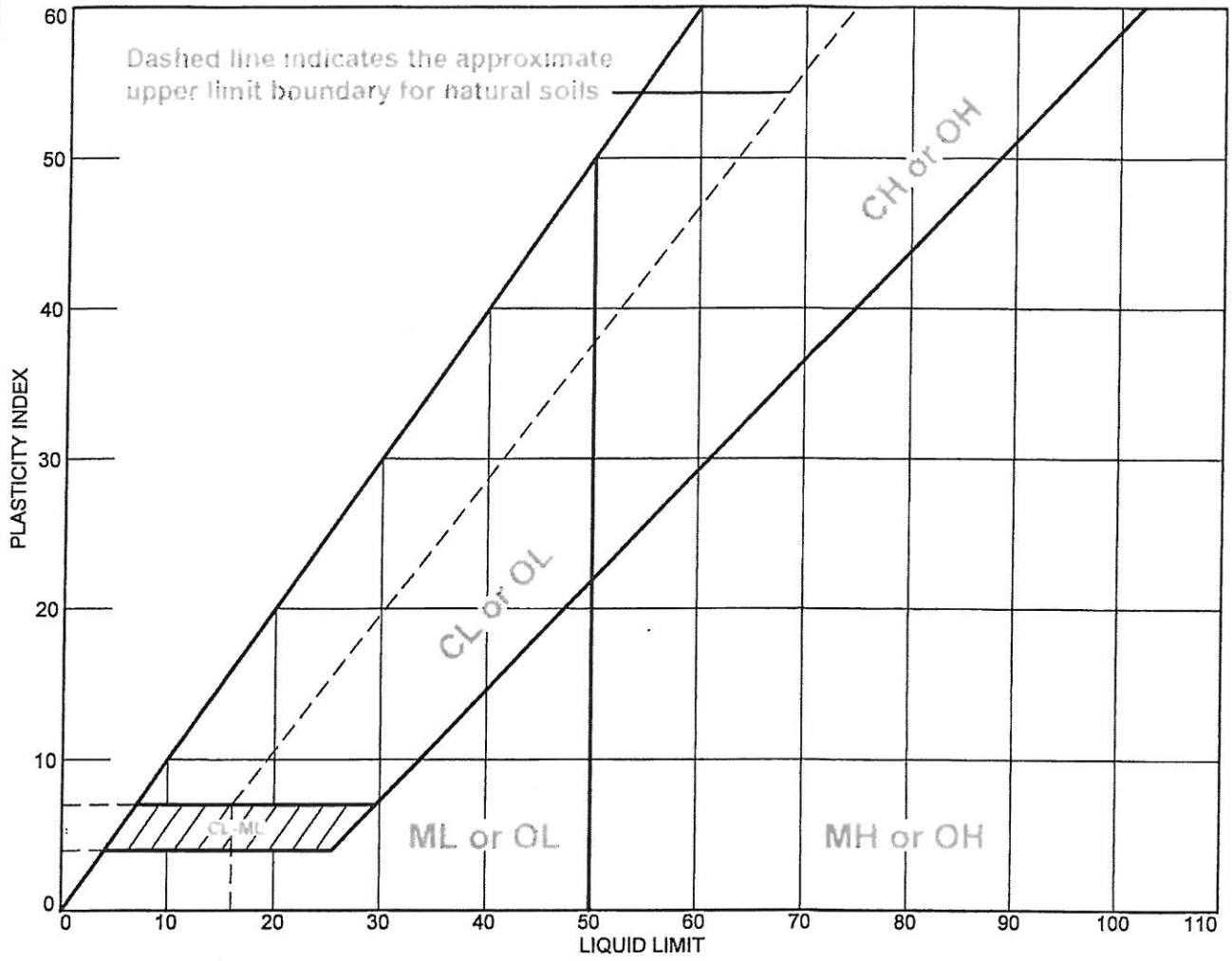
Date:

ALLWEST TESTING & ENGINEERING Hayden, ID

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project No: 111-224G **Checked By:**

Tested By: S Brady **Checked By:** C McKissen

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	sandy silt	21	22	NP	89	63	ML

Project No. 111-224G **Client:** T.O. Engineers

Project: Cave Bay Wastewater Facilities

● **Location:** Test Pit 1 **Sample Number:** S111-931

Remarks:

● Sampled By: C. Beck
Sample Date: 10/25/2011

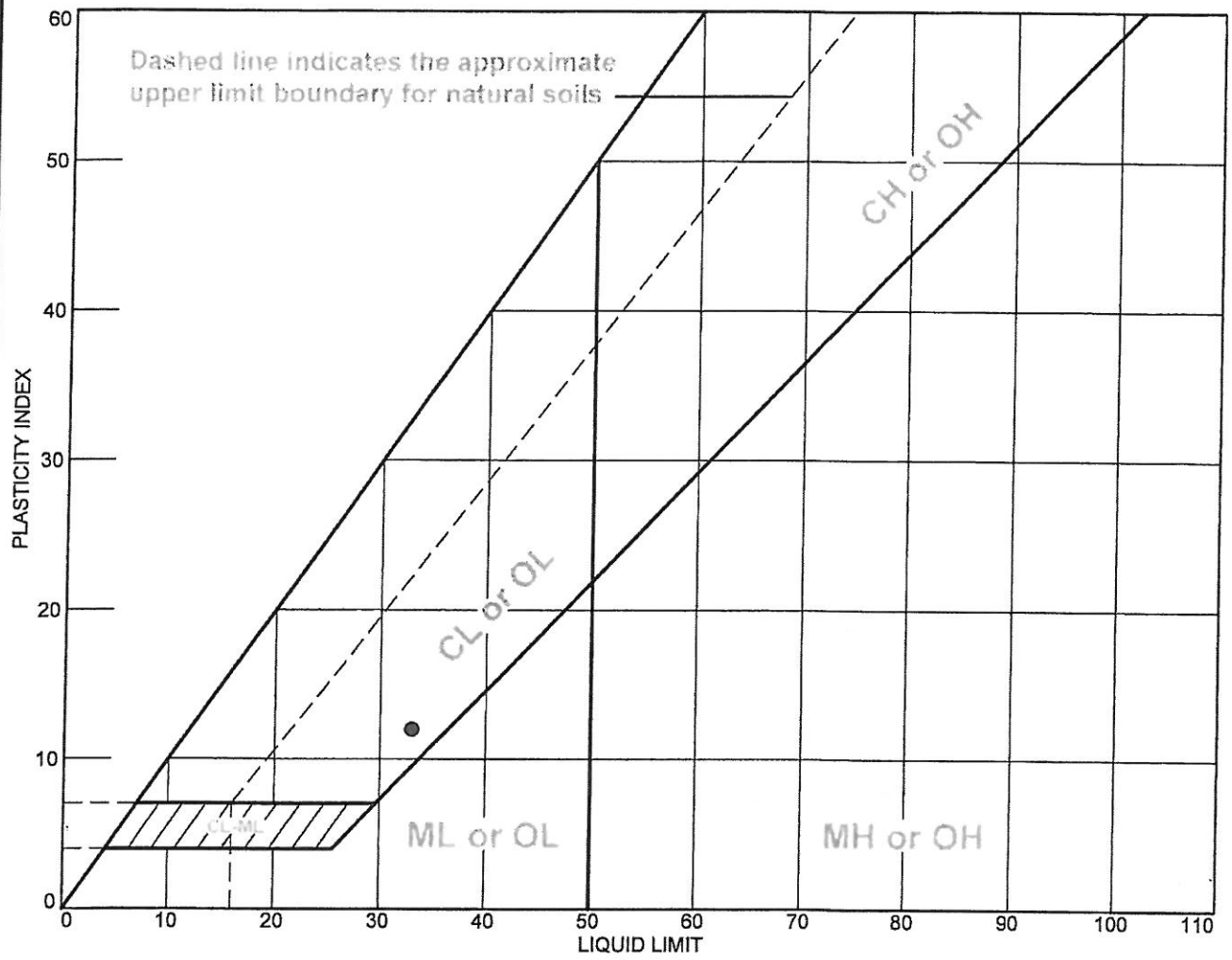
ALLWEST TESTING & ENGINEERING

Hayden, ID

Checked By: AM

Tested By: M Maher **Checked By:** C McKissen

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	lean clay with sand	33	21	12	87	78	CL

Project No. 111-224G **Client:** T.O. Engineers

Project: Cave Bay Wastewater Facilities

● **Location:** Test Pit 3 **Sample Number:** S111-932

ALLWEST TESTING & ENGINEERING

Hayden, ID

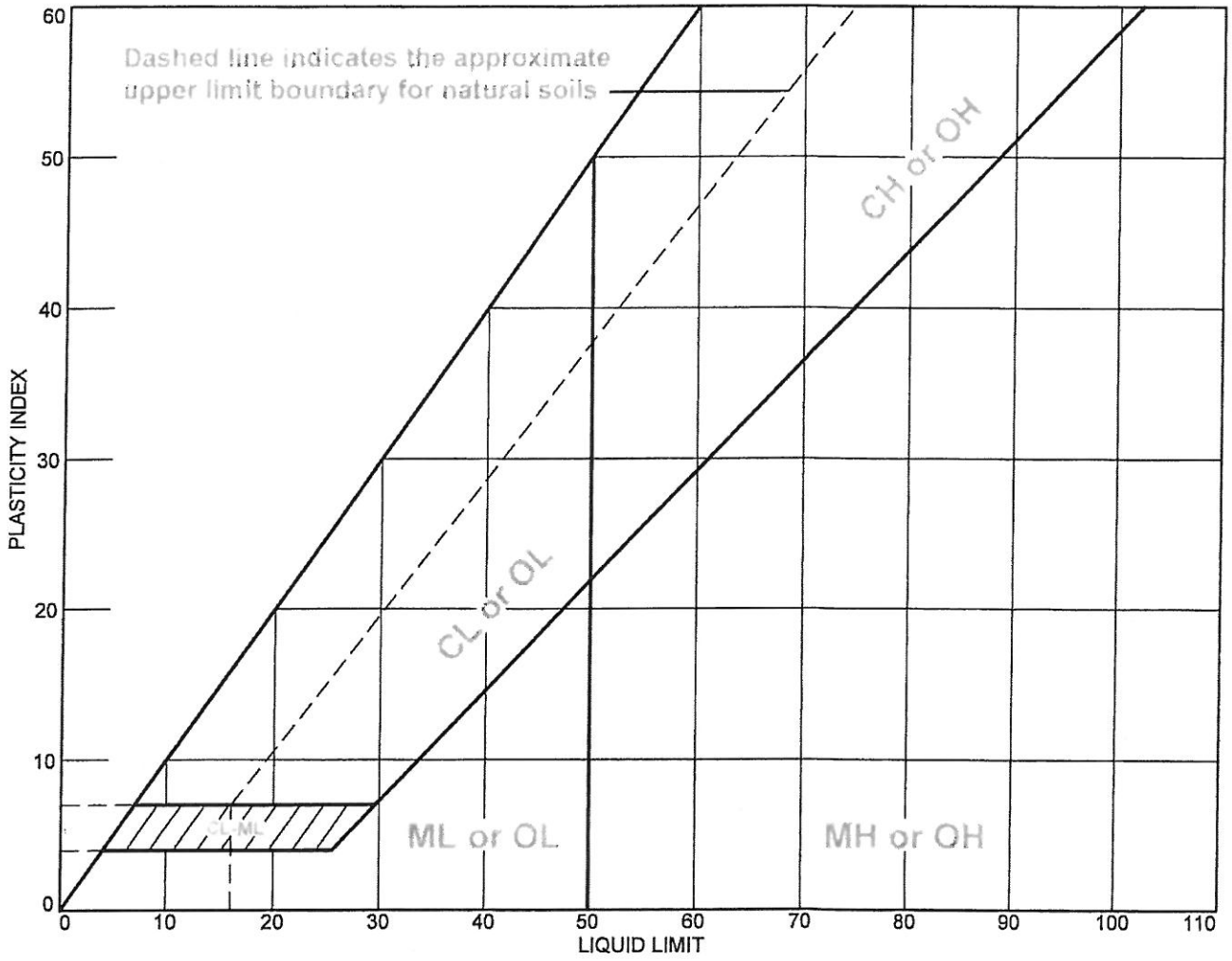
Remarks:

● Sampled By: C. Beck
Sample Date: 10/25/2011

Checked By:

Tested By: M Maher **Checked By:** C McKissen

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	sandy silt	NV	NP	NP	79	63	ML

Project No. 111-224G **Client:** T.O. Engineers

Project: Cave Bay Wastewater Facilities

● **Location:** Test Pit 5 **Sample Number:** S111-933

ALLWEST TESTING & ENGINEERING

Hayden, ID

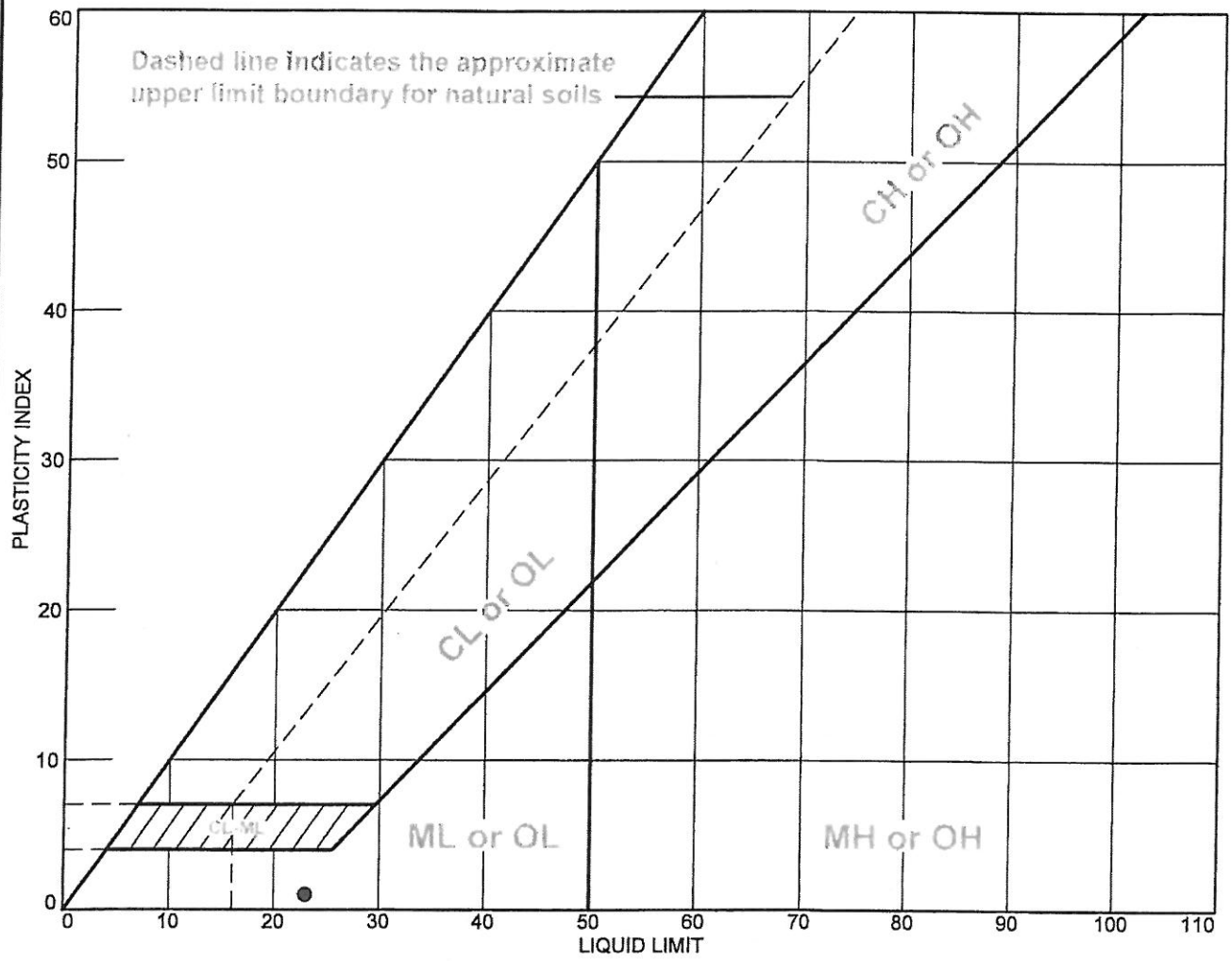
Remarks:

● Sampled By: C. Beck
Sample Date: 10/25/2011
MATERIAL EXHIBITED DILATION BUT DID NOT ROLL THREADS; PLASTIC LIMIT CANNOT BE ACHIEVED

Checked By: CM

Tested By: M Maher **Checked By:** C McKissen

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	silty sand	23	22	1	71	49	SM

Project No. 111-224G **Client:** T.O. Engineers

Project: Cave Bay Wastewater Facilities

● **Location:** Test Pit 6 **Sample Number:** SI11-934

Remarks:

