



# Jackson County Gold Ray Sediment Assessment Report



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*Photo Credit:* Brian Barr: National Center for Conservation Science and Policy

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## Introduction

Jackson County has received grant funding from Ecotrust and Oregon Watershed Enhancement Board to conduct a sediment study of the Gold Ray Dam impoundment on the mainstem of the Rogue River. The objectives of the study are to determine the volume and distribution of sediments in Gold Ray Dam impoundment; to characterize the grain size, metal concentration, and pesticide content of these sediments; and to evaluate the geomorphology of the pre-existing channel and floodplain prior to inundation by the dam.

Several state and federal regulatory agencies require the evaluation of sediment behind a dam. An interim Northwest Regional Sediment Evaluation Framework (SEF) has been developed by representatives of these agencies, led by the U.S. Army Corps of Engineers (USACE et al. 2006). The SEF lays out a sequence of information that should be collected, analyzed, and reported in order for the regulatory agencies to make management decisions regarding dredged and contaminated sediments.

The SEF uses a two-level approach to consider data with respect to risk. The Gold Ray Dam Sediment Analysis was performed within the SEF Level 1. This level included a review of available information to determine the likelihood of the presence of contaminants in the deposited sediments behind Gold Ray Dam, the implementation of a screening assessment of sediment characteristics, and the analysis of the screening assessment. This report includes the results and analysis of the screening assessment.

## Background

Gold Ray Dam (Figure 1) is located in Jackson County, Oregon on the Rogue River at River Mile 125.7. The original dam was a log crib structure built in 1904 by Condor Water and Power Company for the purpose of generating power by rope-driven turbines. The operation was acquired in 1921 by California-Oregon Power Company, frequently referred to as COPCO, which in 1941 constructed a straight-crest, concrete gravity dam immediately downstream of the original log crib dam. The concrete structure is 360 feet across and 38 feet high (approximately 35 feet is exposed above the sediment on the downstream side). The log crib dam was inundated after the construction of the concrete dam, and is still intact. On the right side of the dam is a rock and mortar wall that forms the raceway that diverted flows through the powerhouse and turbines. The powerhouse is no longer in use; power generation ceased in 1972. Flows from the powerhouse used to return to the river through an outlet channel blasted out of the bedrock when the original dam was built in 1904. There is a fish ladder structure with two long “arms” adjacent to the raceway wall; one arm of the ladder is approximately 160 feet long and is adjacent to the raceway wall while the second is perpendicular to the raceway and extends approximately 120 feet into the river channel.



Figure 1. Gold Ray Dam from downstream left bank.  
Photograph ca. 2008. Source: Bill Elliott

Immediately upstream of the concrete dam is the original log crib dam built in 1904. This older dam has a height approximately 5 feet lower than the concrete dam. The log dam arches upstream from either end and is connected to the concrete at the left and right extents of both dams. The widest space between the two dams is approximately 25 feet. An historic photo of the log crib dam is shown in Figure 2.



Figure 2. Inundated area that resulted after the completion and filling  
of the impoundment from the construction of the log crib dam.  
Photograph ca. ~1936. Source: Southern Oregon Historical Society

The section of river immediately downstream of the dam is a relatively narrow reach of exposed bedrock as the river enters into a canyon. Upstream of the dam is the impounded area which has been inundated since 1904. There are numerous sloughs and an extensive hardwood forested riparian area.

A railroad runs along the left side of the river. Upper River Road is also located on the left side of the river. The road crosses to the inside of the railroad tracks approximately 250 feet downstream of the dam. There is also access to the dam from the right side through Gold Rey Estates.

Land adjacent to Gold Ray Dam is currently owned by Jackson County. The land was previously owned by Pacific Power and its predecessors, and ownership was transferred to Jackson County in 1972. The county property is zoned Open Space Reserve.

Historically, land use in the Rogue River basin included lode and placer mining, agriculture and forestry, power generation, and fish harvesting. Much of these uses persist today in varying degrees. Mining had historically been performed for primarily gold and quartz, but also silver, copper, tin, mercury, chromium, manganese, coal, tungsten, cinnabar, and aggregate materials including sand and gravel, and quarry stone including granite and limestone, and clay. Although most mining activities ceased in the 1940's, some mining is still performed in the area. At least 44 mines were historically present in the Rogue River basin upstream of Gold Ray Dam in Jackson County. The practices of hydropower generation and fish harvesting are not likely release contaminants to the environment.

The Rogue River valley has been used for agriculture since settlement began in the region starting around 1850. Important agriculture products included grains, fruit orchards, livestock, and fish. Forest management has occurred in the basin since settlement, and continues to this day.

In a stakeholder meeting at the Rogue Valley Council of Governments office in Central Point, Oregon on December 5, 2008, meeting attendees described their awareness of potential historical contaminant use in the watershed. The reliability of the following anecdotal accounts is not known:

1. **Arsenic** was a key ingredient in pesticides prior to the availability of synthetic chemicals. It is likely that arsenic-based pesticides were used in pear orchards in the watershed, and possibly for other crops. Source: Bob Hunter, WaterWatch.
2. **Mercury** was used in the Jacksonville and Bear Creek placer and hard rock gold mining operations, and also may have been used by individuals "panning" for gold. In larger placer operations, 30% of mercury is typically "lost," much of it attached to fine sediments that are transported downstream with the placer tailings. Sources: Josephine County Historical Society ([http://roguerivervalley.com/historical\\_society/mercury\\_mining.htm](http://roguerivervalley.com/historical_society/mercury_mining.htm)) and USGS Fact Sheet 2005-3014 (<http://pubs.usgs.gov/fs/2005/3014/>).

3. **Pesticides** were used on US Forest Service lands in Oregon for a 5 to 7 year period in the early 1970's. The pesticides were sprayed on clear cuts prior to replanting at the rate of approximately 1000 acres per year. The primary chemicals used included 2,4,5-Trichlorophenoxyacetic acid and Tordon (aka Picloram). In addition, DDT (dichloro-diphenyl-trichloroethane) was used occasionally as a pesticide treatment in Oregon's national forests. Source: Brian Barr, National Center for Conservation Science and Policy.

In 1949, forest land upstream of Cougar Reservoir, located in the Willamette River basin and Willamette National Forest north of Jackson County, was treated with DDT to control western spruce budworm. DDT bonds to soil and was found in Cougar Reservoir sediment. DDT was banned for use in the United States in 1972. Source: Willamette National Forest ([http://www.fs.fed.us/r6/willamette/newsandevents/news/2002newsarchives/021022low\\_ddt\\_at\\_cougar.html](http://www.fs.fed.us/r6/willamette/newsandevents/news/2002newsarchives/021022low_ddt_at_cougar.html))

Forest Service land is well upstream of Gold Ray Dam; however, Gold Ray Dam was the upstream-most significant dam on the mainstem Rogue River until Lost Creek Dam was completed in 1975.

There is a history of light industrial activity in the Whetstone Creek and Military Slough catchments that drain to the Rogue River upstream of Bear Creek. There are no known spills or problems in these subbasins.

A search in EPA's Envirofacts database for NPDES permits returned 9 historic and current permits in zip code 97502 (Central Point, OR). The permit holders include Central Point School District, City of Medford (for the Medford Regional Water Reclamation Facility), Kerry Dalbec, LTM Incorporated, Medina's Dairy, Powell Distributing Company, Ray Vogel Dairy, Rogue River Ranch, and Texaco Service Station.

A search of EPA's CERCLIS database for Jackson County and the Rogue River watershed returns two listed sites: Rogue Transfer and Recycling (Balteau Standard) in Medford, and Weldon's Cleaning Center in Medford. Neither of these facilities is included on EPA's national priority list.

At the Balteau Standard site, more than 8700 gallons of oil were spilled in the 1970's. Soil sampling in 1988 and 1991 found elevated concentrations of PCBs, petroleum hydrocarbons and low levels of organic solvents on site. Groundwater and drainage ditch water sampling in 1994 detected PCBs. In 1995, contaminated soil was excavated and the site was capped.

Dry cleaning solvents were found in a groundwater sample downgradient of Weldon's Cleaning Center in 2000. The site was recently added to CERCLIS. No site verification samples have been taken, and no remediation action has been taken.

Oregon DEQ's Environmental Cleanup Site Information (ECSI) Database includes 12 mines in Jackson County. Of those 12 mines, four of them are located in the Rogue

River basin upstream of Gold Ray Dam. Table 1 provides location details for these four mines.

Table 1. Rogue River Basin Mines in ECSI Database (as of February 2008).

Mine	Location	Watershed	Potential Contaminants	Description (from ODEQ ECSI Database)
<b>Barron</b>	37S/2E/S23	Sampson Creek	Mercury; other metals	Barron Mine's early history is lost. Gold and silver were mined at the site. A 10-stamp mill was used. Major production took place from 1917-1931. There were about 1,000 feet of workings.
<b>Ashland Mine</b>	39S/1W/S12	Wrights Creek	Mercury; other metals; acid mine drainage	"The Ashland vein is one of the most persistent in southwestern Oregon. It has been trace for more than a mile long its strike and to a depth of about 1200 feet down dip, and it extends beyond the limits of the workings." (Brooks and Ramp, 1968) The gold mine was discovered in 1896. The first mill was 5-stamp, and later a 10-stamp mill operated at the site. There are about 1,100 feet of underground workings.
<b>Shorty Hope</b>	39S/1W/S12	Wagner Creek	Copper, zinc, lead, acid mine drainage	Shorty Hope Mine was probably discovered in the late 1800s. Gold and silver were mined. Ore was treated in a 10-stamp mill. There were approximately 3,500 feet of workings.  The former Shorty Hope mine was most likely discovered in the late 1800's. All production is reported to have occurred prior to 1939. Historical ownership of the mine prior to 1939 was not reported in the literature used for this assessment. P.B. Wickham was the owner in 1939.  In 1914 the mine was reported to be equipped with a 10-stamped mill that discharged to amalgamating plates. In 1939 the mine is reported to have had a 5-stamp mill driven by electric motor, rock crusher, amalgamation plates and gravity concentration. This report recommended cyanide be added to the process. The mill was reported to be down slope of the mine to allow gravity to feed the ore to the mill.
<b>Stanley &amp; Brown</b>	36S/1E/S11	Little Butte Creek	Mercury; other metals	Limited historical and operational history is available for the Stanley and Brown Prospects Mine site. The mine was discovered on the crest of a butte in about 1902 and was developed by several pits and trenches (Brooks and Ramp, 1968). The mine was originally opened as a mercury prospect; however, some of the extracted material was used for the manufacturing of refractory brick by the Klamath Falls Brick & Tile Company [Oregon Metal Mines Handbook, 1951]. The mine was developed by an adit 107 long with 30 feet of crosscuts. Also, a shaft 30 to 40 feet deep was located at the base of the butte. The ore produced from the mine was hand-sorted from small, widely-spaced pockets: most of the work was completed around 1920 with a total production of 2 or 3 flasks (Brooks and Ramp, 1968). The presence of an on-site mill and/or retort was not reported in the historical background documents.

*Source: ODEQ*

A search of Jackson County and Rogue River watershed cleanup programs in the EPA “Cleanups in My Community” database (references Superfund, RCRA and Brownfield cleanup programs) returned the Cascade Wood Products remedial investigation. A spill of PCP solution in 1985 caused the contamination of soil and groundwater at the Cascade facility. Cascade performed removals of contaminated soils and operated a groundwater treatment system as an interim measure. As of December 2004, monitoring wells have not detected PCP migrating to surface water sources upstream of Gold Ray Dam (DEQ, 2004).

A search of Jackson County and Rogue River spill events in the EPA “Cleanups in My Community” database returned the Montezuma West truck spill on westbound I-5 north of Central Point. The truck carried chemicals including 1,1,1-trichloroethane and acetone. The chemicals seeped into the groundwater and contaminated water wells along

Blackwell Road, located between the spill site on I-5 and Bear Creek. The spill site is located 1 to 2 miles from Bear Creek, a tributary of the Rogue River upstream of Gold Ray Dam. EPA and Oregon DEQ cleaned up the site between 1999 and 2005.

The background investigation results and lack of comprehensive sediment quality data for the sediments behind Gold Ray Dam led to the conclusion that the Level 1 analysis for Gold Ray Dam should extend beyond the initial information review step. A Sampling and Analysis Plan (SAP – HDR, Inc. and Southern Oregon University, 2009) was developed for Gold Ray Dam and approved by the Project Review Group (PRG) led by the Corps of Engineers. The SAP detailed the type of data that would be collected in the Gold Ray Dam impoundment and how the data would be analyzed. The data collection is described in detail in the “Sample Collection and Analysis” section.

## **Previous Studies**

In 2001, the Bureau of Reclamation issued study reports on the removal of two dams located downstream of Gold Ray Dam (River Mile 126.3): Gold Hill Dam (RM 121) and Savage Rapids Dam (RM 107.3) (Bureau of Reclamation 2001a, 2001b). Both reports included investigations of potential contaminants of sediments behind the dams. Both analyses showed that the sediments were not contaminated with mine wastes, and sediment quality was sufficient to allow a “river erosion” sediment management plan for removal of the dams. Gold Hill Dam was removed in 2008 and Savage Rapids Dam is currently in the construction process of removal.

### ***Savage Rapids Dam***

McLaren/Hart (1998) conducted analyses of marginal sediments for volatile and semivolatile compounds (VOCs and SVOCs). Neither VOCs nor SVOCs were found in measureable concentrations in any of the samples. McLaren/Hart found no indication of a source of either type of compound upstream of the reservoir. Metals were analyzed and all sediment metals concentrations were found to be at or below background concentrations.

Based on the results of the McLaren/Hart study, the Bureau of Reclamation conducted a metals analysis of sediments in the Savage Rapids Dam impoundment with the purpose of looking for evidence of contamination associated with hard rock mining in the region. Analyses were conducted on shallow and deep samples within the sediment core for the following metals: cadmium, copper, iron, lead, manganese, and zinc using EPA Method 6010; mercury using EPA Method 7471; arsenic using EPA method 7060A and 7000, and TOC using EPA Method 9060. Results of the analyses showed the metals concentrations were lower than the SEF guidelines.

### ***Gold Hill Dam***

The Bureau of Reclamation in 2001 tested four sediment samples for major and trace element concentrations, grain size, and total volatile solids (TVS) to determine if the sediment had been contaminated by upstream activities such as mining. The tests found almost all constituents were found in concentrations below screening levels (one sample had a TVS concentration slightly above the screening level), and confirmed that the

discharge of sediments is not expected to have any secondary toxic effects on aquatic life in the Rogue River.

### **Gold Ray Dam**

A senior project was conducted by a geology student at Southern Oregon University in 2007 on a geochemistry and grain size analysis of sediment samples from the Gold Ray Dam impoundment (Carrington and Elliott, 2007). Three sediment cores, 48, 72, and 90 cm in depth, were recovered from the Gold Ray impoundment at water depths of 1.0 to 1.5 m and located about 100 meters upstream of the dam. All sediment cores contained coarse material and sand layers; the sand layers may correspond to historic flooding events on the Rogue River.

Sediments were processed in 3 cm increments for analysis using EPA Method 3050B. Concentrations of Al, As, Ca, Cd, Cu, Fe, K, Mg, Na, Pb, and Zn were determined using a spectrometer. In all sediment cores, metal content for Cu ranged between 163.46 to 593.55 mg/kg dry weight, Ni between 100.5 to 234.58 mg/kg dry weight, Pb between 10.58 to 122.71, and Zn between 354.97 to 879.27 mg/kg dry weight. As and Cd in cores 1 and 2 were below detection limits, but reached levels of 17.7 and 33.27 mg/kg dry weight, respectively.