● Sampled By: C. Beck
Sample Date: 10/25/2011

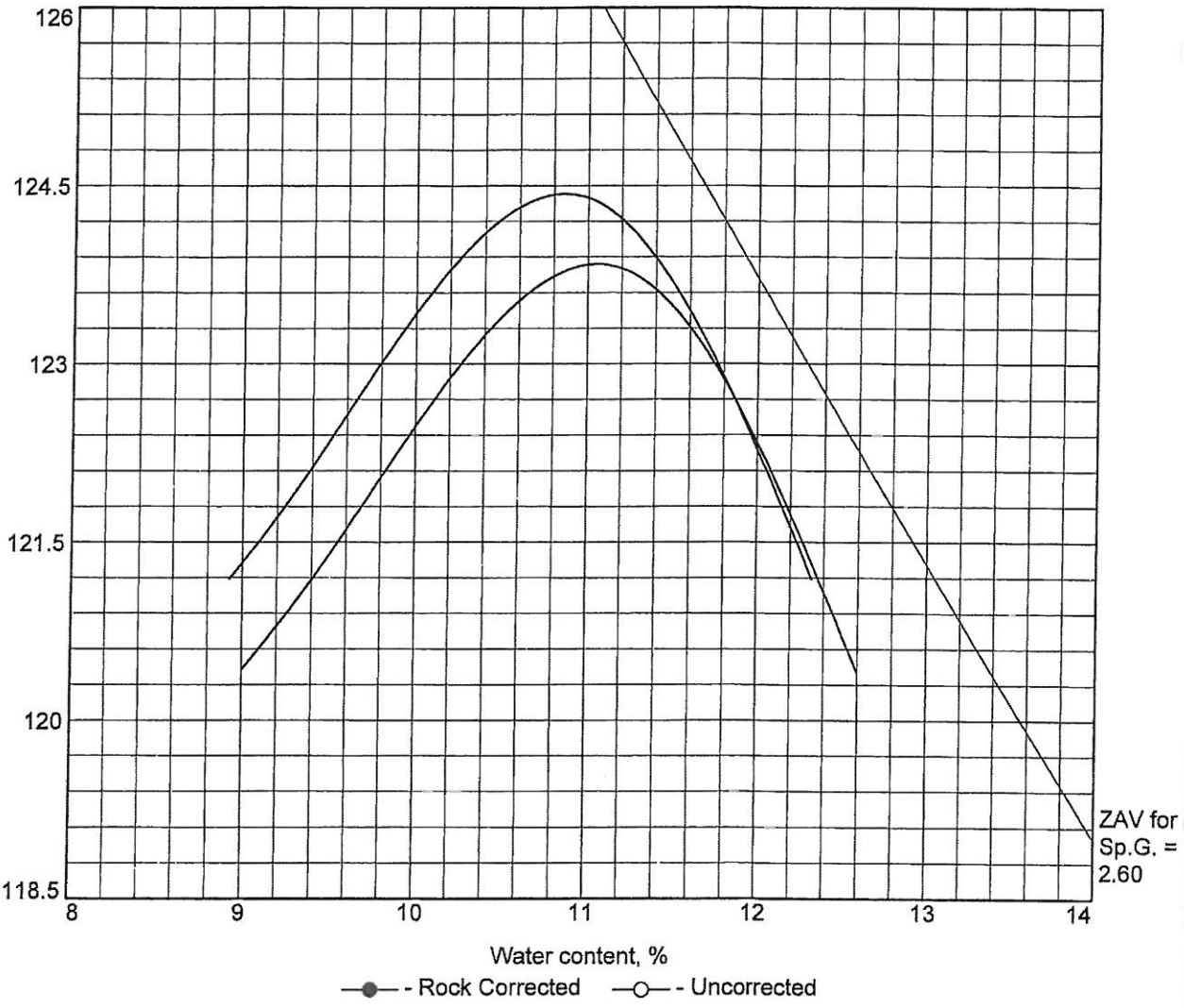
ALLWEST TESTING & ENGINEERING

Hayden, ID

Checked By:

Tested By: M Maher **Checked By:** C McKissen

Moisture Density Curve



Test specification: ASTM D 1557-07 Method A Modified
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	ML	A-4(0)	NA		21	NP	2	63

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 124.4 pcf	123.8 pcf	sandy silt
Optimum moisture = 10.9 %	11.1 %	

Project No. 111-224G **Client:** T.O. Engineers
Project: Cave Bay Wastewater Facilities
Location: Test Pit 1 **Sample Number:** S111-931

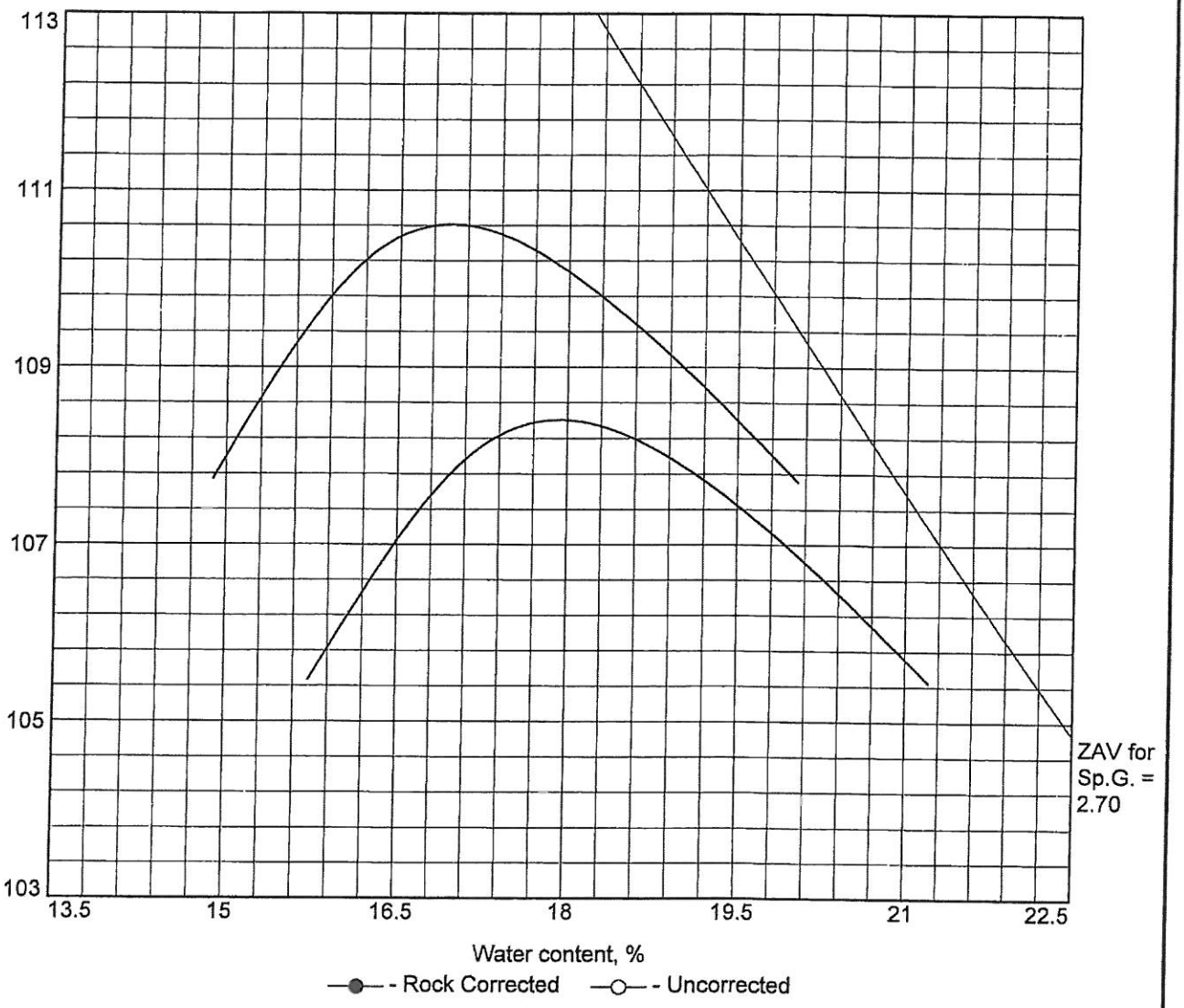
ALLWEST TESTING & ENGINEERING
Hayden, ID

Remarks:
Sampled By: C. Beck
Sample Date: 10/25/2011

Checked By: [signature]

Tested By: S Brady **Checked By:** C McKissen

Moisture Density Curve



Test specification: ASTM D 1557-07 Method A Modified
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CL	A-6(8)	NA		33	12	6	78

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 110.6 pcf	108.4 pcf	lean clay with sand
Optimum moisture = 16.9 %	17.9 %	

Project No. 111-224G **Client:** T.O. Engineers
Project: Cave Bay Wastewater Facilities

Location: Test Pit 3 **Sample Number:** S111-932

ALLWEST TESTING & ENGINEERING

Hayden, ID

Remarks:
Sampled By: C. Beck
Sample Date: 10/25/2011

Checked By:

Tested By: S Brady **Checked By:** C McKissen

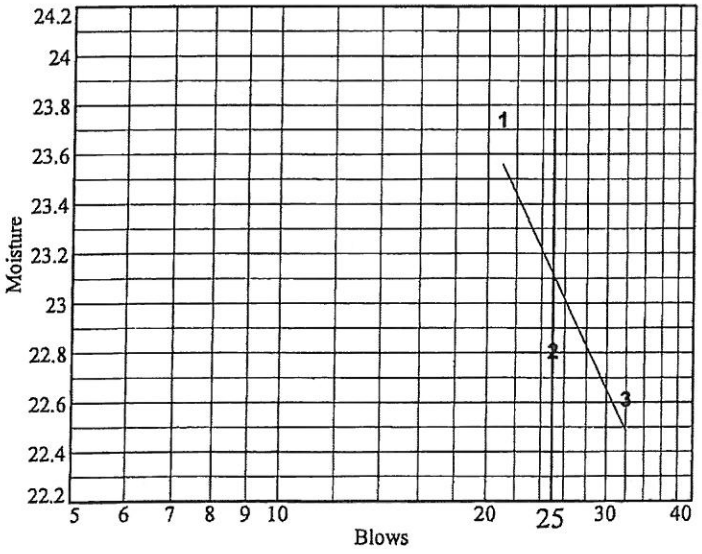
LIQUID AND PLASTIC LIMIT TEST DATA

11/15/2011

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project Number: 111-224G
Location: Test Pit 6
Sample Number: S111-934
Material Description: silty sand
%<#40: 71 **%<#200:** 49 **USCS:** SM **AASHTO:** A-4(0)
Tested by: M Maher **Checked by:** C McKissen
Testing Remarks: Sampled By: C. Beck
Sample Date: 10/25/2011

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	32.43	29.62	34.99			
Dry+Tare	27.01	24.86	29.28			
Tare	4.18	3.99	4.03			
# Blows	21	25	32			
Moisture	23.7	22.8	22.6			



Liquid Limit= 23
Plastic Limit= 22
Plasticity Index= 1

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	21.22	27.91			
Dry+Tare	18.01	23.60			
Tare	4.00	4.00			
Moisture	22.9	22.0			

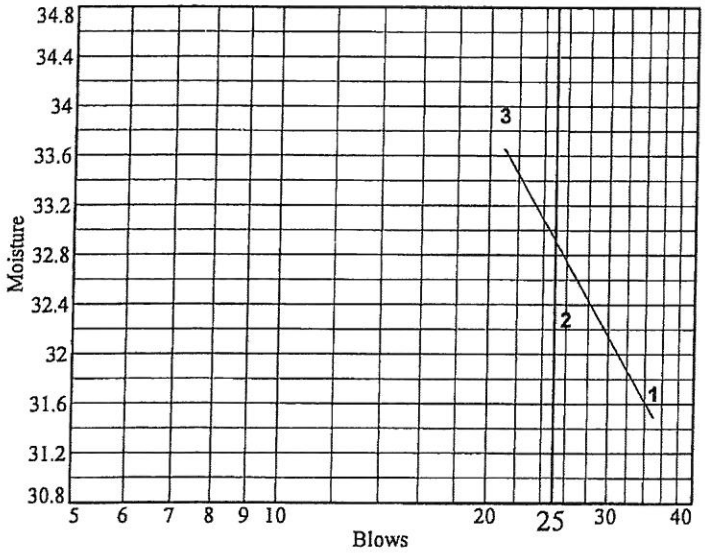
LIQUID AND PLASTIC LIMIT TEST DATA

11/15/2011

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project Number: 111-224G
Location: Test Pit 3
Sample Number: S111-932
Material Description: lean clay with sand
%<#40: 87 **%<#200:** 78 **USCS:** CL **AASHTO:** A-6(8)
Tested by: M Maher **Checked by:** C McKissen
Testing Remarks: Sampled By: C. Beck
Sample Date: 10/25/2011

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	34.89	34.88	34.08			
Dry+Tare	27.52	27.40	26.47			
Tare	4.26	4.23	4.04			
# Blows	35	26	21			
Moisture	31.7	32.3	33.9			



Liquid Limit= 33
Plastic Limit= 21
Plasticity Index= 12
Natural Moisture= NA

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	16.50	15.65			
Dry+Tare	14.42	13.63			
Tare	4.20	4.12			
Moisture	20.4	21.2			

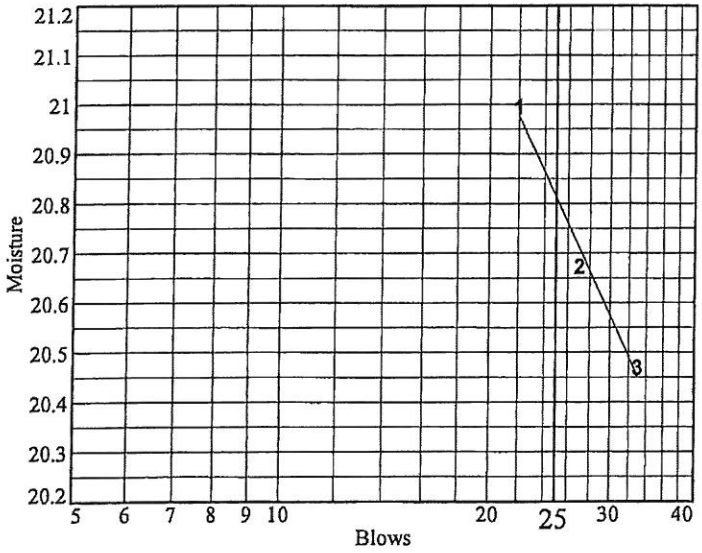
LIQUID AND PLASTIC LIMIT TEST DATA

11/17/2011

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project Number: 111-224G
Location: Test Pit 1
Sample Number: S111-931
Material Description: sandy silt
%<#40: 89 **%<#200:** 63 **USCS:** ML **AASHTO:** A-4(0)
Tested by: M Maher **Checked by:** C McKissen
Testing Remarks: Sampled By: C. Beck
Sample Date: 10/25/2011

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	34.37	32.66	30.67			
Dry+Tare	29.14	27.75	26.14			
Tare	4.23	4.00	4.01			
# Blows	22	27	33			
Moisture	21.0	20.7	20.5			



Liquid Limit= 21
Plastic Limit= 22
Plasticity Index= NP
Natural Moisture= NA

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	42.23	41.25			
Dry+Tare	35.36	34.68			
Tare	4.20	4.10			
Moisture	22.0	21.5			

GRAIN SIZE DISTRIBUTION TEST DATA

11/17/2011

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project Number: 111-224G
Location: Test Pit 1
Sample Number: S111-931
Material Description: sandy silt
Date: 11/2/2011 **PL:** 22 **LL:** 21 **PI:** NP
USCS Classification: ML **AASHTO Classification:** A-4(0)
Testing Remarks: Sampled By: C. Beck
Sample Date: 10/25/2011
Tested by: S Brady **Checked by:** C McKissen

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 925.50
Tare Wt. = 0.00
Minus #200 from wash = 59.1%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
2265.40	0.00	0.00	3/4"	0.00	100
			1/2"	7.90	100
			3/8"	15.00	99
			#4	38.00	98
			#8	68.40	97
			#10	81.60	96
			#16	133.20	94
			#30	208.30	91
			#40	252.00	89
			#50	299.80	87
			#100	481.00	79
			#200	837.10	63

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0	0	2	2	2	7	26	35			63

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
						0.1614	0.2413	0.5185	1.4319

Fineness Modulus
0.55

MOISTURE DENSITY TEST DATA

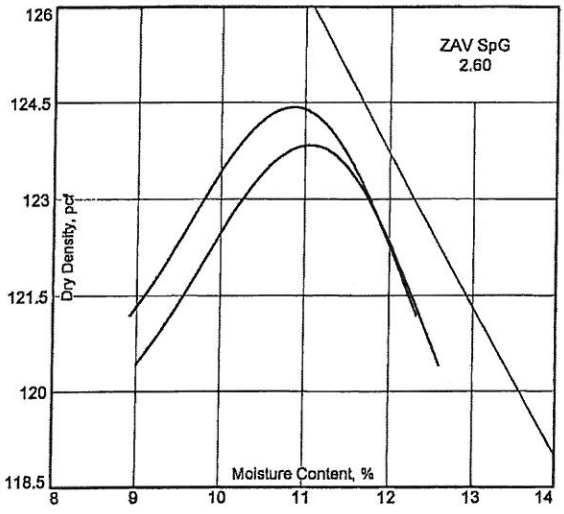
11/17/2011

Client: T.O. Engineers
Project: Cave Bay Wastewater Facilities
Project Number: 111-224G
Location: Test Pit 1
Sample Number: S111-931
Description: sandy silt
USCS Classification: ML **AASHTO Classification:** A-4(0)
Natural Moisture: NA **Liquid Limit:** 21 **Plasticity Index:** NP
Testing Remarks: Sampled By: C. Beck
Sample Date: 10/25/2011
Tested by: S Brady **Checked by:** C McKissen

Test Data and Results

Test Specification:

Type of Test: ASTM D 1557-07 Method A Modified
Mold Dia: 4.00 **Hammer Wt.:** 10 lb. **Drop:** 18 in. **Layers:** five **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	13.62	13.79	13.97	13.85
Wt. M	9.38	9.38	9.38	9.38
Wt. W+T	751.1	867.0	714.7	803.5
Wt. D+T	714.8	803.8	654.7	725.4
Tare	230.9	126.0	123.3	126.2
Moist.	7.5	9.3	11.3	13.0
Moist.*	7.4	9.2	11.1	12.8
Dry Den.*	119.0	121.6	124.3	119.3

Rock Corrected Results: **Max. Dry Den.=** 124.4 pcf **Opt. Moist.=** 10.9%
Uncorrected Results: **Max. Dry Den.=** 123.8 pcf **Opt. Moist.=** 11.1%

Rock Correction Data:

Correction Method: ASTM D 4718-87
Percentage of Oversize Material (%> #4): 2 **Bulk Specific Gravity of Oversize Material:** 2.60
Oversize Material Moisture Content: 1.5
***Note:** the rock correction was applied to every test point's density and moisture value.

APPENDIX D

Well Driller's Reports

Idaho Department of Water Resources

Listing of Driller Reports

Contact	Use	TWP	RNG	SEC	Tract	Gov. Lot	WellAddress	Sub	Bl	L	Gallons Per Minute	Static Water Level	Total Depth	Casing Depth	CSG. DIA.	Construction Date	Permit Number	Tag Number
CAVE BAY OWNERS ASSOCIATION	Municipal	48N	04W	32	SESWNE	2	LAKESHORE DRIVE				53	70	312			12/10/1993	751941	
Related Documents																		
CARROLL, VIRGIL K	Domestic-Single Residence	48N	04W	32	SESWNE	2					10	246	520	19	6	10/6/1983	751940	
Related Documents																		
CAVE BAY COMMUNITY SERVICES	Domestic-Single Residence	48N	04W	32	SESWNE	2			001	029	0	0	0				752630	
CARROLL, VIRGIL K	Domestic-Single Residence	48N	04W	32	NENW						40	65	157	149	6	4/4/1966	750328	
Related Documents																		
STATE OF IDAHO, FOGLE PUMP & SUPPLY	Domestic-Single Residence	48N	04W	32	NWSE		MOWRY STATE PARK				20	165	200	-21	8	12/8/1999	754964	D0010939
Related Documents																		

CBCS #1

(D)

CBCS #2

Form 238-7
1/79

RECEIVED
APR 5 1984
Department of Water Resources

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

(D)

USE TYPEWRITER OR BALL POINT PEN

RECEIVED
MAR 28 1984
Department of Water Resources

(1) (2) (3)

1. WELL OWNER

Name Virgil Carroll

Address Box - 141016 Spokane WA.

Owner's Permit No. @ 95-83-N-14

2. NATURE OF WORK

☑ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning) _____

3. PROPOSED USE

☑ Domestic ☐ Irrigation ☐ Test ☐ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☐ Other _____ (specify type)

4. METHOD DRILLED

☑ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☑ Steel ☐ Concrete ☐ Other _____

Thickness		Diameter		From		To	
1/4	inches	6	inches +	1	feet	19	feet
	inches		inches		feet		feet
	inches		inches		feet		feet
	inches		inches		feet		feet

Was casing drive shoe used? ☑ Yes ☐ No
Was a packer or seal used? ☐ Yes ☑ No
Perforated? ☐ Yes ☑ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

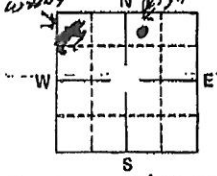
Number		From		To	
	perforations		feet		feet
	perforations		feet		feet
	perforations		feet		feet

Well screen installed? ☐ Yes ☑ No
Manufacturer's name _____
Type _____ Model No. _____
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Gravel packed? ☐ Yes ☑ No ☐ Size of gravel _____
Placed from _____ feet to _____ feet
Surface seal depth 19 Material used in seal: ☐ Cement grout ☑ Puddling clay ☐ Well cuttings
Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☑ Overbore to seal depth
Method of joining casing: ☐ Threaded ☑ Welded ☐ Solvent Weld ☐ Cemented between strata
Describe access port 1/4" Bentonite

MICROFILMED

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name _____
Lot No. _____ Block No. _____
County Kootenai 4W
NW ¼ NE ¼ Sec. 3, T. 48 N, R. 4 W.

7. WATER LEVEL

Static water level 246 feet below land surface.
Flowing? ☐ Yes ☑ No G.P.M. flow _____
Artesian closed-in pressure _____ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature _____ °F. Quality _____

8. WELL TEST DATA

☐ Pump ☐ Bailer ☑ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped
Approx - 100 GPM		

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
6"	0	2	Loamy Topsoil		
	2	8	Brn. Clay (Firm)		
	8	42	Basalt - Hard w/ Fractures		
	42	48	Brn. Clay - Firm		
	48	60	Cinders		
	60	140	Basalt - Hard w/ Fractures		
	140	225	Hard Basalt -		
	225	230	Brn. Clay & Hard Basalt		
	230	232	Light Clay - Firm		
	232	235	Red & Brn. Clay		
	235	240	Brn. Clay - (Firm)		
	240	245	Yellow Clay - Firm		
	245	275	Lt. Brown Clay - Firm		
	275	322	Quartz Sand - Brn	—	
	3[illegible]	360	Water Bearing		
	322	360	Dk. Brn Clay - Firm		
	360	405	Sandstone - Hard & Water	—	
	405	418	Hard Basalt		
	418	455	Basalt Fractured		
	455	520	Sand Stone		

RECEIVED
MAR 28
Department of Water Resources
Northern Region

10.

Work started 4-4-83 finished 10-6-83

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name J & J Drilling Inc Firm No. 319
Address 5613 S Linkoln Rd Date _____
Spokane, WA. 99016
Signed by (Firm Official) _____
and
(Operator) _____

USE ADDITIONAL SHEETS IF NECESSARY — FORWARD THE WHITE COPY TO THE DEPARTMENT

6/93 Fee of $20 ENT'D

IDAHO DEPARTMENT OF WATER RESOURCES

WELL DRILLER'S REPORT

Use Typewriter or Ball Point Pen

CBCS #1

FEB 11 1994

Department of Water Resources

1. DRILLING PERMIT NO. 95 - 83 - N - 14 - 001
Other IDWR No. 95-08235

2. OWNER: CAVEBAY Water Association
Name
Address 22150 LAKESHORE DR
City WORLEY ID State ID Zip 83876

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

N / W / E / S

T. 48 North [X] or South [ ]
R. 04 East [ ] or West [X]
Sec. 32, 10 acres 1/4, 40 acres NW 1/4, 160 acres NE 1/4
Gov't Lot ____ County

Address of Well Site LAKE SHORE DR.
(Give at least Direction + Distance to Road or Landmark)

Lot No. ____ Block No. ____ Subd. Name

4. PROPOSED USE:
[ ] Domestic [X] Municipal [ ] Monitor [ ] Irrigation
[ ] Thermal [ ] Injection [ ] Other

5. TYPE OF WORK DEEPEN
[ ] New Well [X] Modify or Repair [ ] Replacement [ ] Abandonment

6. DRILL METHOD
[ ] Mud Rotary [X] Air Rotary [ ] Cable [ ] Other

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
NONE				

Was drive shoe seal tested? YO NO How?

8. CASING/LINER:

Diameter	From	To	Guage	Casing	Liner	Steel	Plastic	Welded	Threaded
NONE						[ ]	[ ]	[ ]	[ ]
						[ ]	[ ]	[ ]	[ ]
						[ ]	[ ]	[ ]	[ ]
						[ ]	[ ]	[ ]	[ ]

Final location of shoes
Top Packer or Headpipe Bottom Tailpipe

9. PERFORATIONS/SCREENS
[X] Perforations Method SKILLSAW
[ ] Screens Type 160PSI Material PVC

From	To	Slot Size	Number	Diameter	Tele/Pipe Size	Casing	Liner
230	250	1/8x4"				[ ]	[X]
270	290	"				[ ]	[X]
290	310	"				[ ]	[X]
						[ ]	[ ]

NWNE 32 48N 4W

10. WELL TESTS: [ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian

Yield gal./min.	Drawdown	Pumping Depth	Time
53+			

Temperature of water ____ Was a water analysis done? Yes [ ] No [ ]
By whom?
Water Quality (odor, etc.)
Bottom Hole Temperature

11. STATIC WATER LEVEL:
70 ft. below surface Depth artesian flow found
Artesian pressure ____ lb. Describe access port
Describe Controlling Devices:

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	GPM	SWL
6	230	234	BRIDGE BASALT COBBLE W/WOOD		
6	247		BOTTOM OF HOLE	30	
6	247	260	BASALT GRAY W/FRACTURES		
6	260	263	BASLAT HONEY COMP		
6	263	275	BASALT DARK GRAY HARD		
6	275	286	BASALT GRAY W/FRACTURES WBRWN		
6	286	304	BASLAT GRAY MEDIUM		
6	304	311	BASALT GRAY W/BROWN SOFT		
			W/WATER APPROXIMATELY 25GPM	25	
6	311	312	CLAY GRAY		
			NOTE PS 5HR STAND BY TIME		
			PVC FROM -15 TO 312		

RECEIVED
DEC 23 1993
NORTHERN REGION
IDWR

MAR 29 1995

Date: Started 12/09/93 Completed 12/10/93

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name H20 WELL SERVICE INC Firm No. #448
Firm Official Brent McGee Date 12-20-93
and
Supervisor or Operator L E Date 12-20-93
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

CBCS#2

RECEIVED
APR 11 1966

REPORT OF WELL DRILLER
State of Idaho

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER: Virgil Carroll
6615 E 12th Spokane Wash.

Water Permit No. R 32724

TYPE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐

Use to be used for: Domestic

METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Use ☐ Other ☐ (explain)

CASING SCHEDULE: Threaded ☐ Welded ☒
6" Diam. from 0 ft. to 149 ft.
[illegible] Diam. from [illegible] ft. to [illegible] ft.
[illegible] Diam. from [illegible] ft. to [illegible] ft.
Thickness of casing: [illegible] Material:
Steel ☒ concrete ☐ wood ☐ other ☐

PERFORATED? Yes ☐ No ☒ Type of perforator used:
Size of perforations: [illegible] " by [illegible] "
[illegible] perforations from [illegible] ft. to [illegible] ft.
[illegible] perforations from [illegible] ft. to [illegible] ft.
[illegible] perforations from [illegible] ft. to [illegible] ft.
[illegible] perforations from [illegible] ft. to [illegible] ft.

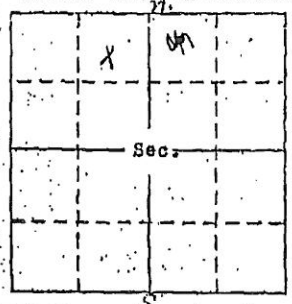
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

CONSTRUCTION: Well gravel packed? Yes ☐
No ☒ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☐ No ☐ To what depth? ft. Material used in seal:

Did any strata contain unusable water? Yes ☐
No ☒ Type of water:
Depth of strata ft. Method of sealing strata off:

Surface casing used? Yes ☐ No ☐
Cemented in place? Yes ☐ No ☐

Locate well in section



LOCATION OF WELL: County Kootenai
NE ¼ NW ¼ Sec. 32 T. 48 N/S R. 4 E/W

Use other side for additional remarks.

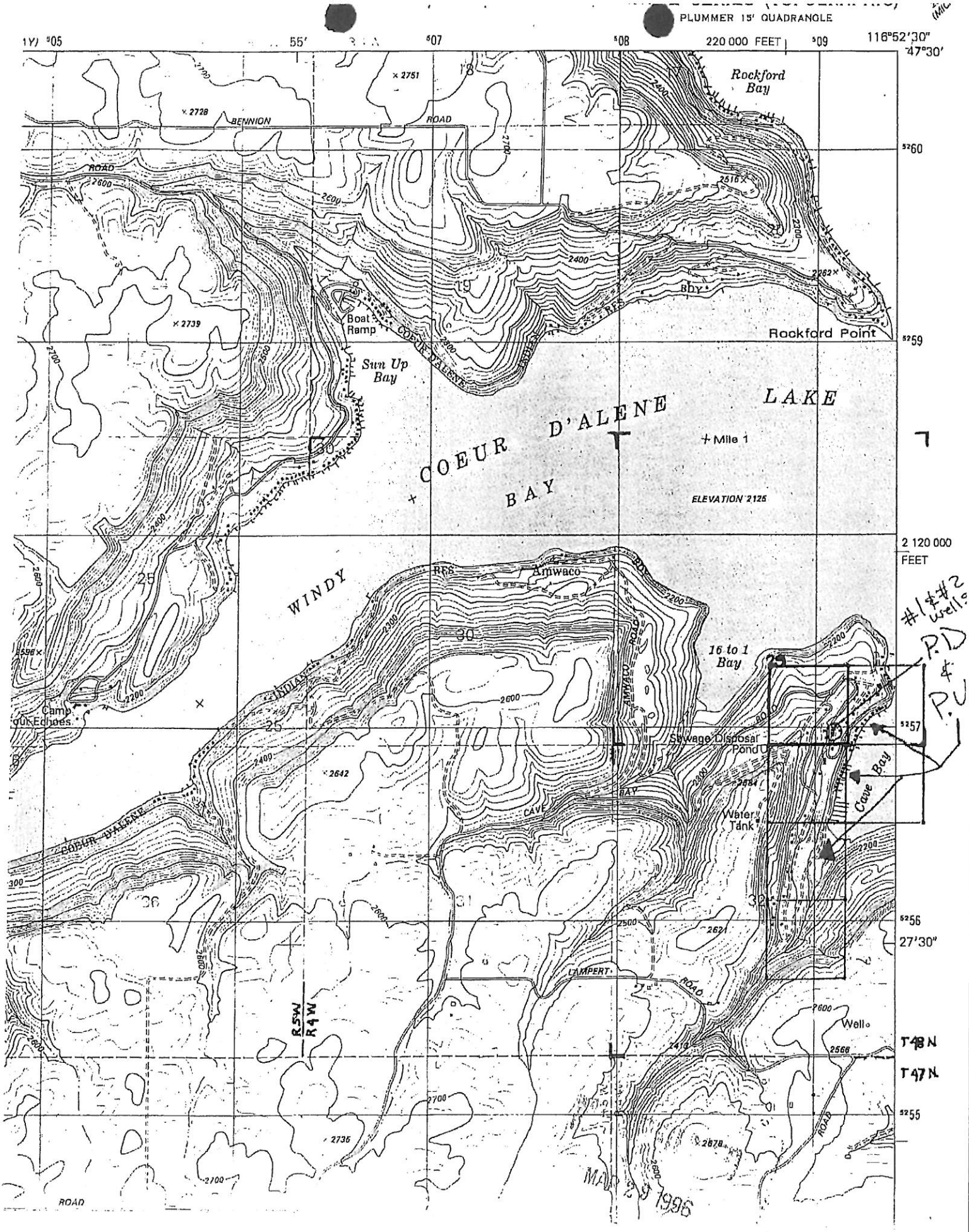
Size of drilled hole: 6" Total depth of well: 167 Standing water level below ground: 65' Temp. Fahr. Test delivery: 40 gpm or cfs Pump? ☐ Bail ☒
Size of pump and motor used to make test:
Length of time of test: 2 Hrs. Min.
Drawdown: 35 ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing? Yes ☐ No ☐

DEPTH FROM FEET	DEPTH TO FEET	MATERIAL	WATER YES OR NO
0	12	Clay Sand "& Bolders	
12	43	Gray Sand	
43	96	Gray Clay	
96	144	" Sandy Clay	
144	167	Broken Basalt Rock	yes

Work started: March 21 - 1966
Work finished: April 7 "

Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: E.A. Hohman
Address: 601 S. Pines Rd Spokane Wash.
Signed by: E A Hohman
License No. 242 Date:

APR 29 1996


PLUMMER 15' QUADRANGLE
220 000 FEET
116°52'30"
47°30'
Rockford Bay
BENNION ROAD
ROAD
Boat Ramp
COEUR D'ALENE RES
Rockford Point
Sun Up Bay
COEUR D'ALENE LAKE
+ Mile 1
BAY
ELEVATION 2125
2 120 000 FEET
WINDY
Amwaco
AMWACO ROAD
16 to 1 Bay
Camp Cur Edjoes
INDIAN
Sewage Disposal Pond
Water Tank
Cave Bay
CAVE BAY
COEUR D'ALENE
CAMPERT ROAD
Well
R5W
R4W
T48 N
T47 N
27'30"
MAR 29 1996
#1 & #2 wells
P.D
&
P.U

J:\110031\Acadd\Sheets\Exhibits\110031_x_Wells_Vicinity.dwg, 9/21/2011 2:28:49 PM, Thompson, Zach, To PDF.pc3

COEUR

BAY

ELEVATION 2128

Mile 0

WINDY

Anlwace

30

29

16 to 1 Bay

CBCS PUBLIC WELLS #1 AND #2

Sewage Disposal Pond

Water Tank

Cave Bay

Cave Bay

S CAVE BAY RD

S CAVE BAY DR

S LAKESHORE DR

Mowry State Pa
(Boat Access on

Aberdeen Lodge Bay

MC

2642

2624

2618

2600

2700

2800

2900

3000

3100

3200

3300

¼ MILE ZONE

LAND APPLICATION SITE

DOMESTIC WELL (CARROL)

31

32

33

LAMPERT RD

S MOWRY RD

T-O ENGINEERS
WEST 280 PRAIRIE AVENUE
COEUR D'ALENE, IDAHO 83815-7710
PHONE: (208) 762-3644 FAX: (208) 762-3708

E-FILE: J:\110031\EXHB_x_Wells_Vicinity DATE: SEPT. 2011 JOB: 110031

APPENDIX E

DEQ Correspondence

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

2110 Ironwood Parkway • Coeur d'Alene, Idaho 83814 • (208) 769-1422

C.L. "Butch" Otter, Governor
Toni Hardesty, Director

February 11, 2011

Dave Kinkela, Board Chairman davekink@aol.com
Cave Bay Community Services
PO Box 115
Worley, ID 83876

RE: **Cave Bay Community Services**, Lagoon Overflow, Reuse Permit Waiver Approval

Dear Mr. Kinkela:

Cave Bay Community Services (CBCS) owns and operates a community wastewater system that consists of a septic tank effluent collection system and two (2) aerated wastewater lagoons located on the west shore of Lake Coeur d'Alene about 790 feet from the lake at the closest point. Approximately 180 homes are connected to the system and about 60 homes are full-time residents. The lagoons were designed in 1977 to be non-discharging. In North Idaho, the amounts of precipitation and evaporation do not allow a total containment lagoon system to function indefinitely without a discharge.

On February 1, 2011, the Department of Environmental Quality (the Department), was notified at a meeting by the CBCS Board that the lower CBCS lagoon was close to overflowing the dike. An overflow of the dike and/or continued operation of the lagoon in the freeboard area could lead to catastrophic failure of the dike. On February 2, 2011, the Department staff visited the lagoon site. The lagoon level was above the dike along the north side and sand bags covered with plastic sheeting were preventing an overflow. Staff also observed that water was surfacing from an outlet/drain pipe connected to the lower lagoon and this pipe daylights below the west dike on property owned by CBCS. This pipe is shown on the 1978 record drawings. Further downslope to the north from this pipe, there were numerous other surface water seeps. The source of this surface water could be seepage from the lagoon.

CBCS Proposal

CBCS must attempt to maintain the integrity of the current lagoon system by not allowing the dike to fail, until extensive improvements can be made to bring the system into compliance with current Idaho rules. Lowering the lagoon water level to at least a two (2) foot freeboard is the first priority (this equates to about 619,000 gallons that must be removed and influent flows are between 5,000 to 10,000 gallons per day). The February 4, 2011 letter from Dave Kinkela, CBCS President, to John Tindall (enclosed) describes the measures proposed. The CBCS Board has notified the system users that water conservation is needed and has initiated plans for hauling wastewater from the lagoon to the wastewater treatment plant (WWTP) owned and operated by the city of Worley. In addition to this hauling, the Board has requested that the Department allow a limited amount of wastewater to be irrigated on a portion of the six (6) acre property owned by CBCS adjacent to the north side of the lower lagoon. Approval of this request will

require the Department to waive the requirement for the issuance of a reuse permit in the Idaho Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater (Reuse Rules) (IDAPA 58.01.17). The conditions of this waiver will control the operation of the temporary irrigation system and require CBCS to enter into a Compliance Schedule Agreement (CAS) with the Department for long-term improvements to the system. There is not adequate time to go through the reuse permitting process for this proposed short-term activity considering the urgency of the situation.

Department Evaluation and Justification:

CBCS Board Members and community volunteers have worked with the Department staff to evaluate possible options to accomplish the priority objective of lowering the lagoon level until there is two (2) feet of freeboard in the lower lagoon as measured at the lowest point on the top of the dike. The most viable options have been determined to be hauling wastewater to the city of Worley WWTP and limited slow rate irrigation on CBCS property adjacent to the west dike of the lower lagoon. The CBCS does not have a reuse permit, as would be required per the Reuse Rules for the irrigation of the domestic wastewater. There is not adequate time, considering the impacts from a dike failure, to process a reuse permit. An evaluation of the impacts from the proposed activity and the impacts from a waiver to the Reuse Rules follows.