In general, Al and Fe content increased with depth while As and Cd decreased with depth in the sediment cores. Cu, Pb, and Zn concentrations correlate with grain size, with increased concentrations of these metals found in the silts and clays. Al, Ca, Fe, K, Mg, Ni, and Na concentrations did not correspond to grain size variations in the sediment cores, and vary with depth.

The measured metal concentrations were all found to be below EPA limits for contaminated sediments. However, many samples exceeded NOAA sediment quality guideline levels for effects range-low and range-medium.

### **Sample Collection and Analysis**

HDR, Inc. and Southern Oregon University developed a SAP (2009) that proposed a plan for sample collection and analysis of sediments behind Gold Ray Dam. The SAP included the following investigations:

- SONAR survey of sediment volume and thickness;
- Vibracore sampling at 12 locations behind the dam; and
- Analysis of stratified sediment samples for particle gradation, Total Organic Carbon content, and concentration of contaminants.

### **Sediment Volume and Thickness**

A SONAR study was conducted by Southern Oregon University on November 22-23, 2008. A portable EdgeTech # 3100 P sub-bottom profiling system with an EdgeTech SB 424 tow fish was used for collecting the data. In addition, a Trimble GeoExplorer Global Positioning System unit keyed to NAD 83 CONUS was integrated to the profiling system, providing latitude and longitude data for the transects. The SONAR system was operated from a tow fish pulled behind a boat at about 5 feet below the water surface.

Three longitudinal and three cross-sectional transects were completed on the main channel of the Rogue River extending from approximately 300 ft above the dam to approximately 400 ft upstream of the confluence with Bear Creek. Two cross-sectional transects were pulled at 30 and 60 ft parallel to the dam. Finally, the tow fish was rigged to buoys and floated to within 5 ft of the dam, and then pulled upstream to provide transects perpendicular to the dam. Longitudinal transects were also conducted for Lower Kelly Slough and Tolo Slough by pulling the tow fish 3 ft below the water line.

The result of the SONAR study included a water depth map, sediment thickness isopleths, and sediment volume estimate for the impoundment behind Gold Ray Dam.

### ***Vibracore Sampling***

Gravity Consulting LLC collected vibracore sediment samples in the Gold Ray Dam impoundment July 14-15, 2009. A total of 12 stations were sampled with a total of 24 recovered samples. A Trimble differential GPS was used to log X and Y coordinates at each location and a Trimble Spectra Vision Laser level was used to log water surface elevations.

Cores were recovered at 11 of 12 sites. At many of the sites, the cores were divided into vertical segments based on stratification of material sizes, organic debris, or other factors, with a maximum segment of 4 feet. Figure 3 shows the locations of the core samples.

### ***Particle Gradation***

SOU conducted particle size distribution analysis on 24 samples, following ASTM D422 protocols utilizing requisite sieve sizes. As specified in the SEF, hydrometer analysis was performed for particle sizes finer than the 230 mesh. Fourteen samples had enough fine material to conduct the hydrometer analysis.

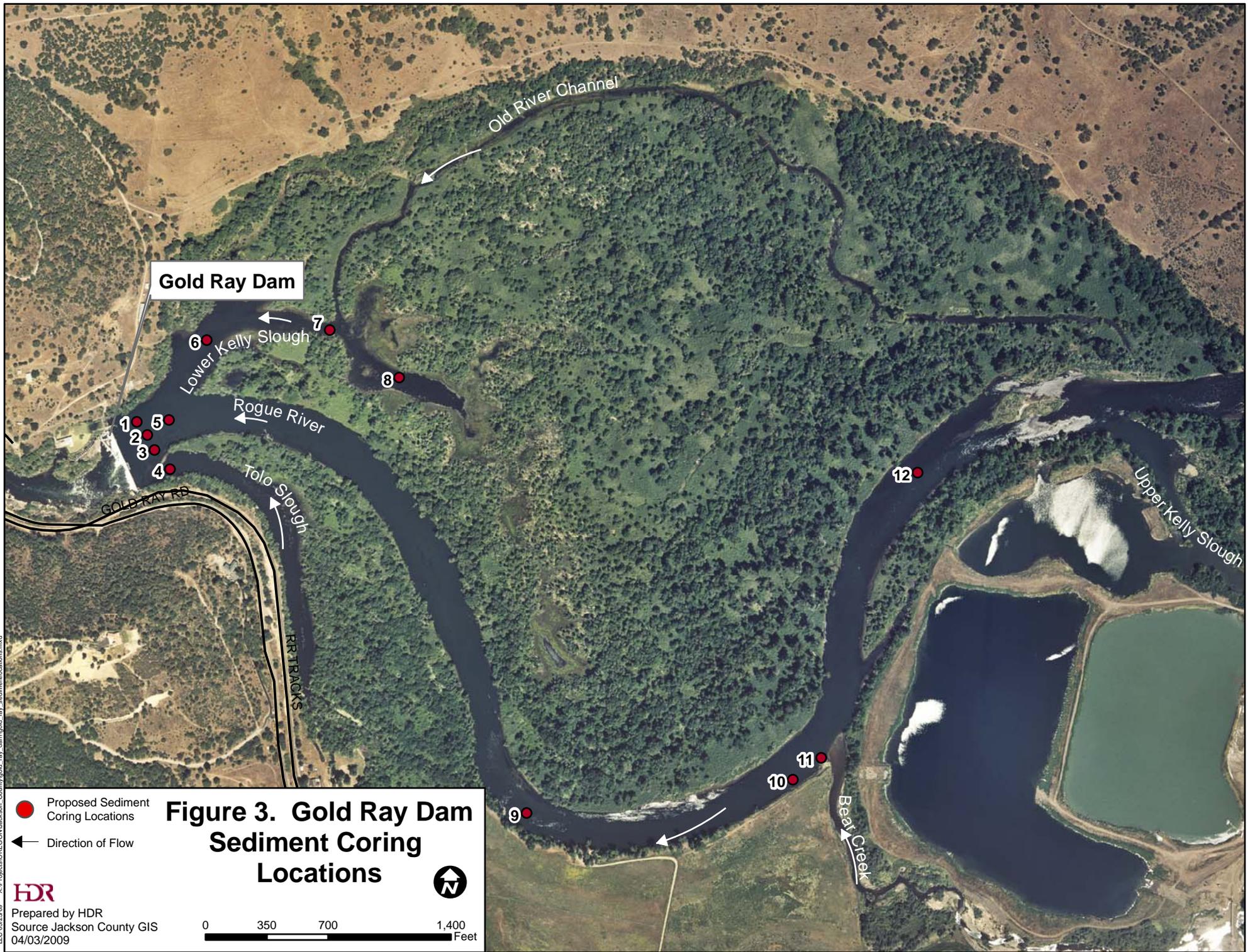
### ***Contaminants***

The contaminants to be analyzed were changed from the SEF requirements based on a conference call with HDR, Inc. and the PRG on June 29, 2009. The PRG agreed that the contaminant sampling should focus on metals, pesticides, and total organic carbon (USACE, 2009). Concentration of trace metals analysis was performed by SOU for arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), lead (Pb), antimony (Sb), and zinc (Zn) using EPA Method 3050B. Neilson Research Corporation of Medford, OR performed trace metals analysis of mercury (Hg) using EPA 7471A, analyzed organochloride pesticides July 21-31, 2009 using EPA 8081, and analyzed PCBs using EPA 8082. Analytical Resources, Inc. of Tukwila, WA analyzed Total Organic Carbon July 22-23, 2009 using Plumb (1981).

## **Results and Analysis**

### ***Sediment Volume and Thickness***

A SONAR study was conducted by Jackson County and SOU on November 22-23, 2008 to estimate the location and thickness of sediment in the impoundment behind Gold Ray Dam. A report detailing the SONAR study and the results was issued by Bill Elliott and



Eric Dittmer of SOU on March 31, 2009. The report included an isopach map of sediment thickness in the impoundment as Plate 2. The SOU SONAR study report and an addendum are attached as Appendix A.

The SOU report estimated up to 400,000 cubic yards of sediment present in the inundated areas of the impoundment (Elliott and Dittmer, 2009). This estimation used the high value in the range of each sediment thickness partition; for example 6 feet was used for the 3'-6' range, 9 feet was used for the 6'-9' range, etc. Thus the sediment volume estimate is conservative and could potentially be less than 400,000 cubic yards (Elliott, 2009).

The sediment isopleths and sediment volume estimate appear to be congruent with the "depth to refusal" for the vibracore sampling. A comparison of the refusal depths with the estimated sediment thickness isopleth map is described in the next section.

The Savage Rapids Dam sediment analysis report (Bountry and Randle, 2001) estimated an average annual Rogue River sediment load of 100,000 cubic yards at Savage Rapids Dam. 400,000 cubic yards represents 4 years of sediment accumulation in the 105 years since dam closure. It is likely that most or all of the annual sediment flux is transported through the Gold Ray Dam impoundment in a typical year.

The SOU report also used a reconstruction of the geomorphology prior to dam construction to estimate a progression of sediment deposition of up to 1,800,000 cubic yards between the main south channel and the remnant channel to the north. The "island" created between the two channels is characterized by established, mature vegetation, and unlikely to erode. Upon dam removal, this area would likely remain an elevated terrace (Elliott & Dittmer, 2009).

### *Vibracore Sampling*

Table 2 presents the results of the vibracore sampling including penetration depth, recovered core sample depth, and sample stratifications. 24 samples were recovered and sent to the laboratories for analysis. The coring field notes are attached as Appendix B.

Vibracoring is a state-of-the-art sediment sampling technology that employs a tube driven with a vibrating device. According to the website "Vibracoring: A Practical Guide" ([www.vibracoring.com](http://www.vibracoring.com)), vibracoring works best on unconsolidated, waterlogged, heterogeneous sediments and soils. Silty sediments of mixed grain size are easiest to core. Vibracoring is less effective for relatively dry clays, packed sand or any consolidated materials.

During the sediment coring work in July 2009, the contractor recorded maximum depth to refusal. Refusal depth is the sediment depth at which the vibracore cannot penetrate further. The reason for refusal is unknown at each site, but in the Gold Ray Dam impoundment it is likely due to one of two factors: either the previous bed material was encountered (consolidated gravel and cobble); or if sand was encountered it compacted, preventing the coring tube from penetrating the sediment and resulting in limited recovery.

Table 2. Vibracore Sampling Results

Core No.	Maximum Depth of Refusal (ft)	Depth of Recovered Sample (ft)	Sample Stratifications
1	2.5	2.5	0.0-1.2 ft 1.2-2.5 ft
2	1.0	1.0	0.0-1.0 ft
3	3.0	3.0	0.0-1.5 ft 1.5-3.0 ft
4	12	7.2 (compacted 60%)	0.0-2.4 ft 2.4-4.8 ft 4.8-7.2 ft
5	1.5	1.5	0.0-1.5 ft
6	10.0	7.0	0.0-2.8 ft 2.8-5.8 ft 5.8-7.0 ft
7	9.0	5.0	0.0-1.0 ft 1.0-2.2 ft 2.2-3.5 ft 3.5-5.0 ft
8	8.0	5.0	0.0-1.0 ft 1.0-2.5 ft 2.5-5.0 ft
9	6.0	1.3	0.0-1.3 ft
10	No recovery		
11	7.0	3.0	0.0-1.6 ft 1.6-3.2 ft
12	5.0	3.0	0.0-1.5 ft 1.5-3.0 ft

If the refusal was due to the core reaching the previous bed surface, then the refusal depth is a very good reflection of sediment depth at that location. If the refusal was due to compacted sand, the true depth of sediment cannot be calculated. It is unknown which of the two conditions hold true for the depths of refusal in the Gold Ray Dam impoundment. However, professional judgment was used by the vibracoring team (Shawn Hinz and Steve Saugen of Gravity Consulting and SOU Geology professors Bill Elliott and Eric Dittmer) to infer the cause of the refusal (Dittmer and Elliott, 2009). The possible reason for refusal is listed in Table 3, with the maximum depth of refusal and the estimated depth of sediment provided in the isopach map (Plate 2 in Appendix A) at each of the 12 coring locations.

As discussed in the previous section, the 400,000 cubic yard sediment volume estimate is based on the high value of the range of each sediment thickness partition, thus the estimate is conservative and the actual volume of sediment in the impoundment could potentially be less. With this knowledge, Table 3 shows that 8 of 12 of the refusal depths are within one foot of the estimated range; of the four depths that were outside of the estimated range, two sites indicated overestimates on the isopach map, and two sites indicated underestimates. The underestimated locations are in sloughs (Core 4 in Tolo Slough and Core 8 in Lower Kelly Slough), and the overestimated locations are in the

main channel (Core 3 immediately upstream of the dam and Core 10 near the confluence with Bear Creek). This information should be considered with the knowledge that the reason for the vibracore refusal is unknown at each site.

Table 3. Comparison of Sediment Depth Estimate with Depth to Refusal in Gold Ray Dam Impoundment

Core No.	Maximum Depth of Refusal (ft)	Range of depth on Isopluvial Plate (ft)	Depth of Refusal within +/- 1 ft of Estimated Range?	Possible Reason for Refusal
1	2.5	0-3	OK	Pre-existing surface
2	1.0	0-3	OK	Compacted sand
3	3.0	9-12	Overestimate	Compacted sand
4	12.0	6-9	Underestimate	Pre-existing surface
5	1.5	0-3	OK	Cobble or pre-existing surface
6	10.0	9-12	OK	Compacted silt/sand
7	9.0	6-9	OK	Compacted clay or pre-existing surface
8	8.0	3-6	Underestimate	Compacted clay or pre-existing surface
9	6.0	3-6	OK	Cobble or pre-existing surface
10	No recovery	3-6	Overestimate	Cobble or pre-existing surface
11	7.0	3-6	OK	Cobble or pre-existing surface
12	5.0	3-6	OK	Cobble or pre-existing surface
<i>Source: Elliott &amp; Dittmer, 2009</i>				

### Particle Gradation

The sieve analyses showed more than 80% of the total sediment sample consisted of sand and gravel. Sand (0.063-2 mm) was the dominant sediment size, totaling nearly two-thirds of the total sample by weight (63.4%). Gravel (2-32 mm) totaled 9.2% of the total sample by weight, and the remaining 19.4% was silt and clay (<0.063 mm).

High proportions of fine sediment and clays, defined as the particles that pass the #230 screen (0.063 mm), were measured at Core 1 (28-30% fines), Core 4 (29-52%), Core 6 (45-58%), Core 7 (4-33%), and Core 8 (16-50%). All of these cores are in sloughs (Tolo Slough for Core 4; Lower Kelly Slough for Cores 6, 7, and 8) except Core 1 which was located on the north side immediately upstream of Gold Ray Dam, near the outlet of Lower Kelly Slough. At the main channel locations, percents of fines were very low, ranging from 0.1% to a maximum of 3.3% by weight.

Table 4 presents the most abundant grain size classifications, per Wentworth (1922), for each of the 11 sites with core recovery. In general, the dominant sediment size immediately behind the dam was coarse sand; in Tolo and Lower Kelly Sloughs the dominant sediment size was silt and clay; and in the main channel the dominant sediment size was coarse sand.

Table 4. Dominant Sediment Diameters in Core Sample

<b>Immediately behind Gold Ray Dam</b>				
Core No.	Classification	Sieve No.	Max Dia. (mm)	% Total Weight
1	Silt & clay	Passes #230	<0.061	29.5%
	Fine sand	#-120	0.124	27.0%
	Very fine sand	#-230	0.061	19.4%
	Medium sand	#-60	0.246	18.0%
2	Coarse sand	#-35	0.495	61.5%
	Very coarse sand	#-18	0.991	26.6%
	Medium sand	#-60	0.246	8.4%
3	Coarse sand	#-35	0.495	39.4%
	Very coarse sand	#-18	0.991	19.5%
	Medium sand	#-60	0.246	15.3%
	Very fine gravel	#-10	1.98	12.4%
5	Coarse sand	#-35	0.495	37.5%
	Very coarse sand	#-18	0.991	30.3%
	Coarse gravel	0.625-inch	15.88	10.9%
<b>Tolo Slough and Lower Kelly Slough</b>				
Core No.	Classification	Sieve No.	Max Dia. (mm)	% Total Weight
4 (Tolo)	Silt & clay	Passes #230	<0.061	44.3%
	Coarse sand	#-35	0.495	14.0%
	Very fine sand	#-230	0.061	11.5%
	Very coarse sand	#-18	0.991	10.4%
6 (Lower Kelly)	Silt & clay	Passes #230	<0.061	46.2%
	Very fine sand	#-230	0.061	14.2%
	Medium sand	#-60	0.246	12.4%
	Fine sand	#-120	0.124	12.3%
	Coarse sand	#-35	0.495	10.8%
7 (Lower Kelly)	Medium sand	#-60	0.246	22.7%
	Fine sand	#-120	0.124	20.6%
	Silt & clay	Passes #230	<0.061	20.5%
	Coarse sand	#-35	0.495	14.4%
	Very fine sand	#-230	0.061	13.9%
8 (Lower Kelly)	Silt & clay	Passes #230	<0.061	36.4%
	Fine sand	#-120	0.124	19.8%
	Medium sand	#-60	0.246	17.3%
	Very fine sand	#-230	0.061	16.4%
<b>Main Channel</b>				
Core No.	Classification	Sieve No.	Max Dia. (mm)	% Total Weight
9	Coarse sand	#-35	0.495	52.7%
	Medium sand	#-60	0.246	35.5%
11	Coarse sand	#-35	0.495	29.1%
	Medium sand	#-60	0.246	32.6%
	Medium gravel	0.313-inch	7.74	9.8%
	Coarse gravel	0.625-inch	15.88	9.0%
12	Medium sand	#-60	0.246	41.1%
	Coarse sand	#-35	0.495	21.9%
	Fine sand	#-120	0.124	19.1%

Near the dam (Cores 1-6), the deeper sediments tended to have a coarser gradation than the upper stratifications. This relationship was weaker upstream in the main channel and in the upper cores in Lower Kelly Slough.

As stated previously, the cores with higher percentages of silts and clays are located in sloughs except Core 1. The sloughs currently are not flow-through channels, and are low-energy areas that allow settling of finer particles from the water column. Tolo Slough is fed by Middough Creek, an ephemeral creek with a drainage area of about 3.5 square miles. The Lower Kelly Slough is fed by an old river channel to the north that is disconnected from the surface of the main channel on the upstream end. During flood events, flows in these two sloughs likely increase due to local runoff, but likely are not high enough to cause substantial erosion of fine sediment.

Following dam removal, the water surface elevations in the sloughs will decrease, exposing much of the sediment on the banks of the slough. Some fine sediments concentrated in the deepest part of the slough may be exposed to erosion during high flood events, but flow rates are not expected to increase in the slough areas over the current conditions. The exception to this statement is if the remnant channel is physically reconnected to the main channel; in this case the deposited fine sediments in Lower Kelly Slough could be exposed to high velocities during floods, although much of the fine sediment on the banks would still be above the water surface elevation. A similar concern would be if the old river (north) channel is reconnected at the upstream end of the impoundment after dam removal.

Particle sizes in the main channel and near the dam were coarser than in the quiescent areas, reflecting the higher velocities that are present during high flow events.

SOU's analysis transmittal report, sieve analysis report, and graphs of particle gradations are presented in Appendix C. The results of the hydrometer analyses are provided in Appendix D.

### ***Contaminants***

Concentrations of trace metals for 24 samples at 11 coring locations were found to be below the lower screening limit (SL1) given in the Table 7-1 of the SEF (USACE et al., 2006). Some of the concentrations were above the instrument detection limit but below the minimum reporting limit; these values are J-flags and reported in the results table (Appendix E).

Pesticides were analyzed and not detected at 10 of the 11 recovered cores. 4,4'-DDE was detected in the three samples for Core 4, located in Tolo Slough. The DDE concentrations of the three samples were 6, 10, and 9  $\mu\text{g}/\text{Kg}$  for the 0-2.4 ft, 2.4-4.8 ft, and 4.8-7.2 ft depths. These three values are below the minimum reporting limits for the method (49, 48, and 49  $\mu\text{g}/\text{Kg}$ , respectively, due to dilution) and below the marine SL1 lower screening limit of 16  $\mu\text{g}/\text{Kg}$  given in Table 7-1 of the SEF.

PCBs were analyzed and not detected in any of the 24 samples.

Total organic carbon was analyzed at concentrations ranging from 0.067% (Core 3, 1.5-3.0 ft depth) to 5.18% (Core 7, 0-1.0 ft depth).

Tables and figures showing summary results of the contaminant analyses are presented in Appendix E. Chain of custody forms were generated for samples that were analyzed by Neilson Research Corporation and Analytical Resources, Inc. The chain of custody forms, data transmittal forms from Neilson Research Corporation and SOU, and results of the contaminant analyses are provided in Appendix F.

## Conclusions

Investigations into size, volume, and chemical quality of sediments in the Gold Ray Dam impoundment were conducted November 2008 and July 2009. The studies were conducted per a Sampling and Analysis Plan developed within the guidelines presented in the Sediment Evaluation Framework (SEF).

A SONAR study conducted in November 2008 estimated up to 400,000 cubic yards of deposited sediment in the inundated areas of the Gold Ray Dam impoundment. With an estimated annual sediment load of 100,000 cubic yards at Savage Rapids Dam, the volume of sediment that has accumulated behind the dam for the last 105 years is approximately 4 times the annual load. This estimate is conservative and represents the high end of the range for sediment volume. Approximately 1,800,000 cubic yards of sediment may be present in the “island” between the main channel of the Rogue River and the remnant channel that lies to the north. Heavy vegetation has established on this island, and most of this area is unlikely to be eroded after the dam is removed.

On July 14-15, 2009, sediment cores were removed from various locations in the impoundment, including immediately behind the dam, Tolo Slough, Lower Kelly Slough, the main channel, and downstream of the riffles near Upper Kelly Slough. Sediment gradation analyses were conducted on 24 samples from 11 locations. 80.6% of the total sediment was sand and gravel; 19.4% was silt and clay. Fine sediment and clays were found in concentrations greater than 15% at five locations, all quiescent areas with low energy and minimal flow-through during storm events: immediately behind the dam (1), Tolo Slough (1) and Lower Kelly Slough (3). Fine sediment and clays were found in low concentrations ranging from 0.1% to 3.1% at six locations where velocities are relatively high: immediately behind the dam (3) and the main channel (3). A core was not successfully recovered at one location in the main channel. In general, the dominant sediment size immediately behind the dam was coarse sand; in Tolo and Lower Kelly Sloughs the dominant sediment size was silt and clay; and in the main channel the dominant sediment size was coarse sand.

Sediment quality analyses were conducted on 24 samples for trace metals including arsenic, cadmium, chromium, copper, nickel, lead, antimony zinc, and mercury. Also analyzed were organochloride pesticides, PCBs, and total organic carbon. The sample concentrations were compared to the screening levels given in the SEF. All metals concentrations were lower than the lowest screening level for fresh water; the highest concentration (Cu at Core 6) is 60% less than the screening limit. At one location on Tolo Slough, 4,4'-DDE was detected at concentrations below the screening limit; this

organochloride pesticide was not detected at the other ten locations. PCBs were not detected in any of the 24 samples. Total organic carbon ranged from 0.067% to 5.18%.

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**APPENDIX A**  
**SONAR STUDY REPORT AND ADDENDUM**

**Preliminary Report of the Sediment Study Conducted at Gold Ray Reservoir,  
Jackson County, Oregon**

By: Bill Elliott and Eric Dittmer  
Department of Environmental Studies, Southern Oregon University



Completed for HDR Engineering, Inc.



March 31, 2009

## **Executive Summary**

A SONAR Survey was completed of Gold Ray Reservoir to determine water depth and thickness of deposited sediment in the slack water areas that extend from the dam to ~1,200 feet above the confluence with Bear Creek. This SONAR data was used to determine the approximate pre-dam river bottom and to identify submerged sediment bars in the inundated areas of the reservoir. A calculated volume of ~400,000 cubic yards of sediment occurs in the currently inundated area of Gold Ray Reservoir. The amount of gravel in the reservoir is ~60,000 cubic yards (about 15 percent of the total sediment volume). The remaining amount of sediment is probably dominated by sand (about 75 percent of total sediment) with a smaller proportion of mud (about 10 percent of total sediment).

The gradient of the Rogue River from the top of the Gold Ray Dam to just above the slack water of Gold Ray Reservoir is currently 4.9 feet per mile. With the removal of Gold Ray Dam, the gradient would be 11.1 feet per mile. This is consistent with the current gradient of 11.8 feet per mile calculated for the Rogue River a few miles upstream from Gold Ray Reservoir. The gradient of the Rogue River below Gold Ray Dam is 14.2 feet per mile, reflecting an increase as the river moves from a riverbed of alluvium to bedrock.

Overall, the sediment volumes calculated above for Gold Ray Reservoir are less than expected, especially with annual sediment loads of 100,000 cubic yards per year estimated for Savage Rapids Dam downstream of this locality. There are three possibilities that may explain the “lack” of sediment in the reservoir: (1) sediment was deposited by a prograding delta that filled in the inundated area of the floodplain upstream from Gold Ray Dam, (2) the gradient of the Rogue River in this stretch is less, and therefore sediment yields are less, and/or (3) the extraction of gravels upstream decreased the availability of sediments delivered into the reservoir. The amount of sediment estimated to have been deposited on this inundated floodplain may be as much as 1,800,000 cubic yards.

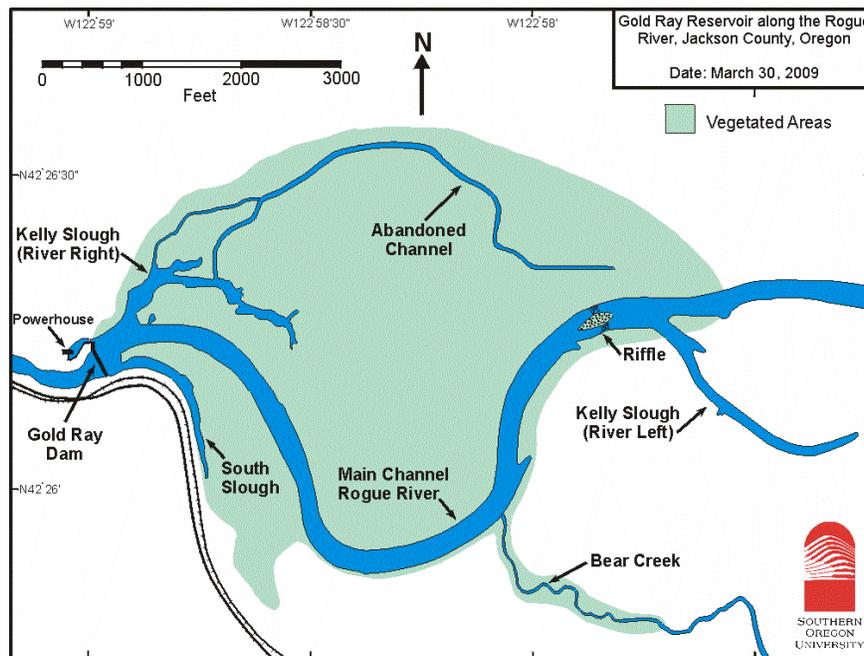
This study also reveals the presence of the original log crib dam built in 1904 just upstream of the concrete Gold Ray Dam erected in 1941. SONAR data indicates that a sediment wedge has been deposited upstream from the submerged log crib dam. On river left, sediments have topped over the submerged log crib dam have been deposited between the log crib dam and the concrete dam. In contrast, the center and river right areas appear to have minimal sedimentation between the log crib and concrete dams with water depths in some places of up to 30 feet.

Finally, this study provides important insights into the distribution and volume of sediment in Gold Ray Reservoir. The results of this study will be used to site the location of several sediment cores that will be used to characterize the grain size, metal concentration, and pesticide content of sediments in Gold Ray Reservoir.

## Introduction

### A. History

Gold Ray Dam is a 35-ft high structure that spans 394.2 ft across the Rogue River at mile 125.7 in Jackson County, Oregon (Fig. 1). The crest of the dam is at 1146 ft above mean sea level with a change in water surface elevation of 23 feet from the reservoir at the crest of the dam to the water surface on the river below the dam (Korbolic, 1996). Ownership of the dam and surrounding property (29 acres) was transferred to Jackson County by the Pacific Power & Light Company for the development of a recreational park in November of 1972. Currently, the dam is a significant barrier to salmon and steelhead migration as well as a liability risk for the County. In order to better plan for the ultimate fate of Gold Ray Dam, this study has been initiated to provide details about the reservoir's history and the sediments impounded by the dam.



**Figure 1.** Location map of the Gold Ray Dam and Reservoir along the Rogue River in Jackson County, Oregon.

Gold Ray Dam is one of the oldest structures on the Rogue River and has an interesting history. The construction of the log crib dam started in 1903 and the powerhouse began generating electricity on December 7, 1904. This electricity was primarily used by mining camps in the area, but then extended to provide electricity to the City of Medford. The present concrete dam was completed in 1941 and erected just downstream of the original log crib dam. During the 1964 flood, a discharge of 131,000 cfs was recorded at the site; the spillway has a design capacity of 80,000 cfs (Korbolic, 1996). There was no observed damage to the dam during the 1964 flood event. Power generation ceased in 1971 and in November of 1972 the dam was donated to Jackson County.

### B. Objectives

The objectives of this study are to determine the volume and aerial extent of sediment deposited in Gold Ray Reservoir on the Rogue River. This information is essential in determining the transportable sediment should Jackson County ultimately decide to notch or eliminate the dam. More specifically, these data will help determine the location for the recovery of sediment cores that will be used to assess sediment quality in the next phase of the project.