The Department has evaluated the CBCS proposal per Section 940 of the Reuse Rules and concludes as follows:

A.. Public health and water quality will continue to be protected - Public health and water quality will continue to be protected even if the waiver is granted, because conditions of the waiver will control the operation of the irrigation system. The conditions included in the portion of this letter titled "Department Waiver and Conditions" will provide those protections. In addition, CBCS will be required to enter into a CAS with the Department to develop an enforceable schedule for making the long-term improvements that will be needed to bring the entire wastewater system into compliance with the applicable Idaho wastewater rules.

B. Effect of the Proposed Loadings - The proposed loadings on the site will be de minimus in both quantity and quality. Irrigation on this site will be limited to a maximum of 10,000 gpd and only until April 15, 2011, or until there is two (2) feet of freeboard in the lower lagoon as measured at the lowest point on the top of the dike, whichever occurs first. The short duration of this irrigation activity will assure that the impacts from this activity will be de minimus. There is no risk to downgradient ground water wells from this activity because there are no wells downgradient.

C. Treatment Requirements – Under this emergency situation, it is not reasonable to install a treatment system to treat the lagoon effluent to a higher level prior to discharge. The time it would take to bring a treatment system on-line would cause a significant delay in lowering the water level in the lagoon. Time is of the essence for correcting this problem.

Department Waiver and Conditions

According to IDAPA 58.01.17.940, the Department may waive any requirement of compliance with IDAPA 58.01.17. The Department agrees that the CBCS must immediately lower the water level of the lower lagoon to prevent a catastrophic failure of the lagoon dike. Limited irrigation on the CBCS 6-acre property will supplement the hauling of wastewater to quickly lower the water level and keep the level sufficiently lowered, until plans can be made for a long-term solution to this problem. Public health and water quality will be protected. Therefore, the Department hereby waives the following rules:

IDAPA 58.01.17.300 PERMIT REQUIREMENTS AND APPLICATION

01. Permit Required. No person shall construct, modify, operate, or continue to operate a reclamation and reuse facility without a valid permit issued by the Director as provided in these rules. (4-11-06)
02. Dischargers. No person shall discharge to a reclamation and reuse facility without a valid permit issued by the Director as provided in these rules. (4-11-06)

The Department's Waiver of the above stated rules is conditioned upon the following:

1. For the irrigation system, at the first sprinkler, a minimum total chlorine residual concentration of 0.5 mg/L must be maintained. When irrigating, a minimum of two (2) grab samples per day must be taken demonstrating compliance with this condition. The first sample must be taken within 30 minutes from starting for that day and the second sample taken within one to two hours after start-up.
2. Irrigation can only be done during daylight hours. CBSC must inspect the site at a minimum of every two (2) hours while irrigating and document those inspections.
3. Irrigation can only be done while the outside temperature at the irrigation site is above 35°F. On the days irrigation occurs, the outside temperature at the start and end of the irrigation must be recorded.
4. No run-off from the 6-acre site owned by CBSC can occur while irrigating. If any run-off from the site is observed while irrigating, irrigation must be stopped until the Department is consulted and approves the restarting of the irrigation.
5. All irrigation must be done on CBCS property.
6. Irrigation on this site through this waiver can continue until April 15, 2011 or until there is two (2) feet of freeboard in the lower lagoon as measured at the lowest point on the top of the dike, whichever occurs first. Irrigation of wastewater on this site after this emergency drawdown is completed will require the issuance of a reuse permit by the Department.
7. Public access points to the irrigation site will be closed. In addition, signs at the public access points will be posted stating "Sewage Effluent Application – Keep Out".
8. When irrigating, the flow and daily volume applied must be recorded.
9. Documentation of the monitoring data required in the conditions listed above and sample times must be maintained and submitted to the Department on a weekly basis.
10. CBCS must contact the Department immediately if they observe any problems during the irrigation process or hauling of wastewater.

11 Prior to June 1, 2011, CBCS will enter into a Compliance Schedule Agreement (CAS) with the Department which will include an enforceable schedule for upgrading the CBCS wastewater system to meet the applicable Idaho wastewater rules.

12 The CBCS president must acknowledge acceptance of these wavier conditions by signing and returning to the Department this letter with original signatures.

Conclusion

Please note that the Department's waiver is contingent upon the CBCS complying with all of the waiver conditions listed above. The Department has not waived any other rules or requirements, except as expressly described in this document. If you have any questions, please contact John Tindall at the Coeur d'Alene Regional Office (666-4629).

Sincerely,

Daniel Redline
Regional Administrator

DR:vh

Enc.

c: 2011AGD376 WW Cave Bay Community Services
Steve Tanner, DEQ, Coeur d'Alene Stephen.tanner@deq.idaho.gov
Rebecca Stevens, Coeur d'Alene Tribe rstevens@cdatribe-nsn.gov
Scott Fields, Coeur d'Alene Tribe sfields@cdatribe-nsn.gov
Charles Krahenbuhl, Cave Bay Community Services ex.hydro@hotmail.com
Richard Huddleston, P.E., DEQ State Office, Boise Richard.huddleston@deq.idaho.gov

On behalf of the Cave Bay Community Services Board, I accept the waiver conditions contained in this letter.

David Kinkela Date 2/11/2011

David Kinkela
President
Cave Bay Community Services

Cave Bay Community Services, Inc. (CBCS)

PO Box 115

Worley, ID 83876

4 February 2011

State of Idaho

Department of Environmental Quality

2110 Ironwood Parkway

Coeur d'Alene, ID 83814

Attn: John C. Tindall, P.E.

Subject: Emergency Action Plan for CBCS Waste Water System.

Dear Sir:

In conjunction with site visits and conversations with your office and JUB Engineers, the community has developed a short term action plan to address the emergency situation present with the community waste water system, specifically the second lagoon overcharging, outflow and lagoon dike overtopping risk.

The following describes the three prong approach to the emergency and a perhaps optimistic timeline with extreme diligence on our part.

1. Community members are being notified of the manner of the emergency and requested to curtail domestic water usage which in turn will reduce the inflow to the lagoon. A significant number of members are part time residents and will be encouraged to refrain from using their homes as well as to check for water usage caused by inadequate winterizing or unnecessary flows. Curtailment includes but not limited to delayed clothes washing, infrequent showers etc .
2. Provisions are being made to begin a trucking regiment to the adjacent village of Worley's waste water treatment plant. As road conditions include load limits, an agreement with the County has been made to allow tanker trucks to operate. It is anticipated that 2 tankers ranging from 3000-6000 gallons will be used to reduce the elevation of the affected lagoon over the next 3 weeks. This will provide freeboard and embankment stability. This will continue until lagoon available capacity is adequate to prevent overcharging until weather allows evaporation exceeding inflow to an appreciable level. It is anticipated that this trucking will begin by 9 February 2011
3. Provisions are being made to begin land application via irrigation system which will be sized to approach or exceed the daily inflow curtailed in 1 above. It will utilize the 6 plus acres of forested land adjacent to the affected lagoon. Constraints discussed during our site visit on 4

February 2011 will be fully in place before operation begins. This would continue until the same factors discussed in 2 above are present. A further request for land application will occur for the summer months to reduce the level of the lagoon further for inspection and temporary repairs as the planning, design and construction phases progress to allow the system to reach all current operation, condition, monitoring and reliability standards.

It is anticipated that these acute actions will commence as soon as possible and continue to approximately 1 May 2011.

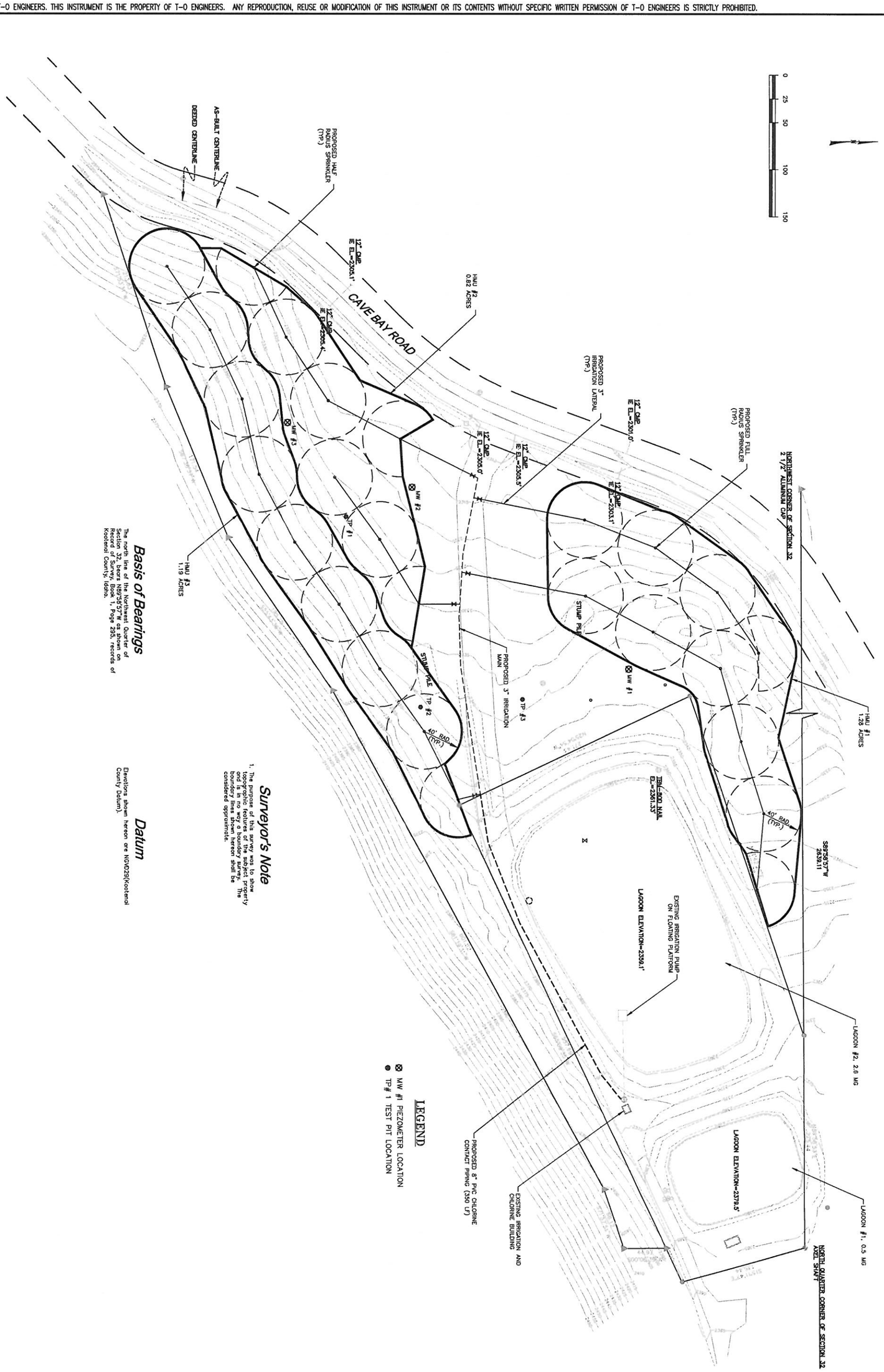
Questions on the above may be addressed to the undersigned or Charles Krahenbuhl at 253 229 4824 or 208 686 0301 respectively.

David Kinkela

President, CBCS, Inc.

APPENDIX F

Interim Land Application System



Basis of Bearings

The north line of the Northwest Quarter of Section 32, T.48N., R.3W., B.M., as shown on Record of Survey, Book 1, Page 295, records of Kootenai County, Idaho.

Surveyor's Note

1. The purpose of this survey was to show topographic features of the subject property and is in no way a boundary survey. The boundaries shown hereon shall be considered approximate.

Datum

Elevations shown hereon are NGVD29(Kootenai County Datum).

LEGEND

⊗ MW #1 PIEZOMETER LOCATION

● TP# 1 TEST PIT LOCATION

FIGURE 2
CAVE BAY COMMUNITY SERVICES, INC.
PRELIMINARY SITE PLAN

SHEET 1 OF 1

DATE: SEPTEMBER 2011
PROJECT: 110031

T-O ENGINEERS
CONSULTING ENGINEERS, SURVEYORS & PLANNERS
WEST 280 PRAIRIE AVENUE
COEUR D'ALENE, IDAHO 83815-7710
PHONE: (208) 762-3644 FAX: (208) 762-3708
OFFICES ALSO IN: BOISE, IDAHO

REVISIONS			E-FILE NAME
NO.	ITEM	DATE	Irrigation Layout
			DESIGNED
			DRAWN
			CHECKED
			APPROVED

APPENDIX G

CBCS Articles of Incorporation and Bylaws

State of Idaho

Department of State.

CERTIFICATE OF AMENDMENT
OF

CAVE BAY COMMUNITY SERVICES, INC.

I, PETE T. CENARRUSA, Secretary of State of the State of Idaho hereby, certify that duplicate originals of Articles of Amendment to the Articles of Incorporation of **CAVE BAY COMMUNITY SERVICES, INC.** duly signed and verified pursuant to the provisions of the Idaho Nonprofit Corporation Act, have been received in this office and are found to conform to law.

ACCORDINGLY and by virtue of the authority vested in me by law, I issue this Certificate of Amendment to the Articles of Incorporation and attach hereto a duplicate original of the Articles of Amendment.

Dated September 28, 19 83.

GREAT SEAL OF THE STATE OF IDAHO — ESTO PERPETUA

Pete T. Cenarrusa

SECRETARY OF STATE

Corporation Clerk

CA 779

AMENDMENT OF ARTICLES OF INCORPORATION
OF CAVE BAY COMMUNITY SERVICES, INC.

WHEREAS, at the annual meeting of the stockholders of CAVE BAY COMMUNITY SERVICES, INC., duly called and held in the city of Worley, Idaho, on the 18th day of June, 1982, at 10:00 o'clock a.m., at which meeting 99 shares of the capital stock issued and outstanding were represented in person, the following Resolutions were adopted by a 94 to 4 vote with 1 abstension of said issued and outstanding stock:

"RESOLVED that the Articles II of Articles of Incorporation of CAVE BAY COMMUNITY SERVICES, INC. shall be amended to read as follows:

ARTICLE II.

The objectives and purposes for which this corporation is formed are as follows:

(1) To enforce the Covenants of Restriction of CARROLL'S CAVE BAY HOMESITES as recorded March 25, 1965, in Book 58 of Miscellaneous, at page 117, records of Kootenai County, Idaho, and all additions of CARROLL'S CAVE BAY HOMESITES, as recorded, and the purpose is for the mutual benefit and use by the present and future members of this Association.

(2) To acquire and hold title and easements to the water well and water distribution system serving CARROLL'S CAVE BAY HOMESITES and Additions, and to obtain, maintain, and control the sewer system and distribution system and the sewer lagoons, all of which serve CARROLL'S CAVE BAY HOMESITES and all Additions. Any future connections to the water and or sewer system shall depend upon the capacity of said systems, with final determination being made by Board action. Any approval for additional connections shall not be unreasonably withheld by the Board of Directors.

(3) To acquire and hold title to and to control the use and maintenance of the boat access ramp, swimming area, and all other commonly owned recreational facilities in existence or coming into existence in the future, for the perpetual use, benefit and enjoyment of owners of lots in CARROLL'S CAVE BAY HOMESITES and any

additions, or property to be included within the service area of this non-profit services corporation.

(4) To acquire and hold title to and to control the use and maintenance of the fresh water supply system of CARROLL'S CAVE BAY HOMESITES and additions thereto, and any future additions thereto, and for the perpetual use, benefit and enjoyment of owners of lots in the Homesites and additions, and any future additions, and to distribute water as a non-profit venture to the members of this non-profit corporation association; and, under certain conditions, to non-members, as determined by the Board.

(5) To acquire and hold title to and control the use and maintenance and repair of the platted private roadways in CARROLL'S CAVE BY HOMESITES and the additions thereof, and any additions thereto, for the perpetual use, benefit and enjoyment of the owners of lots in CARROLL'S CAVE BAY HOMESITES and additions, and any future additions or property to be served from or by the non-profit corporation's facilities.

(6) To acquire and hold title and to control the use and maintenance of the sewer system, distribution system, and the sewer lagoons, which are in place and in use, for the benefit and enjoyment of the owners of CARROLL'S CAVE BY HOMESITES and additions, and any future additions, and to provide said sewer services on a non-profit venture to the members of this non-profit corporation and under certain conditions to non-members, all subject to Article II, Section 2 of the foregoing.

(7) To acquire, buy, sell, lease, own, maintain and improve real and personal property for the mutual use, enjoyment and benefit of the members of this non-profit corporation.

(8) To borrow money when necessary for the use and benefit of this non-profit corporation and its members.

(9) To pledge, mortgage, or secure property of this association or corporation as security for the payment of any money borrowed for the use and benefit of this non-profit corporation.

(10) To exercise without limitation all of the powers granted by the laws of the State of Idaho to a corporation of this character; and to do everything necessary, suitable, and useful for the accomplishment of any one or more of the objectives herein stated, or which shall at any time appear to be conducive to or expedient for the benefit of this corporation and its member.

(11) To levy assessments upon all members in a fair and equitable fashion so as to maintain, and/or acquire common facilities, services, utilities, and any other needed improvement for the use and benefit of the members of the corporation.

(12) To hire and employ personnel and pay wages or salaries for work performed in the furtherance of the purposes and intents of this Corporation.

(13) To enter into leases, contracts and agreements with any individual, corporation, association, or partnership, to carry out the purposes and intents of this corporation.

(14) To decide all questions arising between members of the corporation concerning property rights, easements and restrictions on the use of private lots or community assets of this association, resorting to arbitration when necessary to do so; PROVIDED, however, that this provision shall not be construed to prevent any member from having legal issues decided by the courts of the State of Idaho.

RESOLVED FURTHER that Article III of the Articles of Incorporation of CAVE BAY COMMUNITY SERVICES, INC., be amended to read as follows:

ARTICLE III.

The registered head office, place of business, and post office address of this corporation shall be:

Richard Mellick
Box 118-C
Worley, Idaho 83876

BE IT FURTHER RESOLVED that Article VIII. of the Articles of Incorporation of CAVE BAY COMMUNITY SERVICES be amended to read as follows:

ARTICLE VIII.

The By-Laws of this corporation, in addition to other provisions, provide for the qualification of members, the terms and conditions of admission, the time, mode, conditions and effect of expulsion or withdraw from and restoration to membership, admission fees, charges and assessments; and for reimbursement for services rendered to and expenses incurred on behalf of the corporation by any member or officer of the corporation, and such other rules and regulations as re not repugnant to the laws of the State of Idaho. This corporation shall have the power to enforce the By-Laws of the corporation through litigation, arbitration or by securing assessments through lien upon real property in accordance with Idaho Code 30-308A.