## Methods

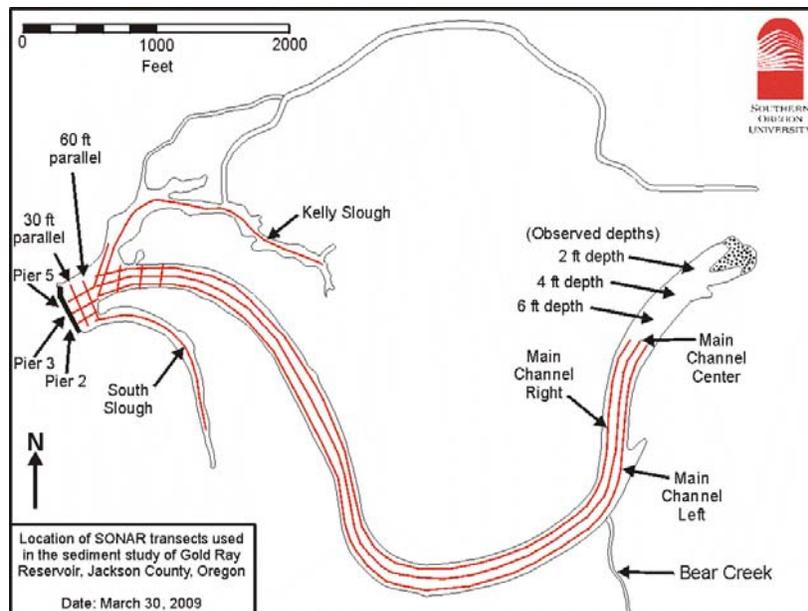
A reconnaissance of the Gold Ray Reservoir was conducted on November 21, 2008 to assess the accessibility and to recover preliminary depth measurements in preparation for a SONAR study. A weight on the end of a 50 ft tape measure was used to collect preliminary depths, measured to the closest tenth of a ft. The location of these depth measurements were determined using a Trimble GeoExplorer Global Positioning System unit keyed to NAD 83 CONUS.

The SONAR study was conducted on November 22 to November 23, 2008. A portable EdgeTech # 3100 P sub-bottom profiling system with an EdgeTech SB 424 tow fish was used for collecting the data. A lap top was connected to the profiling system, providing a live data feed and the ability to digitally record the SONAR data for each transect. In addition, a Trimble GeoExplorer Global Positioning System unit keyed to NAD 83 CONUS was integrated to the profiling system, providing latitude and longitude data for the transects.

The SONAR system was operated from an inboard boat on loan from the Jackson County Sheriff's Office. The tow fish was pulled behind the boat at about 5 ft below the water surface using a tow cable and back-up ropes. Two additional boats were provided by Jackson County District 4 Fire & Rescue as a safety precaution.

Three longitudinal and three cross-sectional transects were completed on the main channel of the Rogue River extending from approximately 200 ft above the dam to approximately 800 ft upstream of the confluence with Bear Creek. Two cross-sectional transects were pulled at 30 and 60 ft parallel to the dam. Finally, the tow fish was rigged to buoys and floated to within 5 ft of the dam, and then pulled upstream to provide transects perpendicular to the dam at Pier 2, Pier 3, & Pier 5. Refer to Figure 2 for the location of these transects.

Longitudinal transects were also conducted for Kelly Slough (River Right) and South Slough by pulling the tow fish 3 ft below the water line. The shallow tow was needed to avoid interference from river weed. In addition, the sloughs were much shallower, which necessitated the use of a smaller boat and a shallower placement of the tow fish. Again, refer to Figure 2.



**Figure 2.** Location of longitudinal and cross-sectional transects used to collect SONAR data in the Gold Ray Reservoir

The SONAR data was compiled and then hard copies printed for each of the longitudinal and cross-sectional transects. This SONAR data was used to determine the approximate pre-dam river bottom and to identify submerged sediment bars, as well as determining the thickness of sediment deposited in inundated areas of the reservoir. SONAR profiles from Kelly Slough were more difficult to interpret because of interference produced by the river weed and shallow water depths. Sediment coring in Kelly Slough will be vital to better constrain the SONAR data in this area. Finally, the interpretation of deposited sediments will be improved upon the completion of sediment cores that will enable better calibration of the collected SONAR data. From the SONAR data, a water depth map (Plate 1) and isopach map of sediments deposited in the reservoir (Plate 2) were compiled. From these maps, the volume of sediment was calculated for the reservoir.

Reconstructions of the geomorphology of the Rogue River prior to dam construction, extent of the inundated area of the reservoir, and progression of sediment filling of the reservoir, was determined by reviewing historical photographs. Additional information about deposition of sediments in the reservoir was determined by observing changes in geomorphology and reservoir surface area by comparing aerial photographs from August 1952, February 1965, July 1990, August 2000, and February 2003.

Finally, gradients of the Rogue River were calculated using the 7.5-Minute Sams Valley and Gold Hill USGS Topographic Maps (1:24,000). The elevation of Gold Ray Dam, along with the hydraulic height, was used to calculate the current river gradient and the gradient if the dam were to be removed.

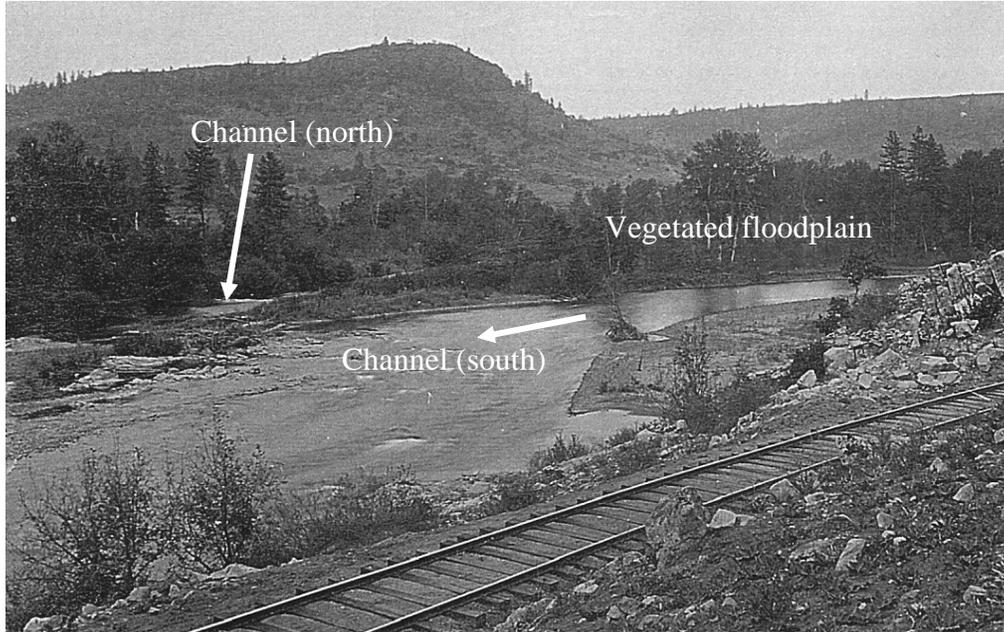
## **Results**

Using the isopach map of deposited sediments interpreted from the SONAR data, a volume of ~400,000 cubic yards of deposited sediment occurs in the currently inundated area of Gold Ray Reservoir (Plates 1 and 2). Gravel in the reservoir is most likely restricted to the upper reach just below the riffle and makes up a portion of the submerged bars just downstream of the confluence with Bear Creek. With this assumption, amount of gravel in the reservoir is 60,000 cubic yards (~15 percent of the total sediment volume). The remaining amount of sediment is probably dominated by sand (~75 percent of total sediment) with a smaller proportion of mud (~10 percent of total sediment). The proportion of sand and mud in these deposits is estimated based on the previous work completed by two undergraduate students at Southern Oregon University that recovered several push cores from Kelly Slough and the sediment bar on river left near Gold Ray Dam (Carrington and Elliott, 2007; Bray-Nash, 2008). Additionally, most of the mud would most likely be “flushed” during flooding events, as the gradient permits transport of clay and silt over the dam.

The gradient of the Rogue River from the top of the dam to just above the beginning of slack water upstream of Gold Ray Reservoir is currently 4.9 feet per mile. With the removal of Gold Ray Dam, the gradient would be 11.1 feet per mile. This is consistent with the current gradient of 11.8 feet per mile calculated for the Rogue River a few miles upstream from Gold Ray Reservoir. The gradient of the Rogue River below Gold Ray Dam is 14.2 feet per mile, reflecting an increase as the river moves from a riverbed of alluvium to bedrock.

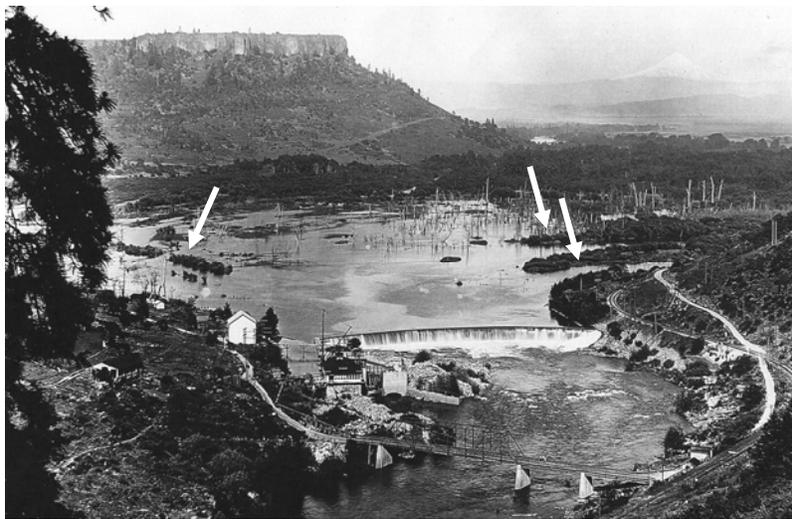
Overall, the sediment volumes calculated above for Gold Ray Reservoir are somewhat surprising, especially with annual sediment loads of ~100,000 cubic yards per year estimated for Savage Rapids Dam downstream of this locality (Bountry & Randle, 2001). There are several possibilities that may explain the “lack” of sediment in Gold Ray Reservoir.

First, historic photographs show that prior to the construction of Gold Ray Dam, water was flowing in a channel to the north of the vegetated floodplain (Fig. 3). The Rogue River may have been in the process of switching to this northern channel prior to the construction of the log crib dam. In addition, the older channel (present-day main channel of the Rogue River) probably



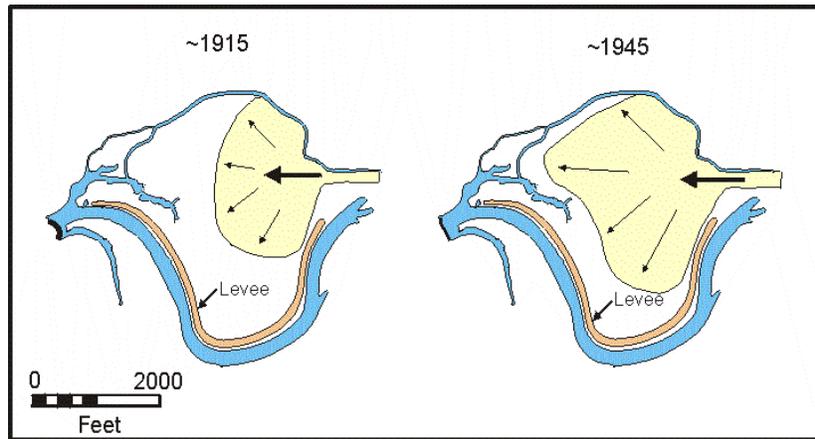
**Figure 3.** Historic photograph at the approximate location of the log crib dam prior to its construction. Please note the presence of a channel to the north of the vegetated floodplain between the two channels of the Rogue River.

formed natural levees composed of overbank sediments during flood events. With the construction of the log crib dam, the floodplain between these two channels became inundated (Fig. 4) with the exception of the elevated natural levees along the pre-existing channels. The



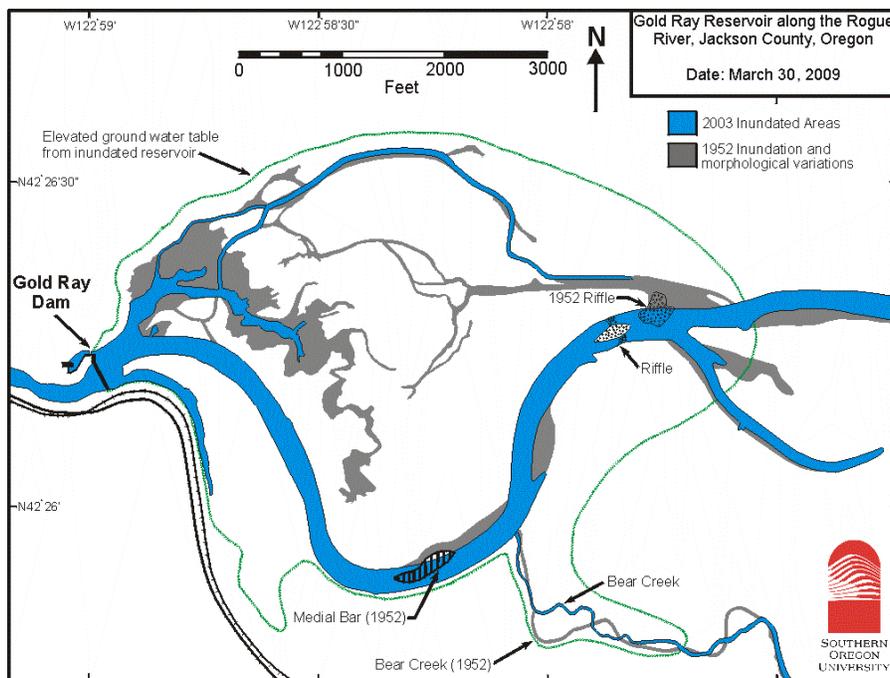
**Figure 4.** Inundated area that resulted after the completion and filling of the reservoir from the construction of the log crib dam. Arrows are highlighting natural levees along pre-existing channels. Circa 1936.

Rogue River continued to follow this newly avulsed channel and created a delta that filled in the low lying areas of the floodplain between the two channels (Fig. 5). This area would have been further inundated after the construction of the concrete dam in 1941, providing additional space for sediments to accumulate. This hypothesis is further supported by the presence of distributary channels and sand bars observed on the August 1952 aerial photograph of this part of the reservoir. Using the additional surface area of the Gold Ray Reservoir present in August 1952,



**Figure 5.** Depositional model for the deposition of sediment in the floodplain that sits between the north and south channels of the Rogue River in Gold Ray Reservoir.

this would account for an additional 160,000 cubic yards of sediment assuming a thickness of 3 ft of sediment (Fig. 6). Extrapolating for this entire area, the amount of sediment deposited may be close to ~900,000 cubic yards, again assuming 3 ft of sediment. If 6 feet of sediment were



**Figure 6.** Comparison of the morphology of Bear Creek, the Rogue River, and Gold Ray Reservoir using 1952 versus 2003 aerial photographs. Note the increased surface area of Gold Ray Reservoir in 1952. Also note the presence of distributary channels that bifurcate from east to west.

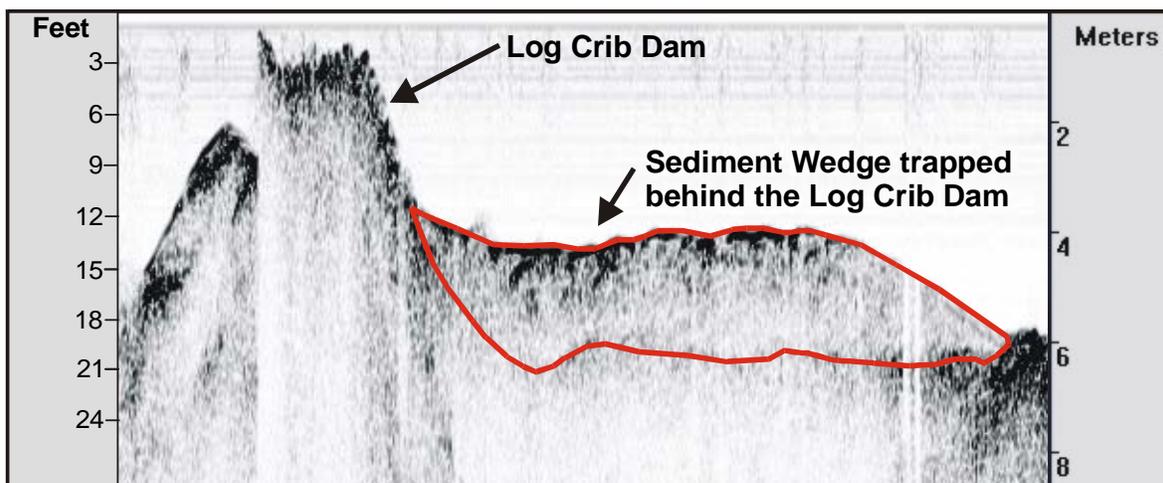
deposited, then the accumulation could be on the order of 1,800,000 cubic yards. Finally, if the Gold Ray Dam were removed, the sediment deposited in this area most likely would not be mobilized, and would result in an elevated terrace along the Rogue River.

Another possibility is a decreased sediment transport rate due to lower gradients of the Rogue River above the Gold Ray Reservoir. The gradient of the Rogue River above the study area is 11.8 feet per mile and 4.9 feet per mile from the dam to just upstream of the slack water area of the reservoir in the Rogue River, compared to 14.2 feet per mile below Gold Ray Dam. This may result in decreased amounts of sediment transport into Gold Ray Reservoir, especially gravels. Therefore, this may result in decreased sediment yields in the stretch of the Rogue River above Gold Ray Dam.

A final explanation for the unusually small amount of sediment in the reservoir has been the gravel extraction activities that have been taking place above the dam. These activities may be decreasing the amount of available sediment that may be mobilized by the Rogue River. This is particularly important following the New Years Day flood event of 1997, when the Rogue River avulsed through a gravel pit, creating a slack water area for sediment deposition above the Gold Ray Reservoir. The impact of gravel extraction activities on sediment yields for the Rogue River prior to January 1997 are not known.

### Submerged Log Crib Dam

Another unexpected result of this study was the discovery that most, if not all, of the original log crib dam constructed in 1904 remains intact just above the concrete dam erected in 1941. This can be seen in the SONAR profiles that were collected perpendicular to the dam (Fig. 7) and on the February 2003 aerial photograph (Fig. 8). The presence of the submerged log crib dam is a significant historic and scientific discovery and would need to be addressed in a plan that proposes removal of Gold Ray Dam.



**Figure 7.** SONAR Profile along the Pier 5 transect perpendicular from the concrete dam upstream showing the submerged log crib dam. The present concrete dam is just to the left of this SONAR profile. Note the sediment wedge that is impounded by the log crib dam and the rapid increase of water depth downstream of the log crib dam. The thickness of deposited sediment between the submerged log crib dam and the concrete dam is minimal on river right and center.



**Figure 8.** Aerial photograph with an inset photograph showing the location and presence of the 1904 log crib dam.

## Conclusions

Based upon the SONAR data and previous sediment studies, a volume of 400,000 cubic yards of deposited sediment occurs in the inundated area of Gold Ray Reservoir. Overall, the sediment volumes calculated above for Gold Ray Reservoir are less than expected, especially with annual sediment loads of ~100,000 cubic yards per year estimated for Savage Rapids Dam downstream of this locality. There are three possibilities that may explain the “lack” of sediment in the reservoir: (1) sediment was deposited by a prograding delta that filled in the inundated area of the floodplain upstream from Gold Ray Dam, (2) the gradient of the Rogue River in this stretch is less, and therefore sediment yields are less, and/or (3) the extraction of gravels upstream decreased the availability of sediments delivered into the reservoir. The amount of sediment estimated to have been deposited on this inundated floodplain may be as much as ~1,800,000 cubic yards.

The gradient of the Rogue River from the dam to just upstream of where the slack water begins in Gold Ray Reservoir is 4.9 feet per mile. With the removal of Gold Ray Dam, the gradient would be 11.1 feet per mile. This is consistent with the current gradient of 11.8 feet per mile calculated for the Rogue River a few miles upstream from Gold Ray Reservoir. The gradient of the Rogue River below Gold Ray Dam is 14.2 feet per mile, reflecting an increase as the river moves from a riverbed of alluvium to bedrock.

This study also reveals the presence of the original log crib dam built in 1904 just upstream of the concrete Gold Ray Dam erected in 1941. A sediment wedge occurs upstream of the submerged log crib dam and inhibits deposition of sediments between the two structures, with the exception of river left.

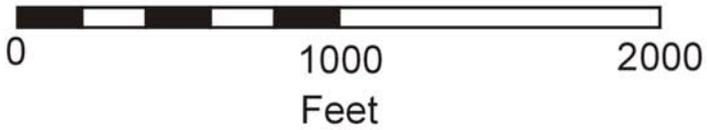
## Acknowledgements

We would like to thank John Burns (Captain), Justin Huntley, and Eric Mattson of Jackson County Fire District 4 Fire & Rescue that provided boats and equipment that allowed us to conduct the SONAR study of the reservoir. We also would like to acknowledge the donation of a boat by the Jackson County Sheriff’s office that was used for the SONAR study. Many thanks to Steve Mason of HDR Engineering that provided logistical support during the SONAR

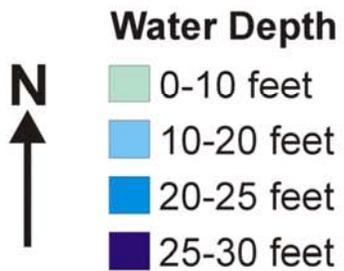
survey, supplied historical photographs of Gold Ray Dam and Reservoir from the Southern Oregon Historical Society, and for discussions about the project. Finally, we would like to acknowledge faculty members Charles Lane and Rich Ugland and students Jon Anderson and Brandon Lambert from Southern Oregon University for assistance in conducting the SONAR survey.

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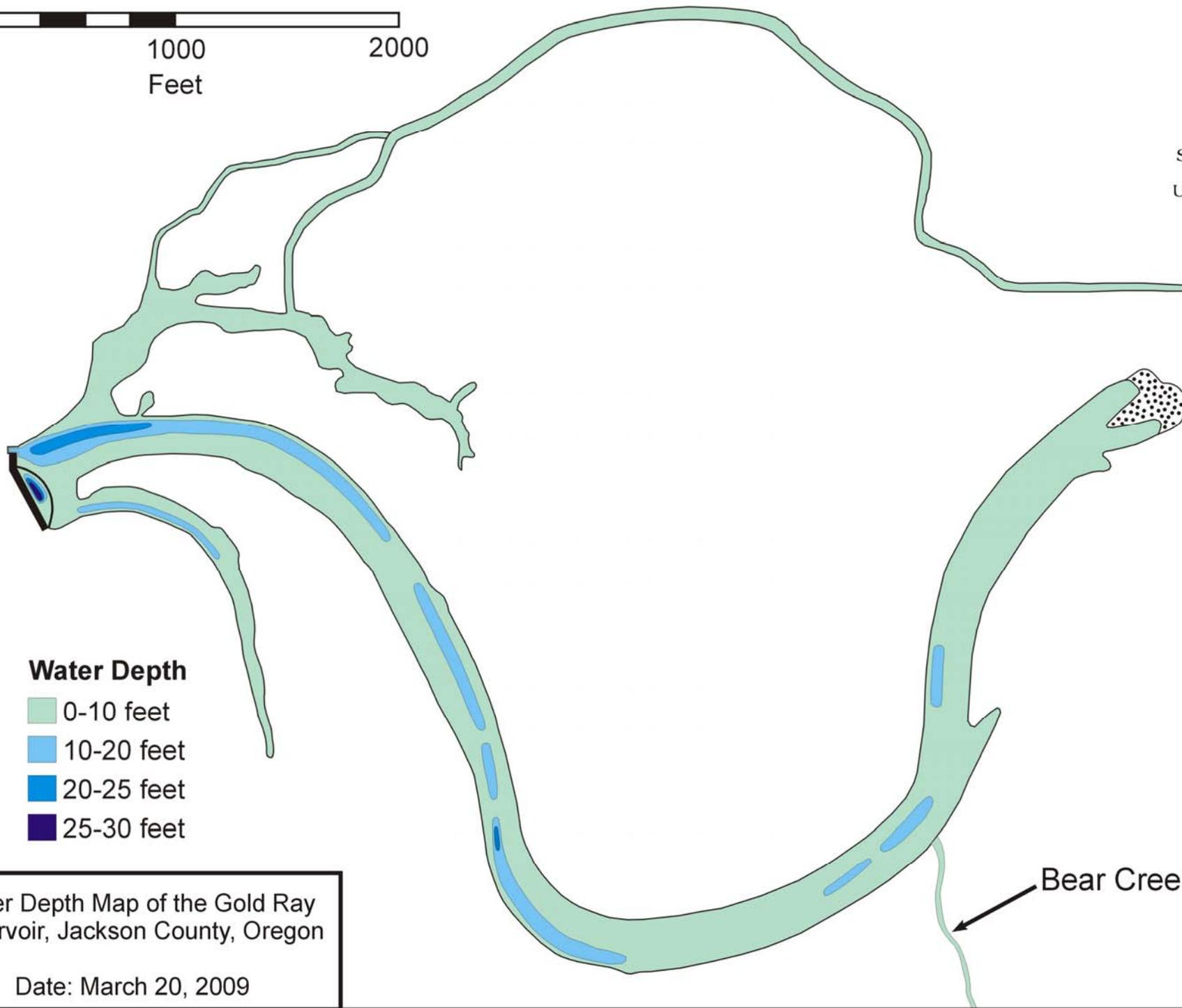
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OREGON  
UNIVERSITY

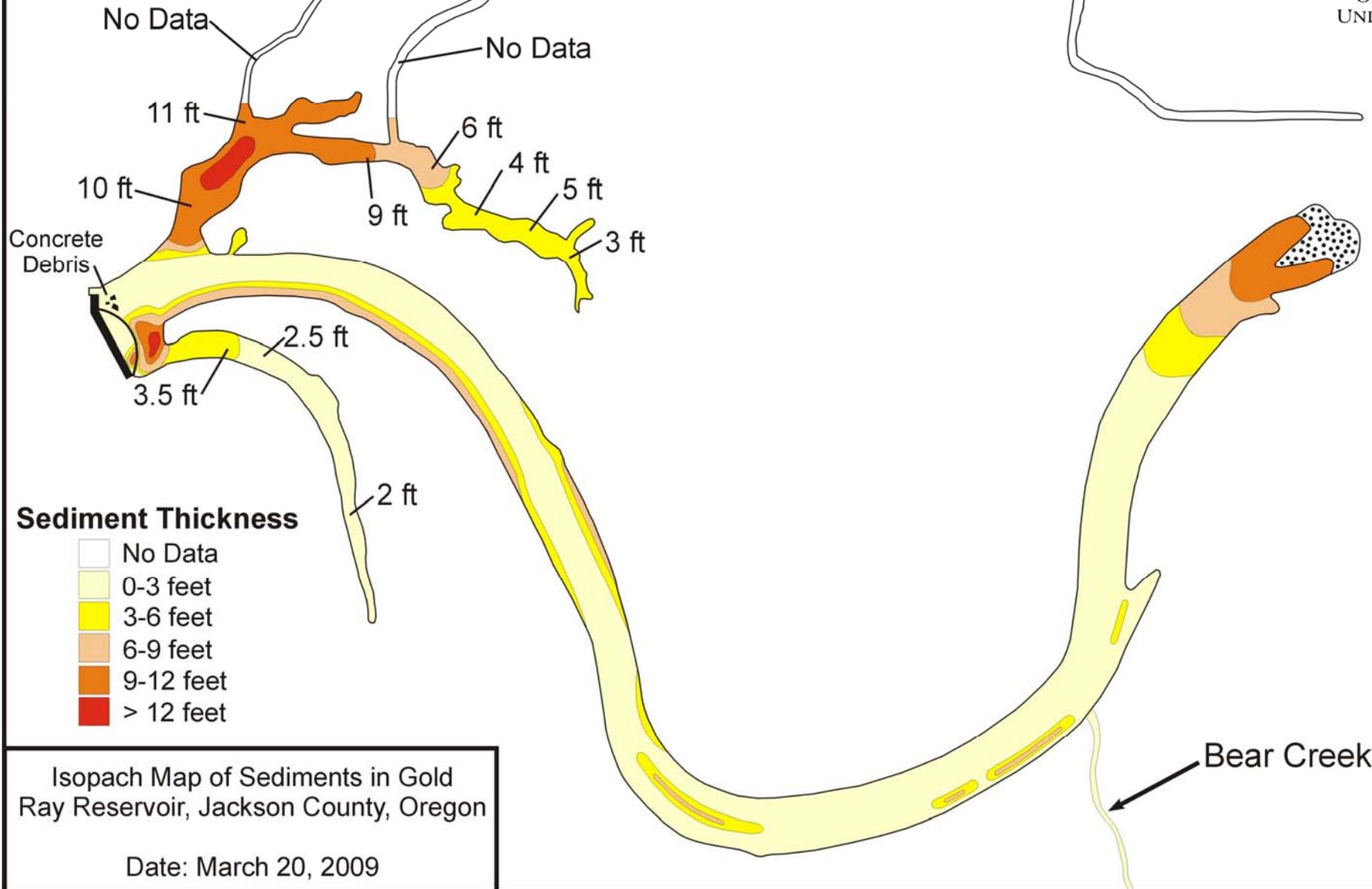
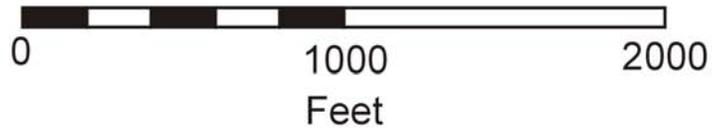


Water Depth Map of the Gold Ray Reservoir, Jackson County, Oregon

Date: March 20, 2009

Bear Creek





Isopach Map of Sediments in Gold Ray Reservoir, Jackson County, Oregon

Date: March 20, 2009

To: Memo to File	
From: Jason Kent, P.E.	Project: Gold Ray Dam Sediment Quality Analysis
Copy:	
Date: September 4, 2009	Job No:
Re: Addendum to Elliott & Dittmer, 2009. "Preliminary Report of the Sediment Study Conducted at Gold Ray Reservoir, Jackson County, Oregon"	

This memorandum is intended to describe information that has been obtained following the release of "Preliminary Report of the Sediment Study Conducted at Gold Ray Reservoir, Jackson County, Oregon" by Elliott & Dittmer on March 31, 2009.

A SONAR study was conducted by Jackson County November 22-23, 2008 to estimate the location and thickness of reservoir sediment in the impoundment behind Gold Ray Dam. A report detailing the sonar study and the results was issued by Bill Elliott and Eric Dittmer of Southern Oregon University on March 31, 2009. The report included an isopach map of sediment thickness in the reservoir as Plate 2. This map is attached to this memorandum as Attachment 1.

On July 14-15, 2009, Jackson County conducted sediment coring using vibracore technology at 12 sites on the impoundment behind Gold Ray Dam. The location of each coring site was presented in the Sampling and Analysis Plan (HDR, Inc. and Southern Oregon University, 2009) and is shown in Attachment 2.

Vibracoring is a state-of-the-art sediment sampling technology that employs a tube driven with a vibrating device. According to the website "Vibracoring: A Practical Guide" ([www.vibracoring.com](http://www.vibracoring.com)), vibracoring works best on unconsolidated, waterlogged, heterogeneous sediments and soils. Silty sediments of mixed grain size are easiest to core. Vibracoring is less effective for relatively dry clays, packed sand or any consolidated materials.