IN WITNESS WHEREOF, we have hereunto set our hands this 5th day of July, 1983.

CAVE BAY COMMUNITY SERVICES, INC.

By: Ted Komis - President
Cave Bay Community Svs.

ATTEST:
Don Colpitts
Secretary
Cave Bay Community Servic

AMENDED BYLAWS

OF

CAVE BAY COMMUNITY SERVICES, INC.

ARTICLE I

PRINCIPAL OFFICE

OFFICES

The principal office of this corporation in the State of Idaho shall be in Cave Bay, Kootenai County, Idaho. Mailing address: Registered Agent, Cave Bay Community Services, Inc., Route 1, Worley, Idaho 83876. The Corporation may have such other offices as the Board of Directors deems necessary.

ARTICLE II

MEMBERSHIP

CLASS OF MEMBERS

Section 1: The Corporation shall have one class of members, who shall be owners or contract purchasers of property in Cave Bay Homesites or Additions thereto, in Kootenai County, Idaho. Members will hold one share of stock for each lot owned or under purchase and/or fractional share of stock for each fractional portion of lot owned or under purchase.

VOTING RIGHTS

Section 2: Members shall be entitled to one vote per share, or fractional vote per fractional share, except for special assessments as specified in Article XI.

SUSPENSION

Section 3: A member may be suspended from the Corporation and lose all corporate rights for non-payment of fees or assessments. The procedure for suspension is as follows:

JB

1. After a period of thirty (30) days delinquency in payment of member's fees or assessments, a notice of the delinquency is sent to the member from the Treasurer of Cave Bay Community Services, Inc., by certified mail, return receipt requested.

(Billings for assessments are made for fiscal year term July 1-June 30. Billings unpaid after June 30 of that fiscal year shall be considered delinquent.);

2. After an additional thirty (30) days delinquency, a second notice citing failure to make payment is sent by certified mail, return receipt requested, and a notice of suspension hearing is announced;

3. A final determination of suspension will be made by a minimum two-thirds (2/3) majority vote of the Board of Directors. During suspension, a member shall lose all rights to vote, use of corporate facilities, or enjoyment of any of the advantages of a corporate member. While suspended, a member is still responsible for fees and assessments, and suspension of membership shall not in any way prohibit any legal remedy, including, but not limited to, the filing of liens or foreclosure in order to secure recovery of fees and assessments.

TRANSFER

Section 4: All shares of stock are non-transferable and non-assignable. If a member sells or transfers property to another, that share of stock is retired and made null and void. The new owner is issued a new stock share/certificate for ten dollars ($10.00) upon notification by both parties to the Board that the transfer of the property has been completed and all outstanding fees and assessments have been paid.

REINSTATEMENT

Section 5: A member whose membership has been suspended may have such membership reinstated upon the approval of a two-thirds (2/3) majority vote of the Board of Directors. Such vote may be taken only after all fees and assessments have been brought current and the suspended member has fulfilled all the obligations of general membership. The application for reinstatement shall be made in writing by the suspended member and filed for action with the Board Treasurer, accompanied by a non-refundable fee of Fifty Dollars ($50.00).

ARTICLE III

MEETING OF MEMBERS

ANNUAL MEETING

Section 1: The annual meeting of the membership, for the purpose of electing directors and transacting any other business, shall be held in Kootenai County, Idaho, on a Saturday in June of each year. In the announcement of the meeting, the specific date, place and commencement time will be included.

SPECIAL MEETINGS

Section 2: Special meetings of the membership may be called by the President, or upon the request of at least twenty (20) members. The President, or the requesting members, may designate any reasonable place in Kootenai County, Idaho, as the location for the special meeting. Due notification of such meetings (see Section 3) must be given.

NOTICE OF MEETING

Section 3: Written notice from the Board stating the place, day and hour of the annual or special meeting of members shall be delivered either personally or by mail to each member entitled to vote at such meeting, not less than ten (10) days nor more than thirty (30) days before the date of such meeting. In case of special meetings, the purpose for which the meeting has been called shall be stated specifically in the notice. If mailed, the notice shall be deemed to be delivered when deposited in the United States mail addressed to the member at his address as listed in the Corporation's records.

ACTION BY CONSENT

Section 4: Should the Corporation be required by law to take action promptly on any issue requiring full membership participation, the Board Secretary will poll the members as follows: a ballot will be prepared, clearly stating the issue(s) for consideration, the rationale for action, and the position of the Board with justification, and "yes" and "no" boxes for the member to record his vote. The ballots returned will be counted by the Board, or a committee appointed by the Board, and the Board will take action in accordance with a vote of the necessary majority for the action required, of the ballots returned.

QUORUM

Section 5: Twenty percent (20%) of the total membership, including proxies, shall constitute a quorum for the membership meetings of the Corporation.

PROXIES

Section 6: At any membership meeting, members may vote by proxy either by executing the proposals on the proxy or by designating an agent in writing on the proxy. A proxy form will be sent with each meeting announcement.

REGULAR BUSINESS

Section 7: All actions brought before the membership for vote at an annual, regular, or special meeting, will be carried by simple majority, except as otherwise stated in these Bylaws. All meetings will be conducted in accordance with Roberts Rules of Order.

ARTICLE IV

GOVERNING BODY

GENERAL POWERS

The total membership of the Corporation constitutes the final authority for the governing of this Corporation. A duly elected Board will represent the interests of the Corporation and is charged with carrying out the general business of this Corporation. The Board of Directors is granted the powers and assigned the duties necessary for the administration and management of the affairs of Cave Bay Community Services, Inc., to the full extent as allowed under law.

ARTICLE V

BOARD OF DIRECTORS

TERM OF DIRECTORS

Section 1: The Board of Directors shall consist of nine (9) directors, each of whom must be a member in good standing of Cave Bay Community Services, Inc. Each Director shall hold office for a term of three (3) years, with the directors having staggered terms so as to elect three directors each year to the nine-member Board.

ELECTION OF BOARD OF DIRECTORS

Section 2: The Board of Directors shall appoint a nominating committee yearly to present a slate of candidates for consideration by the membership for the election to the expired positions on the Board. The Nominations Committee will present a list of three or more candidates, attesting that each candidate listed has consented to run for office. At the annual meeting, the President shall also offer opportunity for nominations from the floor. Cumulative voting will not be allowed.

DISQUALIFICATION OR REMOVAL

Section 3: A Director may be disqualified or removed from the Board for any of the following reasons:

(a) Loss of membership in the Corporation;

(b) Unexcused absence from three (3) consecutive Board of Directors' meetings without just cause; and

(c) A conflict of interest between outside activities and duties as a Director.

The final determination of disqualification shall be made upon a two-thirds (2/3) vote of the Board of Directors. Upon such an affirmative determination of disqualification, that position shall be considered vacant.

VACANCIES

Section 4: A vacancy in any office because of death, resignation, removal, disqualification or otherwise shall be filled for the remainder of the previous Director's term through appointment by the remaining members of the Board.

QUORUM

Section 5: The presence of five (5) Directors at any meeting of the Board shall constitute a quorum.

REGULAR MEETINGS

Section 6: Regular meetings of the Board of Directors shall be conducted at least quarterly at a time and a place chosen by the Board and convenient to the Cave Bay Community. Notice of all meetings of the Board of Directors must be given to each Director personally, by mail, or by telephone or telegraph at least three (3) days prior to the date of the meeting. Such notice also shall be displayed in a prominent place or places within the Cave Bay Community.

SPECIAL MEETINGS

Section 7: A special meeting of the Board of Directors may be called by the President or by written notice signed by three Directors other than the President. Notice of such meeting shall be provided to all Directors and also posted in a prominent place or places within the Cave Bay Community. The notice shall detail the nature of the special business to be considered by the Board.

WAIVER OF NOTICE

Section 8: Before or at any meeting of the Board, any Director may in writing waive notice of such meeting and such waiver shall be deemed equivalent to giving a notice to the Director. Attendance by a Director at any meeting of the Board shall be a waiver of notice to that Director of the time and the place of the meeting except where such attendance is for the limited and expressed purpose of objecting to the transaction of any business at the meeting because the meeting was not lawfully called or convened.

ACTIONS BY CONSENT OF DIRECTORS

Section 9: Emergency actions by the Board of Directors may be taken apart from a formal meeting. All Board members must be polled, votes of nay or yea results, and absent members declared during the next Board meeting and shall be ratified with purpose stated in the next Board meeting minutes.

BOARD MEETING OPEN TO MEMBERS

Section 10: Regular and special meetings of the Board shall be open to all members of Cave Bay Community Services, Inc. Members in attendance who are not on the Board may participate in discussion at the invitation of the Board.

EXECUTIVE SESSION

Section 11: During a Board meeting, the Board may move to Executive Session in order to discuss sensitive, personnel, or litigation issues. Before entering into the closed session, the Board will identify the issues to be discussed.

ARTICLE VI

OFFICERS OF CORPORATION

TITLES AND APPOINTMENTS POWER

Section 1: The officers of the Corporation shall constitute the Board of Directors of the Corporation. The officers shall consist of a President, a Vice-President, a Secretary, a Treasurer and five (5) Directors at large. The Board of Directors shall nominate and elect the officers. The Board of Directors may also appoint such staff as they may deem desirable. Each staff member will be given a clear understanding of the nature and extent of his/her duties and the authority to carry out the assignment under the supervision of the President.

ELECTION AND TERM

Section 2: The election of officers shall take place at the first meeting of the Board of Directors following the annual membership meeting. The term of office shall be for one (1) year.

VACANCIES

Section 3: A vacancy in any office will be filled by appointment of the Board of Directors. The new officer appointed shall serve for the remainder of the term of the officer replaced.

PRESIDENT

Section 4: The President shall be the chief executive officer of the Corporation and supervise and control the business affairs of the Corporation. He/she shall preside at all meetings; shall sign (with the Secretary and Treasurer, or any other proper officer of the Corporation authorized by the Board of Directors) any deeds, mortgages, bonds, contracts or other instruments which the Board of Directors has authorized to be executed; and shall perform any other duties incident to the office of President and prescribed by the Board of Directors.

VICE-PRESIDENT

Section 5: The Vice-President shall perform the duties of the President in the President's absence and any other duties assigned by the President and/or the Board. In the event of an extended incapacity or death of the President, the Vice-President will assume the Presidency for the completion of the regular term of office.

SECRETARY

Section 6: The Secretary shall keep the minutes of all meetings of the Corporation in record books provided for that purpose; record all votes of each Board Member; see that all notices are duly prepared and distributed in accordance with the provisions of these Bylaws or as required by law; serve as custodian of the Corporate records and bearer of the Seal of the Corporation, and see that the Seal of the Corporation is affixed to all official corporate documents; issue certificates; assure prompt posting of all official actions of the Board (i.e. regular and special meeting) on the official Bulletin Board of CBCS and perform all other duties incident to the office or assigned by the President and the Board.

TREASURER

Section 7: The Treasurer shall have charge of and be responsible for all funds and securities of the Corporation; receive and give receipts if necessary for all monies paid to the Corporation; and deposit all funds in the name of the Corporation in such depositories as have been arranged for by the Corporation. The Treasurer will keep a register of the current post office address of each Corporation member as furnished by each member; provide the Secretary with the current financial status reports for inclusion in the posted minutes of CBCS regular and special meetings; and will also carry out all duties incident to the office and such other special duties as from time to time may be assigned to him or her by the President and/or the Board.

DIRECTORS-AT-LARGE

Section 8: The Directors-at-Large individually and/or collectively will carry out the normal responsibilities of Corporate Directors; they will perform such other duties as are assigned by the President and/or Board, including, but not limited to, chairing ad hoc or standing committees, and directly assisting other offices in their assignments.

COMPENSATION

Section 9: The officers shall not be entitled to remuneration by the Corporation for performing their assignments of office. However, officers will be allowed to petition the Board for approval of non-salaried expenses which may be incurred in direct performance of their duties (e.g., Board authorized travel and per diem). Staff members may receive compensation and reimbursement of incurred expenses for their officially approved services on behalf of the Corporation as authorized by the Board of Directors.

ARTICLE VII

RECEIPT OF NON-CORPORATE ASSETS

GIFTS

The Board of Directors of the Corporation may accept, on behalf of the Corporation, any contribution, gift, bequest, or devise for general purposes or special purpose of the Corporation.

ARTICLE VIII

CERTIFICATES AND MEMBERSHIP

ISSUANCE OF CERTIFICATE

Section 1: When a party newly acquires property in Cave Bay Homesites or Additions, that party becomes eligible for membership and a stock certificate shall be issued in the name(s) of the property owner, and delivered to them by the Secretary. Such stock certificate shall be signed by the President and Secretary and sealed with the seal of the Corporation. All stock certificates shall be consecutively numbered. The name(s) and address of the stock certificate recipient, the certificate number, and the date of issuance of the certificate shall be entered on the stock records of the Corporation. The procedure outlined in Article II, Section 5, may also apply.

RETIREMENT OF CERTIFICATE

Section 2: Upon transfer of a member's interest in a property in Cave Bay Homesites and Additions, the member's stock certificate shall be retired and such action will be promptly recorded in the Corporation's records.

ARTICLE IX

BOOKS AND RECORDS

The Corporation shall maintain correct and complete records of all accounts, assets, membership lists, and full proceedings of all official meetings. Such records shall be kept at the Corporation's principal office and must be held available for inspection by any member or that member's duly designated agent at any reasonable time.

ARTICLE X

FISCAL YEAR

The fiscal year of the Corporation shall run from July 1 through June 30 of each year.

ARTICLE XI

ASSESSMENTS, FEES AND CHARGES

All regular and special assessments, fees, and charges shall be listed by the CBCS Board on a "Fee Schedule" prepared and maintained through the office of the President and made available to all Corporation members through the Secretary's office, with a further copy posted upon the Corporation's Bulletin Board.

In further sections of this Article, wherever assessments and fees indicate, specific current dollar assignments will be listed in the Fee Schedule.

PURPOSE OF ASSESSMENTS

Section 1: All assessments levied by Cave Bay Community Services, Inc., in accord with the Corporation's "not-for-profit" status, must be applied judiciously. Income generated through assessments will be used for maintenance and improvements of Corporate areas and in promoting the recreation, health, safety and welfare of all the members and their families in Cave Bay Homesites and Additions. The following three assessments may be charged against each lot in accordance with the requirements and restrictions that follow: regular assessments, special assessments, and extraordinary emergency assessments.

Each assessment, together with any collection costs (including, but not limited to any interest, costs, or attorney's fees), shall be the personal obligation of the property owner, contract purchaser, or party whose name appears on the assessment rolls for that particular lot. Further, any assessment, in accordance with the Articles of Incorporation and the laws of the State of Idaho, may be secured by a lien against a non-paying member's real property, and all assessments shall be constructive real covenants affecting title of real property of each member. No member may exempt himself from any liability for assessment.

REGULAR ASSESSMENT

Section 2: The Board of Directors shall be empowered to levy regular assessments on homes and properties and increase those assessments up to five percent (5%) per year, without full membership vote, toward the maintenance and improvement of the roads and streets, water system, sewage system, launch area, swimming area, and any other community-owned facility or common area of the Corporation, along with other necessary and desirable purposes for the benefit of the Corporation membership. These regular assessments are due and payable upon receipt of annual assessment notice.

SPECIAL ASSESSMENTS

Section 3: In addition to regular assessments as authorized above, the Board of Directors may levy further assessments for the use of special facilities within Cave Bay Homesites and Additions. The special assessments collected will be used exclusively for those specified facilities, and the funds so collected and applied will be kept separate and distinct from general corporate funds. Special assessments may be increased by the Board of Directors up to five percent (5%) per year, without full membership vote, for the following services:

A. Boat Dock Use Fees:

1. The Corporation, as total and exclusive owner of the common boat docks, breakwater, access and parking area, shall, through its Board of Directors, sell the use rights to boat slips to Corporation members only, on an exclusive, open-ended and continuous contract use basis at a maximum rate of one (1) slip per share of corporate stock. (Not applicable to fraction share(s) of stock.)

2. For the above exclusive continuous use right to each boat slip, the member shall pay an initial fee set by the Board of Directors, and will be issued a special boat slip use certificate in evidence of that exclusive right.

3. In the event a member, holding a special boat slip use certificate sells or otherwise transfers his property in Cave Bay Community to a new owner, said certificate shall be transferred to the new owner by the Board Treasurer, and this transaction will be recorded promptly by the Treasurer in the appropriate Corporation record book.

4. Each boat slip certificate owner shall pay an annual assessment toward the continuing maintenance of the docks, slips, breakwater, and access area.

5. (This item deleted in 1996 because all boat slips have been sold).

B. Television Use Fees: All members who are served by the cable television system owned by Cave Bay Community Services, Inc., shall pay an initial hookup fee. Consult CBCS Fee Schedule for applicable fee. Further, those members receiving the standard service shall pay an annual assessment toward maintenance of the basic television system. When option of expanded channel coverage becomes available, the Board of Directors shall determine that hookup fee and annual assessment.

C. Water and Sewer Hookup Fee: A one-time assessment is charged upon each initial connection to the CBCS water and sewer systems. Fees must be paid and notice of date of connection must be at least two days prior to connection. Consult CBCS Fee Schedule for applicable fees.

D. Special Assessments Payments: All special assessments shall be due and payable upon receipt of annual assessment notice. All special assessments shall be spent exclusively for the maintenance and/or improvement of the special use for which the assessment is assigned. Any change in the special assessment shall require a two-thirds (2/3) majority vote of the Board of Directors and majority vote of Corporation members who are paying that special assessment.

E. Forfeiture of Special Use: In the event a special assessment is thirty (30) days delinquent in payment, a notice of delinquency shall be sent to the member from the Treasurer,

and use of the facility shall be suspended until payments of arrearage and any collection charges are made in full. In the event that two (2) years shall pass without delinquency being satisfied, the member shall permanently forfeit any use or right to use the Corporation property on which the special assessment was due.

EXTRAORDINARY EMERGENCY ASSESSMENTS

Section 4: In addition to the regular and special assessments, the Board of Directors is granted emergency powers to levy an extraordinary assessment on lots and residential dwellings located in Cave Bay Homesites and Additions thereto. Such extraordinary emergency assessments may be assessed with the consent of a majority of the Corporation members or by a vote of two-thirds (2/3) of the Board of Directors; however, any extraordinary emergency assessment made by the Board of Directors cannot exceed ten percent (10%) of the regular annual property assessment. The Board of Directors may only levy an extraordinary emergency assessment in the case of a bona-fide emergency, and after the four following criteria have been fulfilled:

1. The need was not foreseeable at the date of the last annual meeting of the membership;

2. The need must relate in whole, or in part, to reconstruction, repair, or replacement of a capital improvement on which the residents of Cave Bay Homesites or Additions depend, or relates to the immediate protection of Corporate property, title and imminent liability;

3. The need must require immediate action;

4. The Board of Directors has determined that insufficient Corporate funds are available to meet the requirements of both the extraordinary emergency event and the regular costs of operations of the Corporation.

FURTHER ASSESSMENTS

Section 5: Further assessments for any Corporate purpose, beyond those previously described, must be approved by a majority vote of the quorum of the Corporate membership at any duly called meeting. Notice of such meeting shall be sent to all members. The notice indicating the purpose of the proposed assessment(s) will also inform the members of the time and place of the meeting. Members may vote by proxy for or against the proposed assessment or assessments. All votes on regular or extraordinary emergency assessments shall be proportioned on the basis of one (1) vote for each lot and/or fractional vote for fractional lot, and one (1) vote for each dwelling. Members owning a lot with a dwelling unit shall be entitled to two (2) votes (one (1) vote for the lot and one (1) vote for the dwelling unit.)

In cases of further special assessments, only those members using the particular special facility in question will participate in voting on further increased assessments applied to the particular special use.

The limitation in this section shall apply only to assessments and shall not eliminate the rights of the Corporation membership to regulate use within the bounds of these Bylaws, the Articles of Incorporation, and the laws of the State of Idaho.

ARTICLE XII

OPERATING RULES

A set of rules was approved and adopted on June 18, 1988, by the entire membership. These rules govern the use of the Corporation's property, including water wells, water reservoir, the water distribution system, the sewer collection system and sewer lagoons, the road system, the boat launching and swimming areas, and any other property or rights acquired by the Corporation. Any changes in these rules require majority action by the Corporation membership.

ARTICLE XIII

WAIVER OF NOTICE

Whenever any notice is required to be given under the statutes of the State of Idaho or under the provisions of the Articles of Incorporation or these Bylaws, a waiver thereof in writing signed by the person or persons entitled to such notice, whether before or after the time stated therein, shall be deemed the legal equivalent to the granting of such notice.

ARTICLE XIV

AMENDMENTS TO BYLAWS

The Bylaws of this non-profit Corporation, incorporated under Chapter 30 of the Idaho Code, may be altered, amended, or new Bylaws adopted at any regular or special meeting of the Corporation members, called for such purpose, by the affirmative vote of two-thirds (2/3) of the membership present at such meeting; provided, that a quorum as specified in the Bylaws of the Corporation be present. Notice of the proposed change or changes in the Bylaws must be given in the written notice calling for the meeting.

ARTICLE XV

POLICY STATEMENT

The members, recognizing that the government of this Corporation is important to all the members' families, wish to encourage participation and discussion in Corporate meetings by all concerned.

IN WITNESS WHEREOF, the undersigned certify the above stated Bylaws, as amended, were duly and lawfully accepted by more than two-thirds (2/3) of the membership present at the lawfully convened annual membership meeting, a quorum being present, of Cave Bay Community Services, Inc., as held at Worley, Idaho, on June 22, 1996.

CAVE BAY COMMUNITY SERVICES, INC.

By Barbara Romine
President
Cave Bay Community Services, Inc.

ATTEST:
Secretary

DIRECTORS:

Keith Drake
Kathy J. Laird
Patrick J. Kahler
Ralph E. McAllister
Eileen M. Wells
Marilyn Wilson

APPENDIX H

CBCS Fee Schedule

CAVE BAY COMMUNITY SERVICES, INC.
P.O. BOX 115
WORLEY, ID 83876-0115

SCHEDULE OF FEES AND ASSESSMENTS

FISCAL YEAR 2011-2012

	2010-2011	2011-2012	
1. LOT WITH HOME, PER YEAR	$ 538.00	**$ 565.00**	
2. IMPROVED LOT, PER YEAR (note 1)	$ 538.00	**$ 565.00**	
3. UNIMPROVED LOT, PER YEAR	$ 538.00	**$ 565.00**	
4. COMMUNITY DOCK, PER YEAR	$ 250.00	**$ 250.00**	
5. WATER & SEWER SYSTEM IMPROVEMENTS, PER LOT, PER YEAR	$ 100.00	**$ 300.00**	*
6. SEWER CONNECTION FEE, ONE TIME	$ 500.00	**$ 500.00**	
7. WATER SYSTEM CONNECTION FEE, ONE TIME	$ 500.00	**$ 500.00**	

Note: An "Improved Lot" is a lot with no dwelling
but which does have water and/or sewer connections.

FEES AND ASSESSMENTS ARE DUE AND PAYABLE UPON RECEIPT OF INVOICE OR STATEMENT
FEES ARE FOR ONE-TIME SERVICES AND ASSESSMENTS ARE FOR ONE FISCAL YEAR.
THE CAVE BAY COMMUNITY SERVICES FISCAL YEAR RUNS FROM JULY 1ST OF THE CURRENT YEAR THROUGH JUNE 30TH OF THE FOLLOWING YEAR.

***Requires vote of entire community.**

APPENDIX I

Water Balances

Cave Bay Community Services
Storage Lagoon and Land Application System Water Balance - Spray Irrigation - Forest
2-16-2012

Total Lagoon Storage Volume =	**3.500 mgal**	**Dwelling Units:**	
Lagoon Surface Area (Inside) =	**1.93 acres**	**ERU's =**	**218**
Lagoon Bottom Area =	**1.00 acres**	**Unit Flow =**	**74 gpd/ERU**
		Annual Unit Flow =	**27,010 gal/yr/ERU**
Forest Spray Irrigation Area =	**8.80 acres**		
Lagoon Seepage Rate =	**0.0000 in/day**		

Month	Wastewater Influent (mgal)	Wastewater Forest Irrigation (in)	Total Wastewater to Irrigation**** (mgal)	Total Lagoon Seepage (mgal)	Mean Precipitation* (in)	Precipitation (mgal)	Mean Evaporation** (in)	Evaporation (mgal)	Net Lagoon Storage (mgal)	
October	0.3610	1.30	0.311	0.000	2.99	0.1563	1.87	0.0489	0.158	
November	0.3131	0.00	0.000	0.000	4.86	0.2540	0.57	0.0149	0.710	
December	0.4535	0.00	0.000	0.000	3.70	0.1934	0.18	0.0047	1.352	
January	0.4795	0.00	0.000	0.000	2.85	0.1490	0.28	0.0102	1.970	
February	0.3426	0.00	0.000	0.000	3.45	0.1803	0.68	0.0284	2.465	
March	0.3436	0.00	0.000	0.000	2.41	0.1260	1.55	0.0729	2.861	
April	0.3789	0.00	0.000	0.000	2.62	0.1369	2.74	0.1289	3.248	***
May	0.4564	2.94	0.702	0.000	3.43	0.1793	3.61	0.1510	3.031	
June	0.5447	5.44	1.300	0.000	1.86	0.0972	4.17	0.1308	2.242	
July	0.9246	7.83	1.871	0.000	0.53	0.0277	5.46	0.1427	1.181	
August	0.7835	6.39	1.527	0.000	0.54	0.0282	4.97	0.1299	0.336	
September	0.5069	3.52	0.841	0.000	0.90	0.0470	3.47	0.0907	0.000	
TOTAL	**5.8882**	**27.42**	**6.552**	**0.000**	**30.14**	**1.5754**	**29.55**	**0.9540**		

*Precipitation data taken from ET Idaho Plummer 3 WSW Station Gross Precipitation
**Evaporation data taken ET Idaho Plummer 3 WSW Basal Transpiration for Open Water - Shallow Systems
*** Max. volume in storage
**** Site irrigation capacity

Cave Bay Community Services
Storage Lagoon and Land Application System Water Balance - Spray Irrigation - Forest
(20% Exceedance for Precipitation and 80% Exceedance for Evaporation)
2-16-2012

Total Lagoon Storage Volume =	**3.500**	**mgal**
Lagoon Surface Area (Inside) =	**1.93**	**acres**
Lagoon Bottom Area =	**1.00**	**acres**
Forest Spray Irrigation Area =	**9.10**	**acres**
Lagoon Seepage Rate =	**0.0000**	**in/day**

Dwelling Units:		
ERU's =	**218**	
Unit Flow =	**74**	**gpd/ERU**
Annual Unit Flow =	**27,010**	**gal/yr/ERU**

Month	Wastewater Influent (mgal)	Wastewater Forest Irrigation (in)	Total Wastewater to Irrigation**** (mgal)	Total Lagoon Seepage (mgal)	20% Exceed. Precipitation* (in)	Precipitation (mgal)	80% Exceed. Evaporation** (in)	Evaporation (mgal)	Net Lagoon Storage (mgal)	
October	0.3610	1.30	0.321	0.000	2.81	0.1469	1.58	0.0413	0.145	
November	0.3131	0.00	0.000	0.000	4.65	0.2430	0.40	0.0105	0.691	
December	0.4535	0.00	0.000	0.000	2.88	0.1505	0.00	0.0000	1.295	
January	0.4795	0.00	0.000	0.000	4.91	0.2566	0.17	0.0062	2.025	
February	0.3426	0.00	0.000	0.000	3.04	0.1589	0.55	0.0230	2.503	
March	0.3436	0.00	0.000	0.000	2.59	0.1354	1.36	0.0640	2.918	
April	0.3789	0.00	0.000	0.000	2.79	0.1458	2.43	0.1143	3.329	***
May	0.4564	2.94	0.726	0.000	4.12	0.2153	3.05	0.1275	3.147	
June	0.5447	5.44	1.344	0.000	1.80	0.0941	3.69	0.1157	2.325	
July	0.9246	7.83	1.935	0.000	0.50	0.0261	5.15	0.1346	1.207	
August	0.7835	6.39	1.579	0.000	0.31	0.0162	4.69	0.1226	0.305	
September	0.5069	3.52	0.870	0.000	1.51	0.0789	3.01	0.0787	0.000	
TOTAL	**5.8882**	**27.42**	**6.775**	**0.000**	**31.91**	**1.6679**	**26.08**	**0.8383**		

*Precipitation data taken from ET Idaho Plummer 3 WSW Station Gross Precipitation
**Evaporation data taken ET Idaho Plummer 3 WSW Basal Transpiration for Open Water - Shallow Systems
*** Max. volume in storage
**** Site irrigation capacity

Cave Bay Wastewater Land Application System

Forested Site - Spray Irrigation

Forest Cover Factor = 0.89
Irrigation Efficiency = 0.80

Month	ETIdaho Pdef* (mm/day)	Pdef (in/mo)	Adjusted Pdef (in/mo)	Irrigation Requirement (in)	
May	2.16	2.64	2.35	2.94	**0.080 mgal/acre**
June	4.14	4.89	4.36	5.44	**0.148 mgal/acre**
July	5.76	7.04	6.26	7.83	**0.213 mgal/acre**
August	4.70	5.74	5.11	6.39	**0.173 mgal/acre**
September	2.68	3.17	2.82	3.52	**0.096 mgal/acre**
October	0.96	1.17	1.04	1.30	**0.035 mgal/acre**

Total Seasonal Application = 27.42 in.
Site Hydraulic Capacity = 0.745 mgal/acre

*From ET Idaho Precipitation Defecit for Orchards - Apples and Cherries no ground cover Coeur d'Alene 1 E NWS.

ET_{Idaho} 2009: Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho

Please send suggestions for improving this site to robison at kimberly dot uidaho dot edu

Coeur d'Alene 1 E (NWS --101956)

Statistics based on thirty

For a different land cover or crop click on the above link.
You can highlight this table and copy via the clipboard to a Mircosoft Excel or OpenOffice spreadsheet to plot or otherwise work with this data.

Orchards - Apples and Cherries no ground cover

Precipitation Deficit (Click here for a graph)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season[a]	Non Growing Season[b]	Annual
Mean	mm/day												mm		
Monthly[c]	0.03	0.13	0.24	0.72	2.16	4.14	5.76	4.70	2.68	0.96	-0.85	-0.30	625	-2	635
15-Day Moving Average[d]	0.02	0.09	0.24	0.61	2.15	4.10	5.76	4.68	2.63	0.96	-0.90	-0.28			
7-Day Moving Average[e]	0.02	0.12	0.23	0.63	2.19	4.08	5.78	4.73	2.66	0.95	-0.90	-0.29			
3-Day Moving Average[f]	0.02	0.14	0.23	0.69	2.17	4.10	5.76	4.72	2.70	0.96	-0.89	-0.29			
Standard Deviation	mm/day												mm		
Monthly	0.11	0.15	0.31	0.59	1.40	0.92	1.23	1.54	0.70	1.16	0.70	0.81	74	27	78
15-Day Moving Average	0.19	0.25	0.39	0.76	1.34	1.51	1.07	1.58	1.19	1.10	1.05	0.82			
7-Day Moving Average	0.38	0.56	0.76	1.16	1.83	2.24	1.46	1.93	1.74	1.63	1.68	1.16			
3-Day Moving Average	0.65	0.96	1.38	1.91	2.61	3.17	2.12	2.53	2.31	2.23	2.41	1.55			
20% Exceedance	mm/day												mm		
Monthly	0.04	0.23	0.36	0.89	2.98	4.91	6.35	5.41	3.30	1.73	-0.01	0.02	692	23	700
15-Day Moving Average	0.21	0.50	0.84	1.47	4.47	6.42	7.16	6.53	4.24	2.51	0.67	0.21			
7-Day Moving Average	0.43	1.04	1.61	2.26	5.69	7.49	7.97	7.39	5.19	3.46	1.74	0.52			
3-Day Moving Average	0.77	1.70	2.76	4.07	7.45	8.69	8.99	8.31	6.53	4.02	3.23	0.69			
80% Exceedance	mm/day												mm		

Monthly	-0.02	-0.02	0.07	0.32	1.38	3.41	5.16	3.69	2.06	0.16	-1.52	-0.77	561	-22	546
15-Day Moving Average	-0.30	-0.43	-0.59	-0.66	0.19	1.62	4.23	1.94	0.69	-1.13	-2.78	-1.74			
7-Day Moving Average	-0.72	-1.06	-1.36	-1.82	-1.32	-1.19	2.65	-0.54	-1.23	-3.55	-4.93	-2.89			
3-Day Moving Average	-1.59	-2.50	-3.19	-5.33	-7.12	-6.36	-0.77	-2.75	-5.09	-7.40	-7.93	-5.70			
Ave Highest P_{def}	mm/day												--		
15-Day Moving Average[g]	0.17	0.41	0.76	1.24	3.29	5.44	6.53	5.82	3.68	1.93	0.32	0.27			
7-Day Moving Average[h]	0.37	0.91	1.41	2.08	4.50	6.84	7.37	6.68	4.66	2.89	1.10	0.67			
3-Day Moving Average[i]	0.74	1.58	2.40	3.34	6.14	8.11	8.43	7.83	5.81	3.64	2.30	1.47			
Ave Lowest P_{def}	mm/day												--		
15-Day Moving Average[g]	-0.15	-0.18	-0.31	-0.02	1.18	2.70	4.87	3.48	1.73	0.04	-1.86	-0.78			
7-Day Moving Average[h]	-0.36	-0.70	-1.15	-1.04	-0.32	0.68	3.67	2.13	0.15	-1.43	-3.52	-1.55			
3-Day Moving Average[i]	-0.82	-1.77	-2.77	-3.44	-3.27	-3.02	1.18	-0.28	-2.55	-4.03	-5.98	-2.67			
Special normal distribution parameters for monthly, seasonal, and annual intervals													--		
Skew	-0.03	0.31	-0.52	2.61	0.30	-0.19	-0.13	0.07	-0.07	-0.08	0.41	-0.26	0.40	-0.32	0.32
Kurtosis	1.02	1.93	1.55	11.49	0.80	3.15	1.02	0.95	2.83	0.59	2.15	0.86	2.86	2.33	2.41

[a] Growing Season: This is usually the time from green up or planting in the spring to a killing frost or harvest in the fall. It is not applicable for entries without a growing season and will be blank.

[b] Nongrowing Season: This is usually the time from a killing frost or harvest in the fall to the of green up in the spring. It is not applicable for entries without a growing season.

[c] Mean of the average daily value for month

[d] Mean of the fourteen 15-day period averages contained in the month

[e] Mean of the twenty three 7-day period averages contained in the month

[f] Mean of the twenty seven 3-day period averages contained in the month

[g] Mean of the highest/lowest 15-day period average in month

[h] Mean of the highest/lowest 7-day period average in month

[i] Mean of the highest/lowest 3-day period average in month

This work and report were prepared by the University of Idaho Research and Extension Center at Kimberly, Idaho under contract with the Idaho Department of Water Resources. Work was supported by funding from IDWR and the Idaho Agricultural Experiment Station and Idaho Engineering Experiment Station. The authors gratefully acknowledge the long-term evapotranspiration data collection and long-standing advice provided by Dr. James L. Wright, USDA-ARS Kimberly (ret.), the more than two decades of high quality agricultural

weather data collection by the U.S. Bureau of Reclamation AgriMet system, and the very long-standing, routine data collection by the hundreds of cooperative weather station volunteers across the state who, for more than one-hundred years, have faithfully observed daily air temperature and precipitation.

The citation for the evapotranspiration data used from this site should be: *Allen, Richard G. and Clarence W. Robison, 2009.* ***Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008****, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.*

Questions regarding the data should be addressed to Clarence W. Robison or Richard G. Allen, University of Idaho, Kimberly Research and Extension Center, 3793 North 3600 East, Kimberly, ID 83341. Telephone (208)-423-6610

University of Idaho
A LEGACY OF LEADING

Table 5.2. Permeability, water holding capacity, irrigation and aridity rating characteristics for Idaho NWS Temperature/Precipitation Stations.