During the sediment coring work in July 2009, the contractor recorded maximum depth to refusal. Refusal depth is the sediment depth at which the vibracore cannot penetrate further. The reason for refusal is unknown at each site, but in the Gold Ray Dam impoundment it is likely due to one of two factors: either the previous bed material was encountered (consolidated gravel and cobble); or if sand was encountered it compacted, preventing the coring tube from penetrating the sediment and resulting in limited recovery.

If the refusal was due to the core reaching the previous bed surface, then the refusal depth is a very good reflection of sediment depth at that location. If the refusal was due to compacted sand, the true depth of sediment cannot be calculated. It is unknown which of the two conditions hold true for the depths of refusal in the Gold Ray Dam impoundment. However, best professional judgment was used by the vibracoring team (Shawn Hinz and Steve Saugen of Gravity Consulting, and SOU Geology professors Bill Elliott and Eric Dittmer) to infer the cause of the refusal (Dittmer and Elliott, 2009). The possible reason for refusal is listed in Table 1, with the maximum depth of refusal and the estimated depth of sediment provided in the isopach map (Attachment 1) at each of the 12 coring locations.

**Table 1. Comparison of sediment depth estimate (Elliott & Dittmer, 2009) with depth to refusal in Gold Ray Dam impoundment.**

Core No.	Maximum Depth of Refusal (ft)	Range of depth on Isopluvial Plate (ft)	Depth of Refusal within +/- 1 ft of Estimated Range?	Possible Reason for Refusal
1	2.5	0-3	OK	Pre-existing surface
2	1.0	0-3	OK	Compacted sand
3	3.0	9-12	Overestimate	Compacted sand
4	12	6-9	Underestimate	Pre-existing surface
5	1.5	0-3	OK	Cobble or pre-existing surface
6	10.0	9-12	OK	Compacted silt/sand
7	9.0	6-9	OK	Compacted clay or pre-existing surface
8	8.0	3-6	Underestimate	Compact clay or pre-existing surface
9	6.0	3-6	OK	Cobble or pre-existing surface
10	No recovery	3-6	Overestimate	Cobble or pre-existing surface
11	7.0	3-6	OK	Cobble or pre-existing surface
12	5.0	3-6	OK	Cobble or pre-existing surface

The Elliott & Dittmer report (2009) estimates about 400,000 cubic yards of sediment in the inundated area behind Gold Ray Dam. Personal communication with Bill Elliott (2009) revealed that this estimate utilized the high value in the range of each sediment thickness partition; for example 6 feet was used for the 3'-6' range, 9 feet was used for the 6'-9' range, etc. Thus the 400,000 cubic yard estimate is conservative and could potentially be less than this value. With this knowledge, Table 1 shows that 8 of 12 of the refusal depths are within one foot of the estimated range; of the four depths that were outside of the estimated range, two sites indicated overestimates on the isopach map, and two sites indicated underestimates. This information should be considered with the knowledge that the reason for the vibracore refusal is unknown at each site.

Elliott & Dittmer (2009) also estimate as much as 1,800,000 cubic yards of alluvial material in the "island" area between the main channel and the remnant channel to the north. The report states that "the sediment deposited in this area most likely would not be mobilized, and would result in an elevated terrace along the Rogue River." No new information contradicts this assertion.

**References:**

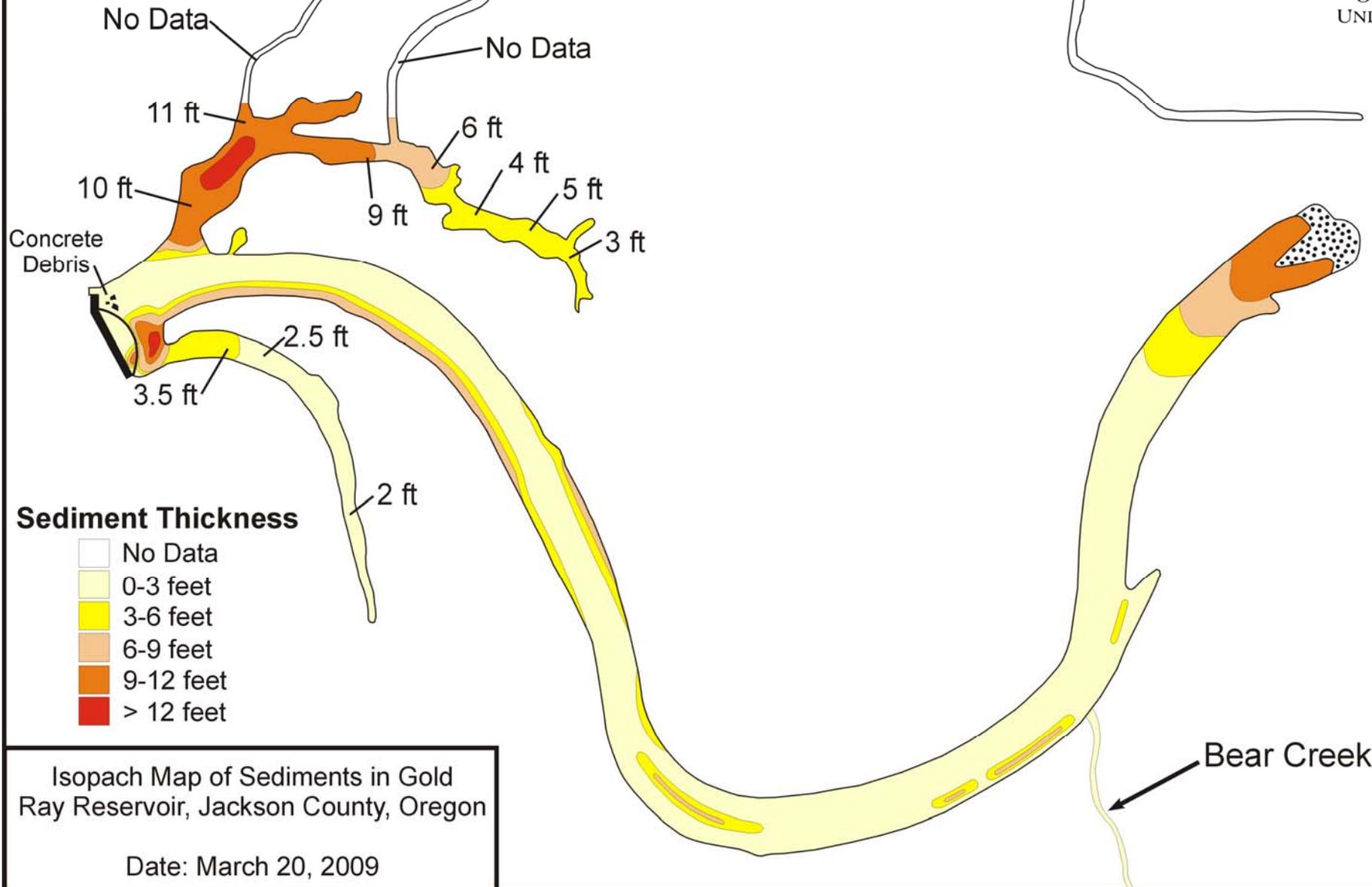
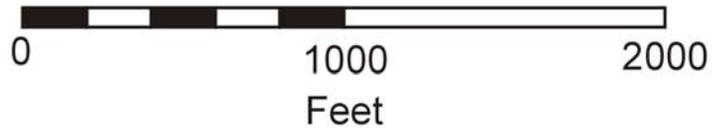
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ATTACHMENT 1.  
ISOPACH MAP OF SEDIMENTS IN GOLD RAY RESERVOIR, JACKSON COUNTY, OREGON  
(ELLIOTT AND DITTMER, 2009)



Isopach Map of Sediments in Gold Ray Reservoir, Jackson County, Oregon

Date: March 20, 2009

ATTACHMENT 2  
GOLD RAY DAM SEDIMENT CORING LOCATIONS (HDR, INC. AND SOUTHERN OREGON  
UNIVERSITY, 2009)



**APPENDIX B**  
**SEDIMENT CORING FIELD NOTES**



# Navigation Report

Gold Ray Dam Sediment Coring	Start Date	End Date
<b>Summary:</b>	7/13/2009	7/17/2009
<p>Gravity Consulting supported HDR Engineering in the collection of vibracore sediment samples from the Gold Ray Dam near Medford, Oregon. A total of 12 stations were sampled with multiple cores collected at each location. A Trimble differential GPS was used to log X and Y coordinates at each location and a Trimble Spectra Vision Laser level was used to log elevations. All core locations encountered hard refusals before reaching the new surface layer (z surface) which was assessed to be a combination of bedrock and original river bed cobbles.</p>		

Location	Date/Time	Description	Northing	Easting
1	7/14/09 9:39 PM	2 attempts with smooth drive followed by solid refusal. Silty sand with cobble at bottom.	42 26.22887	122 59.01214
2	7/14/09 9:09 PM	3 attempts -all hard drives and solid refusal. Course sand, wood debris and large cobbles.	42 26.22301	122 59.00613
3	7/14/09 8:07 PM	Hard drive with very solid refusal at 7 feet. Course Sand with large cobble at bottom.	42 26.21157	122 58.99426
4	7/14/09 6:57 PM	Smooth core until hard refusal at 10'. Depositional silty sand material with bedrock at bottom.	42 26.19318	122 58.96712
5	7/14/09 10:12 PM	Hard drive with 4' of penetration and hard refusal on cobble. Many Amphipods in core sample.	42 26.22611	122 58.98384
6	7/15/09 10:07 PM	Smooth drive until hard refusal at 10 feet.	42 26.25250	122 58.97349
7	7/15/09 12:42 AM	Smooth drive in soft material until 7' with last 2' a hard drive in sand and cobble until refusal.	42 26.31985	122 58.78703
8	7/14/09 11:59 PM	2 attempts in soft material. Smooth drive until 7' with hard refusal on cobble.	42 26.27101	122 58.67038
9	7/15/09 8:45 PM	3 attempts. Hard drives in course sand and cobble. 6 feet of penetration and hard refusal.	42 25.93197	122 58.56210
10	7/15/09 6:45 PM	Hard drive with course sands in barrel and low recovery.	42 25.89296	122 58.20684
11	7/15/09 6:24 PM	Hard drive with 7 feet of penetration and 3.2 feet of recovery. Course Sands.	42 25.91710	122 58.15435
12	7/15/09 5:34 PM	3 attempts in hard sands with low penetration and recovery.	42 01.99975	122 58.10038

## Notes from coring work on Gold Ray Dam Impoundment

July 14<sup>th</sup> – 15<sup>th</sup> 2009

Crew: 7.14 – Shawn Hinz, Steve Saugen, Steve Mason, Bill Elliott. 7.15 – Shawn Hinz, Steve Saugen, Steve Mason, Eric Dittmer.

### **CORE 1**

Date: 7.14.2009

Time: 14:30

Notes: Sediment core collected (~2.5 feet) and then encountered hard refusal. Compact clay – hard pan.

- Abundant wood fragments in upper six inches of core.
- Change from soft clay to hard pan at 1.2 feet.
- Hard pan from 1.2 ft to 2.5 ft.
- Bottom of core at 2.5 ft.

Sample depths:

1. 0 – 1.2 ft.
2. 1.2 – 2.5 ft.

### **CORE 2**

Date: 7.14.2009

Time: 14:05

Notes: Three hard refusals without recovery. Sediment recovered on 4<sup>th</sup> try. Recovered about 1 ft of pebbly coarse to very coarse grained sand. Samples collected

Sample depths:

1. 0 – 1.0 ft.

### **CORE 3**

Date: 7.14.2009

Time: 13:00

Notes: Core collected off point near Gold Ray Dam. Recovered 3 feet of coarse to pebbly sand. Not able to recover more than 3 ft of sediment.

- Woody debris on surface of sediment.
- Coarse sand from 0 to 1.5 ft.
- Pebbly/cobbly material from 1.5 ft to 3.0 ft.
- Hard refusal on both cores.

Sample depths:

1. 0 – 1.5 ft.
2. 1.5 – 3.0 ft.

#### **CORE 4**

Date: 7.14.2009

Time: 11:05

Notes: The core was collected in 15 ft of water in Tolo Slough about 20 ft from sand bar on point. Core recovered 7.2 feet of sediment – compacted about 60%. Recovery of 60% based on penetration vs. recovery in core tube. Both cores hit hard bed and nor further sediment could be recovered. Hard refusal on both cores.

- Entire core (7.2 ft) was homogenous sand, silt and clay.
- Few pebbles found immediately above 4.8 feet.
- Gravel (pebbles and cobbles) found between 4.8 and 7.2 ft.
- Entire core was a dark gray color.

Sample depths:

1. 0 – 2.4 ft.
2. 2.4 – 4.8 ft.
3. 4.8 – 7.2 ft.

#### **CORE 5**

Date: 7.14.2009

Time: 15:10

Notes: Sediment core collected (~1.5 ft.) before hard refusal. Hard refusal was probably due to cobble layer below firm sand lens. Recovered good sediment/ water interface with abundant amphipods in core. Woody debris and clay (about 1 inch on top of core).

- Top thin clay layer with wood fragments and abundant amphipods.
- Coarse to very coarse sand with pebbles throughout core.

Sample depths:

1. 0 – 1.5 ft.

#### **CORE 6**

Date: 7.15.2009

Time: 14:45

Notes: Water depth at 8 ft. Core was driven 10 ft. Seven ft of core was recovered. Increased resistance last 2 feet.

- Muds, silts and woody matter from 0 – 2.8 ft.
- Single cobble recovered at 3.5 ft.
- Wood piece recovered at 5 ft.

Sample depths:

1. 0 – 2.8 ft.
2. 2.8 – 5.8 ft.
3. 5.8 – 7.0 ft.

## **CORE 7**

Date: 7.14.2009

Time: 17:35

Notes: Core Sediment core recovered (5 ft) for a 9 ft penetration. Sediment recovered consists of muds and silts with beds of sand. Top layer contains a lot of woody debris. Hard drive at base (compact clay?).

- Woody debris in mud from 0 – 1.5 ft.
- Sand (coarse to very coarse) from 1.0 to 2.2 ft.
- Sandy mud from 2.2 – 3.5 ft.
- Mud with some wood fragments from 3.5 – 5.0 ft.

Sample depths:

1. 0 – 1.0 ft.
2. 1.0 – 2.2 ft.
3. 2.2 – 3.5 ft.
4. 3.5 – 5.0 ft.

## **CORE 8**

Date: 7.14.2009

Time: 17:00

Notes: Sediment core recovered (5 ft.) from 8 ft of penetration. On the previous drive before the core was recovered there was a fragmented organic film released to the surface of the water. The film did not absorb onto an absorbent pad, but was dispersed with addition of soap on the surface. Fragmented sheen on surface of the water.

- Organic layer from 0 – 1.0 ft. Mud dominates
- Sand interval with some mud from 1.0 – 2.5 ft.
- Clay rich (some silt and sand) from 2.5 – 5.0 ft.

Sample depths:

1. 0 – 1.0 ft.
2. 1.0 – 2.5 ft.

3. 2.5 – 5.0 ft.

### CORE 9

Date: 7.15.2009

Time: 13:40

Notes: Try 1 - ~80 ft from left bank. Large scale cobble. No recovery. Try 2 – 7 ft coring into large cobble. No recovery. Lost core tube. Assumed tube held in place by buried cobble. Try 3 – 20 ft. from right bank. Initial hard penetration. 6 ft core penetration with 1.3 ft of recovery.