Internal ET Sta. no.	Heritage Flag*	NOAA Station Name	NCDC Coop no.	Irrig. Flag 1= yes	Aridity Rating (0-100)	Area wtd. ave. Perm. – in/hr	Area wtd. ave. WHC – in/ft	Hydrologic Soil Group (1-3)	Aridity Rating (0-100)
1	1	ABERDEEN EXP. STN	100010	1	45	2.63	1.93	2	45
2	1	AMERICAN FALLS 1 SW	100227	1	60	2.62	1.93	2	60
3	1	ANDERSON DAM	100282	1	65	3.78	1.66	2	65
4	1	ARBON 2 NW	100347	1	45	1.30	2.29	2	45
5	1	ARCO	100375	1	55	1.46	1.15	2	55
6	2	ARROWROCK DAM	100448	1	100	1.94	1.54	2	100
7	1	ASHTON	100470	1	30	2.05	1.83	2	30
8	1	BAYVIEW MODEL BASIN	100667		20	1.77	1.42	2	20
9	1	BLACKFOOT	100915	1	40	2.55	1.96	2	40
10	1	BLISS	101002	1	35	2.36	1.61	2	35
11	2	BOISE 7 N	101017	1	70	4.09	1.57	1	70
12	1	BOISE WSFO AIRPORT	101022	1	75	1.72	1.60	2	75
13	1	BONNERS FERRY	101079	1	25	1.58	1.92	2	25
14	2	BROWNLEE DAM	101180	1	100	1.17	1.82	2	100
15	1	BRUNEAU	101195	1	40	3.24	1.43	2	40
16	2	BUHL	101217	1	60	3.80	1.44	2	60
17	1	BURLEY FAA AP	101303	1	40	1.55	1.94	2	40
18	1	CABINET GORGE	101363		35	2.26	1.71	2	35
19	1	CALDWELL	101380	1	35	2.33	1.75	2	35
20	1	CAMBRIDGE	101408	1	30	0.86	2.12	3	30
21	1	CASCADE 1 NW	101514	1	35	3.20	1.74	2	35
22	1	CASTLEFORD 2 N	101551	1	20	1.35	1.31	2	20
23	1	CHALLIS	101663	1	60	1.43	0.74	2	60
24	1	COEUR D ALENE 1 E	101956	1	45	1.96	1.32	2	45
25	1	COTTONWOOD	102154		20	1.28	2.11	2	20
26	1	COUNCIL	102187	1	45	2.61	1.99	2	45
27	1	DEER FLAT DAM	102444	1	5	2.61	1.63	2	5
28	1	DRIGGS	102676	1	25	1.33	1.90	2	25
29	1	DUBOIS EXPERIMENT STN	102707	1	90	2.81	1.21	2	90
30	2	DWORSHAK FISH HATCHERY	102845		10	1.39	1.84	2	10
31	2	ELK CITY	102875		20	1.98	0.89	2	20
32	2	ELK RIVER 1 S	102892		10	2.06	2.27	2	10
33	1	EMMETT 2 E	102942	1	20	2.19	1.82	2	20
34	1	FAIRFIELD	103108	1	15	2.49	1.96	2	15

*Heritage Flag = 1 if station was included in Allen and Brockway (1983); Flag = 2 indicates a "new" station
Irrigation Flag = 1 indicates that managed agricultural crops are typically irrigated.
Aridity Rating (0 – 100%) is from Allen and Brockway (1983), and is used to adjust air temperature prior to calculating cumulative growing degree days and 30-day running average air temperature (0% indicates well-watered condition in vicinity and area of weather station and 100% indicates dry, arid (natural) condition in vicinity and area of weather station). (Air temperature was not adjusted during calculation of reference ET_r).
Hydrologic Soil Group: 1 = course soil, 2 = medium textured soil, 3 = fine textured soil.

Table 5.2, continued. Permeability, water holding capacity, irrigation and aridity rating characteristics for Idaho NWS Temperature/Precipitation Stations.

Internal ET Sta. no.	Heritage Flag*	NOAA Station Name	NCDC Coop no.	Irrig. Flag 1= yes	Aridity Rating (0-100)	Area wtd. ave. Perm. – in/hr	Area wtd. ave. WHC – in/ft	Hydrologic Soil Group (1-3)	Aridity Rating (0-100)
69	1	MCCALL	105708	1	45	3.09	1.44	2	45
70	2	MCCAMMON	105716	1	35	1.35	2.12	2	35
71	1	MINIDOKA DAM	105980	1	60	2.03	1.71	2	60
72	1	MONTPELIER	106053	1	45	1.52	2.02	2	45
73	1	MOSCOW UNIV OF IDAHO	106152		15	1.29	2.27	2	15
74	1	MOUNTAIN HOME 1 W	106174	1	75	1.93	1.46	2	75
75	1	NEW MEADOWS RNG. STN	106388	1	20	1.35	1.83	2	20
76	1	NEZPERCE	106421		15	1.38	2.15	2	15
77	1	OAKLEY	106542	1	35	1.93	1.62	2	35
78	1	OLA	106586	1	35	1.12	2.11	2	35
79	1	OROFINO	106681		30	1.66	1.98	2	30
80	1	PARMA Exp. Station	106844	1	10	2.41	1.83	2	10
81	1	PAYETTE	106891	1	15	2.37	1.89	2	15
82	1	PICABO	107040	1	20	2.05	1.68	2	20
83	2	PLUMMER 3 WSW	107188		30	1.29	2.26	2	30
84	1	POCATELLO WB AP	107211	1	90	1.75	2.10	2	90
85	1	PORTHILL	107264		45	1.33	1.95	2	45
86	1	POTLATCH 3NNE	107301		10	1.27	2.27	2	10
87	1	PRESTON 3 NE	107346	1	40	1.26	1.81	2	40
88	2	REXBURG RICKS COLLEGE	107644	1	30	2.78	1.95	2	30
89	1	REYNOLDS	107648	1	90	1.82	1.40	2	90
90	1	RICHFIELD	107673	1	35	3.62	1.65	2	35
91	1	RIGGINS RANGER STN	107706	1	70	2.06	0.87	2	70
92	1	RUPERT	107968	1	50	2.29	1.82	2	50
93	1	ST ANTHONY	108022	1	55	4.18	1.85	1	55
94	1	SAINT MARIES	108062		40	1.68	2.13	2	40
95	1	SALMON	108076	1	80	3.20	1.86	2	80
96	1	SANDPOINT KSPT	108137		30	1.58	1.53	2	30
97	1	SHOSHONE	108380	1	75	3.30	1.66	2	75
98	2	SODA SPRINGS	108535	1	20	1.12	2.03	2	20
99	1	STANLEY	108676	1	60	1.68	1.40	2	60
100	1	STREVELL CAA AIRPORT	108786	1	45	1.24	1.41	2	45
101	1	SWAN VALLEY 1 W	108937	1	30	2.19	1.47	2	30
102	1	TETONIA EXPERIMENT STN	109065	1	10	1.38	2.18	2	10
103	1	THREE CREEK	109119	1	80	1.20	1.38	2	80
104	1	TWIN FALLS 2 NNE	109294	1	55	1.92	1.81	2	55
105	2	TWIN FALLS 3 SE	109299	1	35	1.50	1.67	2	35
106	1	TWIN FALLS WSO	109303	1	0	1.50	1.83	2	0
107	1	WEISER	109638	1	20	1.17	2.07	2	20

*Heritage Flag = 1 if station was included in Allen and Brockway (1983); Flag = 2 indicates a "new" station
Irrigation Flag = 1 indicates that managed agricultural crops are typically irrigated.

If there is green understory, then the ET rate will likely be similar to that for full canopy cover (i.e. 1.0 * P_{def}). The ET rate will also be similar to that of full canopy cover if there is no understory, but the soil is nearly continuously wet by frequent effluent land application. Continuously wet conditions from wastewater land treatment are seldom encountered however. In cases of full cover or continuously wet conditions, ET will approach a maximum rate governed by energy available for evaporation (Allen, 2008).

Table 2. Canopy Density Correction Factors to Modify *Orchard – no cover* (no understory) in Estimating Forest P_{def} .

Fraction of Forest Canopy Covering the Ground (no understory)	Factor to Modify *Orchard – no cover* P_{def}
1.0	1.0
0.9	0.95
0.8	0.89
0.7	0.84
0.6	0.77
0.5	0.71
0.4	0.63
0.3	0.55

The ETIdaho report documents the freeze-down (leaf fall) temperature used to terminate the growing season for orchards. In the case of conifers, they would tend to keep their crop coefficient (K_c) high into the winter, but probably will transpire less effectively due to cool temperatures and in some cases, frozen soil that impedes liquid movement to roots.

4.1.3.2.3 Example Calculation - Forest

The following is an example calculation to determine forest P_{def} and ET_{act} for a scenario provided in Table 3:

ET*Idaho* 2009: Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho

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Plummer 3 WSW (NWS --107188)

Statistics based on thirty

For a different land cover or crop click on the above link.
You can highlight this table and copy via the clipboard to a Mircosoft Excel or OpenOffice spreadsheet to plot or otherwise work with this data.

Gross Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season[a]	Non Growing Season[b]	Annual
Mean	mm/day												mm		
Monthly[c]	2.33	3.13	1.94	2.22	2.81	1.57	0.43	0.44	0.76	2.45	4.11	3.03	0	758	758
15-Day Moving Average[d]	2.52	3.17	2.02	2.07	3.14	1.42	0.40	0.36	0.90	2.12	4.22	2.82			
7-Day Moving Average[e]	2.62	3.23	1.88	2.24	2.96	1.55	0.44	0.41	0.86	2.32	4.12	3.07			
3-Day Moving Average[f]	2.37	3.18	1.89	2.27	2.85	1.53	0.44	0.43	0.81	2.45	4.07	3.06			
Standard Deviation	mm/day												mm		
Monthly	2.08	1.44	1.19	1.06	1.85	0.31	0.51	1.00	0.65	1.61	1.81	2.73	0	232	232
15-Day Moving Average	1.68	1.78	1.39	1.74	2.20	0.84	0.46	0.78	0.88	1.88	2.45	1.69			
7-Day Moving Average	1.87	2.75	1.92	2.31	3.01	1.46	0.79	1.03	1.11	2.80	3.19	2.80			
3-Day Moving Average	2.70	4.06	2.72	3.05	4.14	2.27	1.10	1.33	1.67	3.87	3.87	4.07			
20% Exceedance	mm/day												mm		
Monthly	4.02	2.76	2.12	2.36	3.37	1.52	0.41	0.25	1.28	2.30	3.93	2.36	0	788	788
15-Day Moving Average	5.21	3.21	3.11	3.44	5.33	2.57	0.81	0.43	1.98	3.52	5.46	4.67			
7-Day Moving Average	7.50	6.53	4.26	6.20	8.17	4.57	1.09	0.91	3.19	7.09	7.70	7.99			
3-Day Moving Average	12.77	10.50	9.30	9.57	11.73	6.60	2.53	2.03	4.83	10.83	11.27	11.70			
80% Exceedance	mm/day												mm		

Monthly	0.42	1.63	0.74	1.03	1.06	1.23	0.04	0.00	0.00	1.12	2.26	1.50	0	504	504
15-Day Moving Average	0.11	1.19	0.29	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.73	0.00			
7-Day Moving Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
3-Day Moving Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Ave Highest	mm/day												--		
15-Day Moving Average[g]	3.45	4.41	3.00	3.51	4.98	2.47	0.77	0.81	1.35	4.34	6.04	4.43			
7-Day Moving Average[h]	4.68	6.89	4.87	5.76	7.53	4.07	1.45	1.54	2.07	7.95	8.54	7.58			
3-Day Moving Average[i]	7.87	11.91	8.29	9.59	11.85	7.17	2.88	2.86	4.12	11.66	11.66	12.26			
Ave Lowest	mm/day												--		
15-Day Moving Average[g]	1.52	2.02	0.94	0.87	1.06	0.45	0.09	0.05	0.37	0.64	2.05	1.35			
7-Day Moving Average[h]	0.55	0.26	0.03	0.39	0.00	0.00	0.00	0.00	0.02	0.00	0.72	0.49			
3-Day Moving Average[i]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00			
Special normal distribution parameters for monthly, seasonal, and annual intervals													--		
Skew	-0.15	0.73	-0.10	0.25	0.02	0.70	0.56	0.90	-0.38	0.11	0.85	0.62	0.00	1.35	1.35
Kurtosis	1.25	3.44	0.88	3.27	0.91	3.59	1.60	2.06	2.65	0.73	4.20	1.53	0.00	8.05	8.05

[a] Growing Season: This is usually the time from green up or planting in the spring to a killing frost or harvest in the fall. It is not applicable for entries without a growing season and will be blank.

[b] Nongrowing Season: This is usually the time from a killing frost or harvest in the fall to the of green up in the spring. It is not applicable for entries without a growing season.

[c] Mean of the average daily value for month

[d] Mean of the fourteen 15-day period averages contained in the month

[e] Mean of the twenty three 7-day period averages contained in the month

[f] Mean of the twenty seven 3-day period averages contained in the month

[g] Mean of the highest/lowest 15-day period average in month

[h] Mean of the highest/lowest 7-day period average in month

[i] Mean of the highest/lowest 3-day period average in month

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Statistics based on thirty

For a different land cover or crop click on the above link.
You can highlight this table and copy via the clipboard to a Mircosoft Excel or OpenOffice spreadsheet to plot or otherwise work with this data.

Open water - shallow systems (ponds, streams)

Basal Transpiration (Click here for a graph)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season[a]	Non Growing Season[b]	Annual
Mean	mm/day												mm		
Monthly[c]	0.23	0.62	1.27	2.32	2.96	3.53	4.47	4.07	2.94	1.53	0.48	0.15	750	0	750
15-Day Moving Average[d]	0.22	0.58	1.33	2.33	2.99	3.55	4.46	4.08	2.91	1.54	0.48	0.14			
7-Day Moving Average[e]	0.22	0.59	1.30	2.33	2.98	3.51	4.48	4.09	2.93	1.53	0.47	0.14			
3-Day Moving Average[f]	0.22	0.61	1.27	2.32	2.97	3.51	4.48	4.08	2.94	1.52	0.47	0.15			
Standard Deviation	0.28	0.68	1.55	2.74	3.61	4.17	5.06	4.97	3.97	1.87	0.57	0.18	mm		
Monthly	0.14	0.12	0.16	0.26	0.74	0.27	0.34	0.25	0.26	0.30	0.12	0.13	33	0	33
15-Day Moving Average	0.12	0.11	0.25	0.34	0.72	0.34	0.30	0.24	0.40	0.39	0.16	0.09			
7-Day Moving Average	0.16	0.20	0.37	0.52	0.81	0.44	0.40	0.41	0.53	0.52	0.21	0.12			
3-Day Moving Average	0.20	0.27	0.44	0.66	0.88	0.58	0.58	0.59	0.68	0.60	0.25	0.16			
20% Exceedance	mm/day												mm		
Monthly	0.28	0.63	1.34	2.33	3.03	3.64	4.60	4.22	3.09	1.61	0.54	0.19	778	0	778
15-Day Moving Average	0.42	0.78	1.73	2.81	3.98	3.91	4.75	4.62	3.51	2.02	0.74	0.28			
7-Day Moving Average	0.56	0.99	2.01	3.52	4.53	4.37	5.03	5.01	3.62	2.50	0.82	0.32			
3-Day Moving Average	0.70	1.21	2.35	4.03	4.66	4.84	5.33	5.34	4.31	2.70	0.92	0.48			
80% Exceedance	mm/day												mm		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec			
Monthly	0.14	0.50	1.11	2.06	2.50	3.12	4.22	3.84	2.55	1.29	0.34	-0.01	712	0	712
15-Day Moving Average	0.17 0.03	0.55 0.40	1.36 0.89	2.43 1.72	3.05 2.06	3.69 2.85	5.15 3.92	4.69 3.59	3.51 1.99	1.58 0.88	0.40 0.24	0 -0.06			
7-Day Moving Average	0.00	0.28	0.58	1.40	1.83	2.72	3.53	3.25	1.61	0.66	0.19	-0.14			
3-Day Moving Average	-0.11	0.15	0.53	1.33	1.32	1.86	2.82	2.48	1.27	0.56	0.12	-0.15			
Ave Highest ET_{bas}	mm/day												--		
15-Day Moving Average[g]	0.33	0.69	1.61	2.71	3.49	3.79	4.70	4.39	3.27	1.87	0.65	0.21			
7-Day Moving Average[h]	0.46	0.92	1.84	3.07	3.93	4.12	4.94	4.80	3.62	2.19	0.77	0.28			
3-Day Moving Average[i]	0.58	1.10	2.10	3.57	4.23	4.46	5.25	5.13	4.07	2.47	0.86	0.41			
Ave Lowest ET_{bas}	mm/day												--		
15-Day Moving Average[g]	0.12	0.50	0.99	1.92	2.50	3.27	4.26	3.82	2.57	1.21	0.30	0.07			
7-Day Moving Average[h]	0.03	0.36	0.80	1.73	2.19	3.01	3.89	3.53	2.17	0.93	0.22	0.00			
3-Day Moving Average[i]	-0.05	0.26	0.62	1.50	1.73	2.65	3.30	2.97	1.89	0.78	0.15	-0.07			
Special normal distribution parameters for monthly, seasonal, and annual intervals													--		
Skew	0.42	1.79	-0.33	1.48	0.50	-1.07	0.23	-0.27	-0.92	0.30	0.68	-0.82	0.32	0.00	0.32
Kurtosis	1.51	8.49	1.31	7.83	1.87	7.08	1.36	1.16	7.12	1.63	6.06	2.36	4.70	0.00	4.70

[a] Growing Season: This is usually the time from green up or planting in the spring to a killing frost or harvest in the fall. It is not applicable for entries without a growing season and will be blank.

[b] Nongrowing Season: This is usually the time from a killing frost or harvest in the fall to the of green up in the spring. It is not applicable for entries without a growing season.

[c] Mean of the average daily value for month

[d] Mean of the fourteen 15-day period averages contained in the month

[e] Mean of the twenty three 7-day period averages contained in the month

[f] Mean of the twenty seven 3-day period averages contained in the month

[g] Mean of the highest/lowest 15-day period average in month

[h] Mean of the highest/lowest 7-day period average in month

[i] Mean of the highest/lowest 3-day period average in month

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hundreds of cooperative weather station volunteers across the state who, for more than one-hundred years, have faithfully observed daily air temperature and precipitation.