- Coarse sand uniform throughout core from 0 – 1.3 ft.

Sample depths:

1. 0 – 1.3 ft.

### CORE 10

Date: 7.15.2009

Time: 11:30

Notes: Try 1 – recovered sand on cobbles (about 5 in.). Try 2 – Sand or large cobble. No recovery. Try 3 – Estimate gravel sediment by core resistance but no recovery. Coarse gravel and cobble sediment?

- No samples recovered from three cores.
- Small amount (5 in.) of sand and cobble collected in first core.

Sample depths: No samples collected at this location.

Photo: Material recovered on try 2.



## CORE 11

Date: 7.15.2009

Time: 11:05

Notes: 7 ft drive with 3 ft of recovery. Thin layer of silt at top. 2 ft cobble resistance at bottom.

- Silt on top of core. Small amount of aquatic weed collected at top.
- Coarse sand and small cobble from 0 – 1.6 ft.
- Coarse sand with cobble from 1.6 – 3.2 ft.

Sample depths:

1. 0 – 1.6 ft.
2. 1.6 – 3.2 ft.

## CORE 12

Date: 7.15.2009

Time: 10:30

Notes: Try 1 – Solid resistance. Max diameter of recovery (~ 5 in.) was 2 in. cobble. Try 2 – No sediment recovery. Try 3 – Hard rock. No penetration. Large cobble? Try 4 – 5 ft penetration with 3 ft of recovery.

- Organics (aquatic weeds), sand, silt, and mud from 0.1.5 ft.
- Sandy silt with max. 3" cobble.
- Cobble mix (0.5" – 1") from 1.5 – 3 ft.

Sample depths:

1. 0 – 1.5 ft.
2. 1.5 – 3.0 ft.

Photo: Material recovered on try 1.



**APPENDIX C**  
**SIEVE ANALYSIS RESULTS**

**SEDIMENT ANALYSIS – GOLD RAY DAM, JACKSON COUNTY, OREGON**  
**DATA TRANSMITTAL REPORT**

*ERIC DITTMER, STEVE PETROVIC, and CHARLES LANE*  
*SOUTHERN OREGON UNIVERSITY*

**INTRODUCTION**

Southern Oregon University (SOU) has worked with both Jackson County and HDR Inc. (HDR), assisting in sampling and analysis of sediment found behind Gold Ray Dam in Jackson County. We collaborated with Gravity Inc. in July 2009 to collect core samples at sites determined by HDR and approved by the US Army Corps of Engineers. The samples were analyzed for grain size distribution and heavy metals at SOU laboratories, and for mercury and organics at Neilson Labs in Medford. Laboratory analyses were performed using requisite methodologies for : (1) sieve, (2) hydrometer, and (3) metals; analytical results are attached. It is our understanding that analysis of these data is the responsibility of HDR.

**METHODOLOGY**

Field sampling –

Field sampling was accomplished by use of boat-mounted Vibra-Core (equipment and personnel from Gravity, Inc.). Field sampling included 12 coring attempts and the collection of 11 cores. Refusal for one core was due to the presence of large-diameter cobbles which prohibited penetration. Recovered cores were photographed in 3 foot intervals. Sediment samples were collected every 3 feet of core recovered; additional samples taken where abrupt soil stratigraphic changes were evident.

Lab analyses –

- a) Grain size distribution followed ASTM D422 protocols utilizing requisite sieve sizes and < 230 sieve clay fraction definition for hydrometer procedures.
- b) Metals analyses - In order to prepare the sediment samples for metals determination, acid-peroxide digestion of the sediment samples was performed using EPA Method 3050B. Following the digestion procedure, the metals concentrations were determined with a Perkin-Elmer Optima 2100 Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES) using EPA Method 6010C.

**RESULTS**

(A) Sieve analyses (24), (B) Hydrometer analyses (11), and (C) metals analyses (24) are attached.

No particular difficulties were encountered in the sieve analyses; as instructed, hydrogen peroxide was not used in the process, and some organics (primarily woody debris) are reflected in some of the coarse fractions. However, several of the samples with predominantly coarser grain sizes did not yield enough fine material (less than 5 grams passing the 230 sieve) to yield accurate hydrometer results. We attempted to contact US Army Corps of Engineers but did not receive a returned call verifying the validity of our decision not to run hydrometer tests with such small sample sizes. We have, however, retained the low-weight (<5g) samples.

The concentration of each metal (Ag, As, Cd, Cr, Cu, Ni, Pb, Sb and Zn) is reported (see Metals Analysis attachment, Table 2) using concentration units of parts per million (wet weight). All underlined entries represent metal concentrations that are at or below detection limits. The ICP-AES detection limits are reported in Table 1 of the Metals Analysis attachment. The response of all quality control standards and blanks to check instrument performance fell within recommended EPA levels with the exception of Sb. Although the recovery of Sb from a spiked blank (i.e. Laboratory Control Sample) was always greater than 90%, the recovery of Sb from a spiked soil sample ranged from 27 – 55%. The measured concentrations of Sb in the sediment samples exceeded instrumental detection levels in only one of 24 samples. That sample registered 0.20 ppm, which indicates that none of the samples could contain more than 0.8 ppm given these recovery levels.

#### **ACKNOWLEDGEMENTS**

Laboratory work was supported by the efforts of SOU student Patrick Kennedy. Our thanks to Steve Mason of HDR Inc. and the owners of Gravity Inc for their help and collaboration during this operation.

**Southern Oregon University Department of Environmental Studies**

**ASTM D422 SIEVE ANALYSIS**

**Date:**

**Sample Number: C1 0 - 1.2**

**Sample Wt.(g) 63.4**

**Depth: 0 - 1.2 ft.**

**% Passing filter**

Sieve #	Size (mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.1	0.16			100.0
#-18	0.991	0.3	0.47			99.8
#-35	0.495	1.4	2.21			99.4
#-60	0.246	11.1	17.51			97.2
#-120	0.124	18.8	29.65			79.7
#-230	0.061	12.4	19.56			50.0
	<0.061	19.3	30.44			30.4
	<b>Total</b>	63.4	100.00			

**Sieve Loss %:** 0

**Sample Number: C1 1.2 - 2.5**

**Sample Wt.(g) 53.7**

**Depth: 1.2 - 2.5 ft.**

Sieve #	Size (mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0	0			
2.5-inch	63.5	0	0			
1.25-inch	31.75	0	0			
0.625-inch	15.88	0	0			
0.313-inch	7.74	0	0			
#-5	3.96	0	0			
#-10	1.98	0.1	0.19			100.0
#-18	0.991	0.7	1.32			99.8
#-35	0.495	4.5	8.47			98.5
#-60	0.246	9.9	18.64			90.0
#-120	0.124	12.6	23.73			71.4
#-230	0.061	10.2	19.21			47.6
	<0.061	15.1	28.44			28.4
	<b>Total</b>	53.1	100.00			

**Sieve Loss %:** 1

Southern Oregon University Department of Environmental Studies						
ASTM D422 SIEVE ANALYSIS				Date:		
Sample Number: C2 0 - 1			Sample Wt.(g) 75.0			
Depth: 0 - 1.0 ft.						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.5	0.67			100.0
#-18	0.991	19.9	26.60			99.3
#-35	0.495	46	61.50			72.7
#-60	0.246	6.3	8.42			11.2
#-120	0.124	1.5	2.01			2.8
#-230	0.061	0.4	0.53			0.8
	<0.061	0.2	0.27			0.3
	<b>Total</b>	74.8	100.00			
<b>Sieve Loss %:</b>		1				

Southern Oregon University Department of Environmental Studies						
ASTM D422 SIEVE ANALYSIS				Date:		
<b>Sample Number: C3 0 - 1.5</b>				<b>Sample Wt.(g) 61.5</b>		
<b>Depth: 0 - 1.5 ft.</b>						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0.8	1.30			100.0
#-5	3.96	0.7	1.14			98.7
#-10	1.98	3.4	5.53			97.6
#-18	0.991	11.1	18.05			92.0
#-35	0.495	32.5	52.85			74.0
#-60	0.246	11.9	19.35			21.1
#-120	0.124	0.9	1.46			1.8
#-230	0.061	0.1	0.16			0.3
	<0.061	0.1	0.16			0.2
	<b>Total</b>	61.5	100.00			
<b>Sieve Loss %:</b>		0				
<b>Sample Number: C3 1.5 - 3</b>				<b>Sample Wt.(g) 69.1</b>		
<b>Depth: 1.5 - 3.0 ft.</b>						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	7.1	10.27			100.0
#-5	3.96	7	10.13			89.7
#-10	1.98	12.8	18.52			79.6
#-18	0.991	14.4	20.84			61.1
#-35	0.495	18.9	27.35			40.2
#-60	0.246	8.1	11.72			12.9
#-120	0.124	0.6	0.87			1.2
#-230	0.061	0.1	0.14			0.3
	<0.061	0.1	0.14			0.1
	<b>Total</b>	69.1	100.00			
<b>Sieve Loss %:</b>		0				

**Southern Oregon University Department of Environmental Studies**

**ASTM D422 SIEVE ANALYSIS**

**Date:**

**Sample Number: C4 0 - 2.4**

**Sample Wt.(g) 39.6**

**Depth: 0 - 2.4 ft.**

Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	1.4	3.56			100.0
#-18	0.991	4.1	10.43			96.4
#-35	0.495	5.5	13.99			86.0
#-60	0.246	3.4	8.65			72.0
#-120	0.124	3	7.63			63.4
#-230	0.061	4.5	11.45			55.7
	<0.061	17.4	44.27			44.3
	<b>Total</b>	<b>39.3</b>	<b>100.00</b>			

**Sieve Loss %:** 1.00

**Sample Number: C4 2.4 - 4.8**

**Sample Wt.(g) 37.6**

**Depth: 2.4 - 4.8 ft.**

Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.3	0.80			100.0
#-18	0.991	1.6	4.27			99.2
#-35	0.495	4.4	11.73			94.9
#-60	0.246	3.7	9.87			83.2
#-120	0.124	3.2	8.53			73.3
#-230	0.061	4.8	12.80			64.8
	<0.061	19.5	52.00			52.0
	<b>Total</b>	<b>37.5</b>	<b>100.00</b>			

**Sieve Loss %:** 1

**Sample Number: C4 4.8 - 7.2**

**Sample Wt.(g) 62.8**

**Depth: 4.8 - 7.2 ft.**

Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	23.8	37.90			100.0
0.625-inch	15.88	0	0.00			62.1
0.313-inch	7.74	0	0.00			62.1
#-5	3.96	0	0.00			62.1
#-10	1.98	0.8	1.27			62.1
#-18	0.991	2.5	3.98			60.8
#-35	0.495	4.7	7.48			56.8
#-60	0.246	3.4	5.41			49.4
#-120	0.124	3.7	5.89			43.9
#-230	0.061	5.7	9.08			38.1
	<0.061	18.2	28.98			29.0
	<b>Total</b>	<b>62.8</b>	<b>100.00</b>			

**Sieve Loss %:** 0

Southern Oregon University Department of Environmental Studies						
ASTM D422 SIEVE ANALYSIS				Date:		
Sample Number: C5 0 - 1.5			Sample Wt.(g) 67.2			
Depth: 0 - 1.5 ft.						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	7.2	10.89			100.0
0.313-inch	7.74	0	0.00			89.1
#-5	3.96	2.8	4.24			89.1
#-10	1.98	6	9.08			84.9
#-18	0.991	20	30.26			75.8
#-35	0.495	24.8	37.52			45.5
#-60	0.246	3.9	5.90			8.0
#-120	0.124	1	1.51			2.1
#-230	0.061	0.2	0.30			0.6
	<0.061	0.2	0.30			0.3
	<b>Total</b>	66.1	100.00			
<b>Sieve Loss %:</b>		1				

Southern Oregon University Department of Environmental Studies						
ASTM D422 SIEVE ANALYSIS				Date:		
<b>Sample Number: C6 0 - 2.8</b>				<b>Sample Wt.(g) 56.9</b>		
<b>Depth: 0 - 2.8 ft.</b>						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.5	0.89			100.0
#-18	0.991	1.8	3.22			99.1
#-35	0.495	3.5	6.26			95.9
#-60	0.246	5.7	10.20			89.6
#-120	0.124	8.2	14.67			79.4
#-230	0.061	9.4	16.82			64.8
	<0.061	26.8	47.94			47.9
	<b>Total</b>	55.9	100.00			
<b>Sieve Loss %:</b>		1.00				
<b>Sample Number: C6 2.8 - 5.8</b>				<b>Sample Wt.(g) 46.6</b>		
<b>Depth: 2.8 - 5.8 ft.</b>						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.5	1.07			100.0
#-18	0.991	1.2	2.58			98.9
#-35	0.495	5.1	10.94			96.4
#-60	0.246	5.7	12.23			85.4
#-120	0.124	5.5	11.80			73.2
#-230	0.061	7.3	15.67			61.4
	<0.061	21.3	45.71			45.7
	<b>Total</b>	46.6	100.00			
<b>Sieve Loss %:</b>		0				
<b>Sample Number: C6 5.8 - 7</b>				<b>Sample Wt.(g) 47.4</b>		
<b>Depth: 5.8 - 7.0 ft.</b>						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.1	0.21			100.0
#-18	0.991	2	4.24			99.8
#-35	0.495	7.6	16.10			95.6
#-60	0.246	7.1	15.04			79.4
#-120	0.124	4.7	9.96			64.4
#-230	0.061	4.6	9.75			54.4
	<0.061	21.1	44.70			44.7
	<b>Total</b>	47.2	100.00			
<b>Sieve Loss %:</b>		1				

Southern Oregon University Department of Environmental Studies						
ASTM D422 SIEVE ANALYSIS				Date:		
<b>Sample Number: C7 0 - 1</b>				<b>Sample Wt.(g) 33.2</b>		
<b>Depth: 0 - 1.0 ft.</b>						
Sieve #	Size(mm)	g retain	% retain	%passed	Cuml. Wt. %	
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0.4	1.23		100.0	
#-10	1.98	1.3	4.01		98.8	
#-18	0.991	2.8	8.64		94.8	
#-35	0.495	5	15.43		86.1	
#-60	0.246	6.3	19.44		70.7	
#-120	0.124	3.5	10.80		51.2	
#-230	0.061	2.4	7.41		40.4	
	<0.061	10.7	33.02		33.0	
	<b>Total</b>	<b>32.4</b>	<b>100.00</b>			
<b>Sieve Loss %:</b>		1				
<b>Sample Number: C7 1 - 2.2</b>				<b>Sample Wt.(g) 60.4</b>		
<b>Depth: 1.0 - 2.2 ft.</b>						
Sieve #	Size(mm)	g retain	% retain	%passed	Cuml. Wt. %	
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	2.1	3.48		100.0	
#-5	3.96	1.1	1.82		96.5	
#-10	1.98	1.5	2.49		94.7	
#-18	0.991	5.3	8.79		92.2	
#-35	0.495	19.8	32.84		83.4	
#-60	0.246	21.2	35.16		50.6	
#-120	0.124	5.2	8.62		15.4	
#-230	0.061	1.9	3.15		6.8	
	<0.061	2.2	3.65		3.6	
	<b>Total</b>	<b>60.3</b>	<b>100.00</b>			
<b>Sieve Loss %:</b>		1				
<b>Sample Number: C7 2.2 - 3.5</b>				<b>Sample Wt.(g) 61.6</b>		
<b>Depth: 2.2 - 3.5 ft.</b>						
Sieve #	Size(mm)	g retain	% retain	%passed	Cuml. Wt. %	
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.5	0.82		100.0	
#-18	0.991	1	1.63		99.2	
#-35	0.495	3.6	5.87		97.6	
#-60	0.246	7.3	11.91		91.7	
#-120	0.124	14.3	23.33		79.8	
#-230	0.061	14.3	23.33		56.4	
	<0.061	20.3	33.12		33.1	
	<b>Total</b>	<b>61.3</b>	<b>100.00</b>			
<b>Sieve Loss %:</b>		1				
<b>Sample Number: C7 3.5 - 5</b>				<b>Sample Wt.(g) 57.2</b>		
<b>Depth: 3.5 - 5.0 ft.</b>						
Sieve #	Size(mm)	g retain	% retain	%passed	Cuml. Wt. %	
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.3	0.53		100.0	
#-18	0.991	0.5	0.88		99.5	
#-35	0.495	2	3.50		98.6	
#-60	0.246	13.1	22.94		95.1	
#-120	0.124	20.4	35.73		72.2	
#-230	0.061	10.8	18.91		36.4	
	<0.061	10	17.51		17.5	
	<b>Total</b>	<b>57.1</b>	<b>100.00</b>			
<b>Sieve Loss %:</b>		1				