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APPENDIX J

Preliminary Cost Estimates

CBCS
WASTEWATER TREATMENT AND LAND APPLICATION EXPANSION OPTIONS
FOREST IRRIGATION
Engineer's Preliminary Opinion of Construction Cost
April 5, 2012

Dreher Property - 6 acres

Item Description	Quantity	Units	Unit Price	Amount
Wastewater Treatment System Improvements				
Mobilization (5%)	1	LS	$37,825.00	$38,000.00
4" PVC Irrigation Sub-main and Fittings	1500	LF	$25.00	$37,500.00
4" Gate Valves	8	EA	$800.00	$6,400.00
Sprinkler Irrigation System	6	Acres	$10,000.00	$60,000.00
12" PVC Chlorine Contact Pipe & Fittings	260	LF	$50.00	$13,000.00
Warning Signs	8	EA	$100.00	$800.00
Erosion Control Measures	1	LS	$10,000.00	$10,000.00
Lagoon Aeration System	1	LS	$75,000.00	$75,000.00
Hypochlorite Disinfection System	1	LS	$2,000.00	$2,000.00
3-wire Pasture Fence	2500	LF	$4.00	$10,000.00
Monitoring Peizometers	6	EA	$300.00	$1,800.00
Expand Lagoon #2	1	LS	$250,000.00	$250,000.00
Line Existing Lagoon Cells	1	LS	$75,000.00	$75,000.00
Fencing Around Lagoons	1800	LF	$15.00	$27,000.00
New Irrigation Pump Station	1	LS	$150,000.00	$150,000.00
			Subtotal Construction Costs	**$756,500.00**
Collection System Improvements				
Mobilization (5%)	1	LS	$4,150.00	$4,000.00
Replace Septic Tanks	5	EA	$10,000.00	$50,000.00
Residential Pump Run-Time Meters	50	EA	$100.00	$5,000.00
Lift Station Flow Meters	3	EA	$8,000.00	$24,000.00
			Subtotal Construction Costs	**$83,000.00**
			Engineering/Surveying (15%)	$125,925.00
			Permitting (County and DEQ)	$25,000.00
			Contingency (15%)	$125,925.00
			Subtotal Construction and Engineering Costs	**$1,116,350.00**
Property Acquisition	9	Acres	$8,000.00	$72,000.00
			GRAND TOTAL	**$1,188,350.00**

Capital Cost of Selected Alternatives

Class C Treatment Forest Irrigation

Mobilization	$42,000.00
Existing Lagoon Improvements	$427,000.00
Irrigation System	$291,500.00
Irrigation Land Acquisition	$72,000.00
Collection System Improvements	$79,000.00
Engineering/Permitting	$150,925.00
Contigency	$125,925.00
Total=	$1,188,350.00

CBCS
WASTEWATER TREATMENT AND LAND APPLICATION EXPANSION OPTIONS
PASTURE GRASS IRRIGATION
Engineer's Preliminary Opinion of Construction Cost
April 5, 2012

Lampert Property - 8.2 acres

Item Description	Quantity	Units	Unit Price	Amount
Wastewater Treatment System Improvements				
Mobilization (5%)	1	LS	$41,805.00	$42,000.00
4" PVC Irrigation Sub-main and Fittings	2500	LF	$25.00	$62,500.00
4" Gate Valves	10	EA	$800.00	$8,000.00
Sprinkler Irrigation System	8.2	Acres	$10,000.00	$82,000.00
12" PVC Chlorine Contact Pipe & Fittings	260	LF	$50.00	$13,000.00
Warning Signs	8	EA	$100.00	$800.00
Erosion Control Measures	1	LS	$10,000.00	$10,000.00
Lagoon Aeration System	1	LS	$75,000.00	$75,000.00
Hypochlorite Disinfection System	1	LS	$2,000.00	$2,000.00
3-wire Pasture Fence	3000	LF	$4.00	$12,000.00
Monitoring Peizometers	6	EA	$300.00	$1,800.00
Expand Lagoon #2	1	LS	$250,000.00	$250,000.00
Line Existing Lagoon Cells	1	LS	$75,000.00	$75,000.00
Fencing Around Lagoons	1800	LF	$15.00	$27,000.00
New Irrigation Pump Station	1	LS	$175,000.00	$175,000.00
			Subtotal Construction Costs	**$836,100.00**
Collection System Improvements				
Mobilization (5%)	1	LS	$4,150.00	$4,000.00
Replace Septic Tanks	5	EA	$10,000.00	$50,000.00
Residential Pump Run-Time Meters	50	EA	$100.00	$5,000.00
Lift Station Flow Meters	3	EA	$8,000.00	$24,000.00
			Subtotal Construction Costs	**$83,000.00**
			Engineering/Surveying (15%)	$137,865.00
			Permitting (County and DEQ)	$25,000.00
			Contingency (15%)	$137,865.00
			Subtotal Construction and Engineering Costs	**$1,219,830.00**
Property Acquisition	13	Acres	$8,000.00	$104,000.00
			GRAND TOTAL	**$1,323,830.00**

Capital Cost of Selected Alternatives

Class C Treatment Pasture Grass Irrigation

Mobilization	$46,000.00
Existing Lagoon Improvements	$427,000.00
Irrigation System	$367,100.00
Irrigation Land Acquisition	$104,000.00
Collection System Improvements	$79,000.00
Engineering/Permitting	$162,865.00
Contigency	$137,865.00
Total=	$1,323,830.00

APPENDIX K

Classification Worksheets

IDAHO PUBLIC WASTEWATER COLLECTION SYSTEM CLASSIFICATION WORKSHEET

OFFICE USE ONLY
DON'T WRITE HERE

System Class _____

Approved by: _____

Date: _____

Name of System: Cave Bay Sewer System

Legal Owner of Treatment System: Cave Bay Community Services, Inc.
System Address: P.O. Box 115
City: Worley **State:** ID **Zip Code:** 83876

Contact Person: Dave Kinkela **Title:** President

Business Phone Number: (253) 229-4824 **Email:** davekink@aol.com

Collection System Classification Worksheet is (check one):

☐ **Initial System Rating** ☒ **System Upgrade** ☐ **Standard 5 yr Rating**

Date of last system classification rating (if applicable) unknown

Collection System - Design Flow /Actual Flow 28 gpm peak / 14 gpm peak

Item	Points	Your System
System Size (Minimum 3 points)		
Miles of Line	1 point/10 miles or part	0
Number of Connections = 169 (Use Connection Equivalencies)	1 point /250 or part	1
Number of Manholes	1 point/150 or part	0
Lift Stations	1 point/each	4
Miles of Force Mains = 2.7 miles	1 point/mile or part	3
Odor Abatement		
Chemical Feed System	2 points	0
Air Entrainment System	2 points	0
Bio-filter System	2 points	0
Maintenance Management System		
Manual Maintenance Management System	3 points	3
Manual Mapping System	3 points	3
Computerized Maintenance Management System	5 points	0
Computerized Mapping System	5 points	0
Alarm or SCADA System for Lift Stations	5 points	0
TOTAL POINTS FOR YOUR SYSTEM		14

System Classification Key		
VSWWS**	Class I 0-30 points	
Class II 31-55 points	Class III 56-75 points	Class IV 76 or greater points
YOUR SYSTEM CLASSIFICATION	**VSWWS, (I) II, III, IV (Circle one)**	

**The Very Small Wastewater System Classification is applicable to a system that serves 500 connections with a system size of six points or less.

Signature of Legal Owner or Owner's Representative / 9/14/11 Date

Mail form to: Department of Environmental Quality, 1410 N. Hilton, Boise, Idaho 83706, Attn: Mike May

IDAHO PUBLIC WASTEWATER TREATMENT PLANT CLASSIFICATION WORKSHEET

OFFICE USE DO NOT WRITE HERE

System Class _____

Upgrade ___ STD 5 Yr ___

Approved by _____

Date _____

Name of System: Cave Bay Sewer System

Legal Owner of Treatment System Cave Bay Community Services, Inc.

System Address: P.O. Box 115

City: Worley **State:** ID **Zip Code:** 83876

Contact Person: Dave Kinkela **Title:** President

Business Phone Number: (253) 229-4824 **Email:** davekink@aol.com

Treatment System - Design Flow/Actual Flow 0.068 /0.090
(MGD) (MGD)

Treatment Plant Classification Worksheet is (Check one):

☐ **Initial System Rating** ☒ **System Upgrade** ☐ **Standard 5 Year Rating**

Date of last system classification rating (if applicable) unknown

☐ **Attach a flow schematic or hydraulic flow diagram of the treatment facility to this treatment plant classification worksheet when submitting to DEQ.**

Instructions:

Use this rating form for all types of public wastewater treatment plants, facilities, or systems[D-16] that treat domestic and/or industrial wastewater including, but not limited to traditional biological and mechanical treatment processes, large soil absorption systems, community drainfields, and wastewater lagoon systems. Fill out ONE form for the wastewater treatment facility including all sequential, parallel or multiple treatment processes for both effluent and solids that provide treatment of all wastewater introduced into the system.

How to Assign Points:

Evaluate each item listed in the table below and place the specified point value next to each item selected. *Each unit process should have points assigned only once*. Add the total number of points selected to determine the class of the treatment system. Definitions describing all configurations, names, and/or reasons why rating points are or are not assigned to a particular item are provided for those items with a small D-number behind the item, i.e. D-1. Check the definition if unsure whether a particular treatment plant process qualifies for the point value shown.

Treatment facilities will be classified as VSWW, Class I, Class II, Class III or Class IV with IV being the largest and most complex. *Mail the completed, signed form to the Department of Environmental Quality 1410 N. Hilton, Boise, ID 83706 Attention: Mike May. Keep a photocopy of the original form for your files.*

Item	Points	Your System
System Size (2 to 20 points)		
Number of Connections (for information only)	(not scored)	169
Maximum population served, peak day (1 point minimum to 10 point maximum)	1 point/10,000 or part	1

Item	Points	Your System
Design flow (average/day) or peak months (average/day) Whichever is larger (1 point min to 10 point max)	1 point/MGD or part	1
Variation in Raw Waste (0 to 6 points) [1]		
Variations do not exceed those normally or typically expected	0 points	0
Recurring deviations/excessive variations of 100% to 200% in strength/flow	2 points	0
Recurring deviations/excessive variations of more than 200% in strength/flow	4 points	0
Raw wastes subject to toxic waste discharges	6 points	0
Impact of septage of truck-hauled waste (0 to 4 points)	0-4 points	0
Preliminary Treatment Process		
Plant pumping of main flow	3 points	0
Screening, comminution	3 points	0
Grit removal	3 points	0
Equalization	1 point	0
Primary Treatment Process		
Primary clarifiers	5 points	0
Imhoff tanks, septic tanks, or similar (combined sedimentation/digestion)[D-8]	5 points	5
Secondary Treatment Process		
Fixed-film reactor[D-7]	10 points	0
Activated sludge[D-1]	15 points	0
Stabilization ponds or lagoon without aeration	5 points	0
Stabilization ponds or lagoon with aeration	8 points	8
Membrane Biological Reactor (MBR) – Basic MBR which combines activated sludge (minus secondary clarification) and membrane filtration.[D-17]	15 points	0
Tertiary Treatment Process		
Polishing ponds for advanced waste treatment	2 points	0
Chemical/physical advanced waste treatment w/o secondary[D-5]	15 points	0
Chemical/physical advanced waste treatment following secondary[D-4]	10 points	0
Biological or chemical/biological advanced waste treatment[D-2]	12 points	0
Nitrification by designed extended aeration only	2 points	0
Ion exchange for advanced waste treatment	10 points	0
Reverse osmosis, electrodialysis and other membrane filtration techniques for advanced waste treatment	15 points	0
Advanced waste treatment chemical recovery, carbon regeneration	4 points	0
Media filtration (removal of solids by sand or other media) [D-13]	5 points	0
Additional Treatment Processes		
Chemical additions (2 points each for a max of 6 points)[D-3]	0-6 points	0
Dissolved air floatation (for other than sludge thickening)	8 points	0
Intermittent sand filter	2 points	0
Recirculating intermittent sand filter	3 points	0
Microscreens	5 points	0
Generation of oxygen	5 points	0
Solids Handling		
Solids stabilization (used to reduce pathogens, volatile organic chemicals &		

Item	Points	Your System
odors include lime or similar treatment and thermal conditioning)[D-15]	5 points	0
Gravity thickening	2 points	0
Mechanical dewatering of solids[D-11]	8 points	0
Anaerobic digestion of solids	10 points	0
Aerobic digestion of solids	6 points	0
Evaporative sludge drying	2 points	0
Solids reduction (including incineration, wet oxidation)	12 points	0
On-site landfill for solids	2 points	0
Solids composting[D-14]	10 points	0
Land application of biosolids by contractor [D-9]	2 points	0
Land application of biosolids by facility operator in responsible charge	10 points	0
Disinfection (0 to 10 points maximum)		
No disinfection	0 points	0
Chlorination (including chlorine dioxide or chloramines) or ultraviolet irradiation	5 points	5
Ozonation	10 points	0
Effluent Discharge (0 to 10 points maximum)		
No discharge	0 points	0
Discharge to surface water receiving stream[D-6]	0 points	0
Mechanical post aeration[D-12]	2 points	0
Land treatment with surface disposal or land treatment with subsurface disposal [D-10]	4 points	4
Direct recycle and reuse	6 points	0
Instrumentation (0 to 6 point maximum)		
SCADA or similar instrumentation systems to provide data with no process operation	0 points	0
SCADA or similar instrumentation systems to provide data with limited process operation	2 points	0
SCADA or similar instrumentation systems to provide data with moderate process operation	4 points	0
SCADA or similar instrumentation systems to provide data with extensive or total process operation	6 points	0
Laboratory Control (0 to 15 point maximum) [2]		
Bacteriological/Biological Laboratory Control (0 to 5 point maximum)		
Lab work done outside the treatment plant	0 points	0
Membrane filter procedures	3 points	0
Use of fermentation tubes or any dilution method; fecal coliform determination	5 points	0
Chemical/Physical Laboratory Control (0 to 10 point maximum)		
Lab work done outside the treatment plant	0 points	0
Push-button or visual (colorimetric) methods for simple tests such as pH, settleable solids	3 points	0
Additional procedures such as DO, COD, BOD, gas analysis, titrations, solids, volatile content	5 points	0
More advanced determinations such as specific constituents; nutrients, total		

Item	Points	Your System
oils, phenols	7 points	0
Highly sophisticated instrumentation such as atomic absorption, gas chromatography	10 points	0
TOTAL POINTS FOR YOUR SYSTEM		**24**

System Classification Key			
*VSWWS***		*Class II*	*31 to 55 points*
Class I	*30 points or less*	*Class III*	*56 to 75 points*
Class IV	76 points or greater		
YOUR SYSTEM CLASSIFICATION		**VSWWS, (I) II, III, IV (Circle one)**	

Footnote [1] The key concept is frequency and/or intensity of deviation or excessive variation from normal or typical fluctuations; such deviation can be in terms of strength, toxicity, shock loads, I/I, with points from 0-6.

Footnote [2] The key concept is to credit laboratory analyses done on-site by plant personnel under the direction of the operator in direct responsible charge with points from 0-15.

**The Very Small Wastewater System Classification is applicable to a system comprised of one of the following wastewater treatment processes: aerated lagoon (s); non-aerated lagoon(s); primary treatment; or LSAS.

Signature of Legal Owner or Owner's Representative / Date 9/14/11

Wastewater Treatment Definitions

D-1. **Activated Sludge** - Wastewater treatment by aeration of suspended organisms followed by secondary clarification, including extended aeration, oxidation ditches, Intermittent Cycle Extended Aeration system (ICEAS), and other similar processes. A sequencing batch reactor with the purpose of providing this form of treatment would be rated under this category.

D-2. **Biological or chemical/biological advanced waste treatment** - The advanced treatment of wastewater for nutrient removal including nitrification, denitrification, or phosphorus removal utilizing biological or chemical processes or a combination. If the facility is designed to nitrify based solely on detention time in an extended aeration system, only the points for nitrification by designed extended aeration should be given.

D-3. **Chemical addition** - The addition of a chemical to wastewater at an application point for the purposes of adjusting pH or alkalinity, improving solids removal, dechlorinating, removing odors, providing nutrients, or otherwise enhancing treatment, excluding chlorination for disinfection of effluent and the addition of enzymes or any process included in the Tertiary Chemical/Physical Processes. The capability to add a chemical at different application points for the same purpose should be rated as one application; the capability to add a chemical(s) to dual units should be rated as one application; and the capability to add a chemical at different application points for different purposes should be rated as separate applications.

D-4. **Chemical/physical advanced treatment following secondary** - The use of chemical or physical advanced treatment processes following (or in conjunction with) a secondary treatment process. This would include processes such as carbon adsorption, air stripping, chemical coagulation, and precipitation, etc.

D-5. **Chemical/physical advanced treatment without secondary** - The use of chemical or physical advanced treatment processes without the use of a secondary treatment process. This would include processes such as carbon adsorption, air stripping, chemical coagulation, precipitation, etc.

D-6. **Discharge to Receiving Water** - Treatment processes present at the facility are designed to achieve NPDES permit limitations that have already factored in the sensitivity of the receiving stream. Consequently, no additional points are assigned to rate the receiving stream separately from the facility treatment processes.

D-7. **Fixed-film reactor** - Biofiltration by trickling filters or rotating biological contactors followed by secondary clarification.

D-8. **Imhoff tanks (or similar)** - Imhoff tanks, septic tanks, spirogester, clarigester, or other single unit for combined sedimentation and digestion.

D-9. **Land application of biosolids by contractor** - The land application or beneficial reuse of biosolids by a contractor outside of the control of the operator in direct responsible charge of the wastewater treatment facility.

D-10. **Land treatment and disposal (surface or subsurface)** - The ultimate treatment and disposal of the effluent onto the surface of the ground by rapid infiltration or rotary distributor or by spray irrigation. Subsurface treatment and disposal would be accomplished by infiltration gallery, injection, or gravity or pressurized drain field.

D-11. **Mechanical dewatering** - The removal of water from sludge by any of the following processes and including the addition of polymers in any of the following: vacuum filtration; frame, belt, or plate filter presses; centrifuge; or dissolved air floatation.

D-12. **Mechanical post-aeration** - The introduction of air into the effluent by mechanical means such as diffused or mechanical aeration. Cascade aeration would not be assigned points.

D-13. **Media Filtration** - The advanced treatment of wastewater for removal of solids by sand or other media or mixed media filtration.

D-14. **Solids composting** - The biological decomposition process producing carbon dioxide, water, and heat. Typical methods are windrow, forced air-static pile, and mechanical.

D--15. **Solids stabilization** - The processes to oxidize or reduce the organic matter in the sludge to a more stable form. These processes reduce pathogens or reduce the volatile organic chemicals and thereby reduce the potential for odor. These processes would include lime (or similar) treatment and thermal conditioning. Other stabilization processes such as aerobic or anaerobic digestion and composting are listed individually.

D-16 **Wastewater Treatment Facility**. Any physical facility or land area for the purpose of collecting, treating, neutralizing or stabilizing pollutants including treatment plants, the necessary intercepting, outfall and outlet sewers, pumping stations integral to such plants or sewers, equipment and furnishing thereof and their appurtenances. A treatment facility may also be known as a treatment system, waste treatment system, waste treatment facility, or waste treatment plant (IDAPA 58.01.16.010).

D-17 **Membrane Biological Reactor (MBR) Point Factoring** - The points assigned to the basic MBR unit does not include points for any additional treatment processes such as phosphorus removal, nitrification, denitrification, land application, rapid infiltration basins, lagoons, etc. Points must be assigned separately to each additional treatment process beyond the basic MBR unit. Additional treatment processes may vary on a case-by-case basis.

APPENDIX L

Final Public Input

[To be completed following Public Review and Comment, and Public Meeting]

APPENDIX M

EID and Checklist

[To be provided with Final Facilities Plan]