**Southern Oregon University Department of Environmental Studies**

**ASTM D422 SIEVE ANALYSIS**

**Date:**

**Sample Number: C8 0 - 1**

**Sample Wt.(g) 34.8**

**Depth: 0 - 1.0 ft.**

Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.2	0.58			100.0
#-18	0.991	1.9	5.49			99.4
#-35	0.495	5	14.45			93.9
#-60	0.246	4.8	13.87			79.5
#-120	0.124	3.1	8.96			65.6
#-230	0.061	3.1	8.96			56.6
	<0.061	16.5	47.69			47.7
	<b>Total</b>	<b>34.6</b>	<b>100.00</b>			

**Sieve Loss %:** 1

**Sample Number: C8 1 - 2.5**

**Sample Wt.(g) 57.7**

**Depth: 1.0 - 2.5 ft.**

Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.1	0.17			100.0
#-18	0.991	0.7	1.21			99.8
#-35	0.495	4.1	7.11			98.6
#-60	0.246	16.1	27.90			91.5
#-120	0.124	17.4	30.16			63.6
#-230	0.061	9.9	17.16			33.4
	<0.061	9.4	16.29			16.3
	<b>Total</b>	<b>57.7</b>	<b>100.00</b>			

**Sieve Loss %:** 0

**Sample Number: C8 2.5 - 5**

**Sample Wt.(g) 56.5**

**Depth: 2.5 - 5.0 ft.**

Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.1	0.18			100.0
#-18	0.991	0.6	1.06			99.8
#-35	0.495	2.4	4.25			98.8
#-60	0.246	4.8	8.50			94.5
#-120	0.124	9	15.93			86.0
#-230	0.061	11.4	20.18			70.1
	<0.061	28.2	49.91			49.9
	<b>Total</b>	<b>56.5</b>	<b>100.00</b>			

**Sieve Loss %:** 0

Southern Oregon University Department of Environmental Studies						
ASTM D422 SIEVE ANALYSIS				Date:		
Sample Number: C9 0 - 1.3			Sample Wt.(g) 60.3			
Depth: 0 - 1.3 ft.						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0				
#-10	1.98	0.6	1.00			100.0
#-18	0.991	4.5	7.46			99.0
#-35	0.495	31.8	52.74			91.5
#-60	0.246	21.4	35.49			38.8
#-120	0.124	1.8	2.99			3.3
#-230	0.061	0.1	0.17			0.3
	<0.061	0.1	0.17			0.2
	<b>Total</b>	60.3	100.00			
<b>Sieve Loss %:</b>			0			

<b>Southern Oregon University Department of Environmental Studies</b>	
<b>ASTM D422 SIEVE ANALYSIS</b>	<b>Date:</b>
<b>Site: C10</b>	
<b>NO RECOVERY</b>	

Southern Oregon University Department of Environmental Studies						
ASTM D422 SIEVE ANALYSIS				Date:		
<b>Sample Number: C11 0 - 1.6</b>				<b>Sample Wt.(g) 69.7</b>		
<b>Depth: 0 - 1.6 ft.</b>						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	11.4	16.36			100.0
0.313-inch	7.74	12.4	17.79			83.6
#-5	3.96	2.3	3.30			65.9
#-10	1.98	2.6	3.73			62.6
#-18	0.991	6.1	8.75			58.8
#-35	0.495	15.6	22.38			50.1
#-60	0.246	14.3	20.52			27.7
#-120	0.124	3.8	5.45			7.2
#-230	0.061	0.6	0.86			1.7
	<0.061	0.6	0.86			0.9
	<b>Total</b>	69.7	100.00			
<b>Sieve Loss %:</b>		0				
<b>Sample Number: C11 1.6 - 3.2</b>						
<b>Sample Wt.(g) 57.5</b>						
<b>Depth: 1.6 - 3.2 ft.</b>						
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0.6	1.06			100.0
#-10	1.98	0.2	0.35			98.9
#-18	0.991	2.3	4.05			98.6
#-35	0.495	21.2	37.32			94.5
#-60	0.246	26.9	47.36			57.2
#-120	0.124	4.2	7.39			9.9
#-230	0.061	0.8	1.41			2.5
	<0.061	0.6	1.06			1.1
	<b>Total</b>	56.8	100.00			
<b>Sieve Loss %:</b>		1				

**Southern Oregon University Department of Environmental Studies**

**ASTM D422 SIEVE ANALYSIS**      **Date:**

**Sample Number: C12 0 - 1.5**      **Sample Wt.(g) 60.4**

**Depth: 0 - 1.5 ft.**

Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	0				
#-5	3.96	0.2	0.33			100.0
#-10	1.98	0.4	0.66			99.7
#-18	0.991	2.3	3.81			99.0
#-35	0.495	15.9	26.32			95.2
#-60	0.246	28.8	47.68			68.9
#-120	0.124	9.7	16.06			21.2
#-230	0.061	2.1	3.48			5.1
	<0.061	1	1.66			1.7
	<b>Total</b>	60.4	100.00			

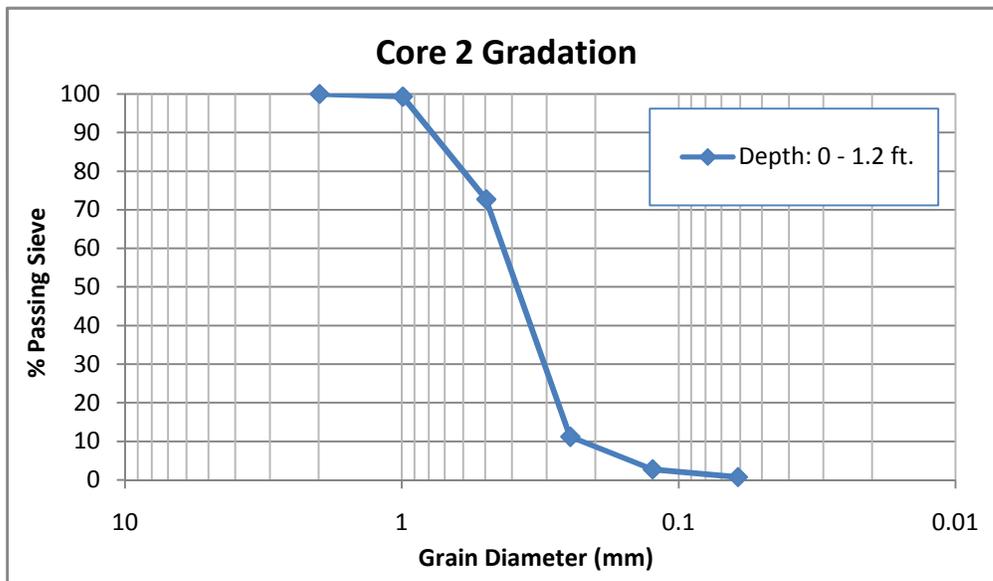
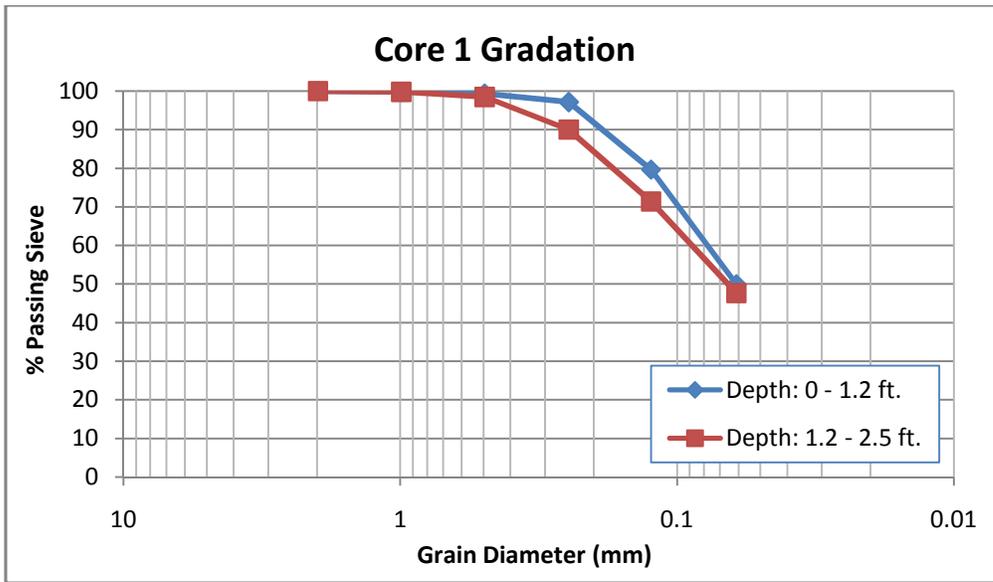
**Sieve Loss %:**      0

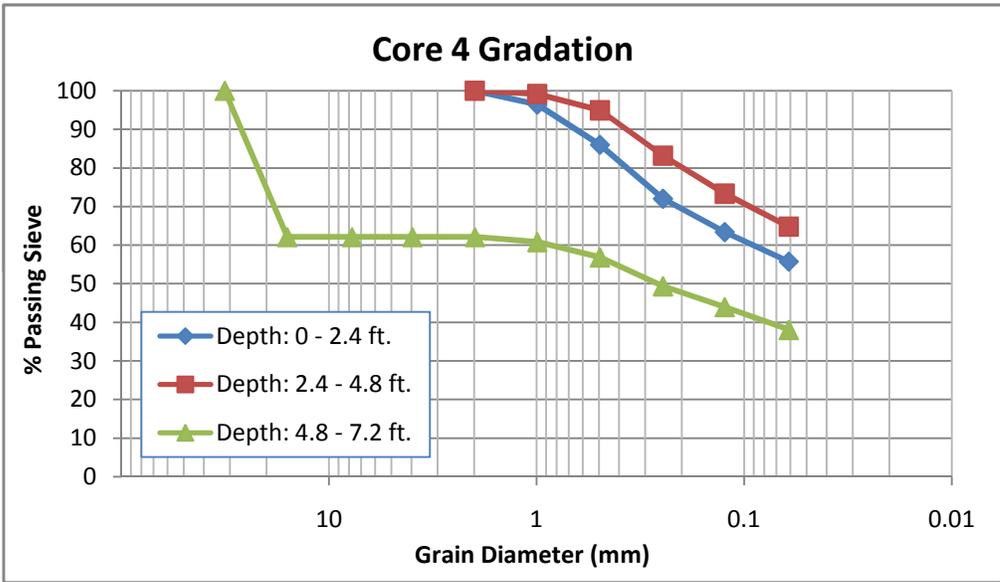
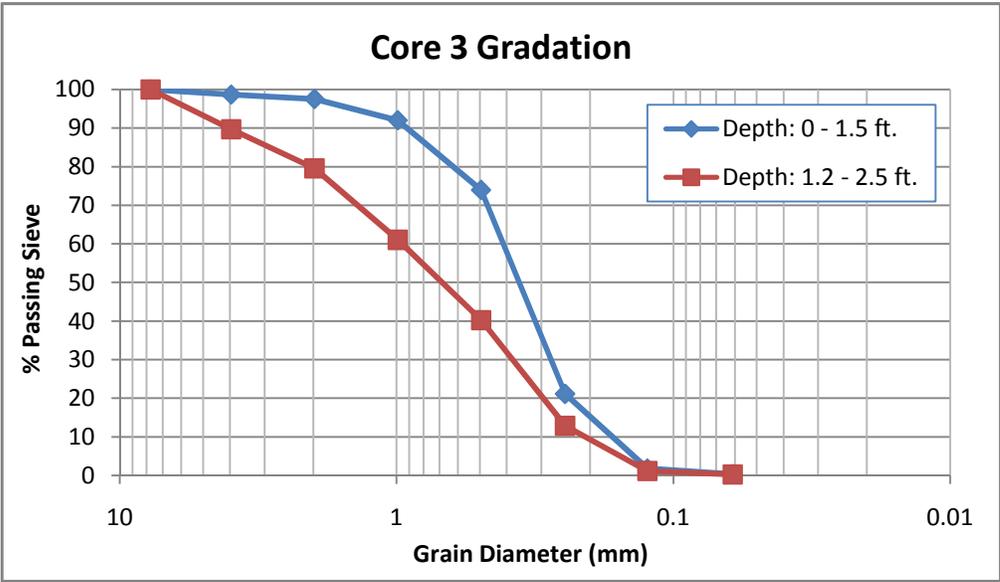
**Sample Number: C12 1.5 - 3**      **Sample Wt.(g) 60.3**

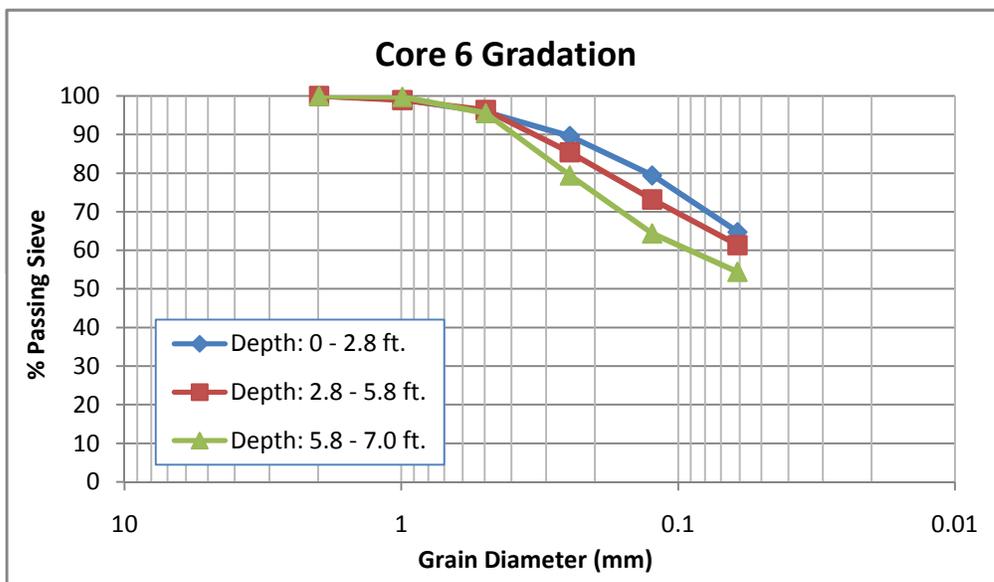
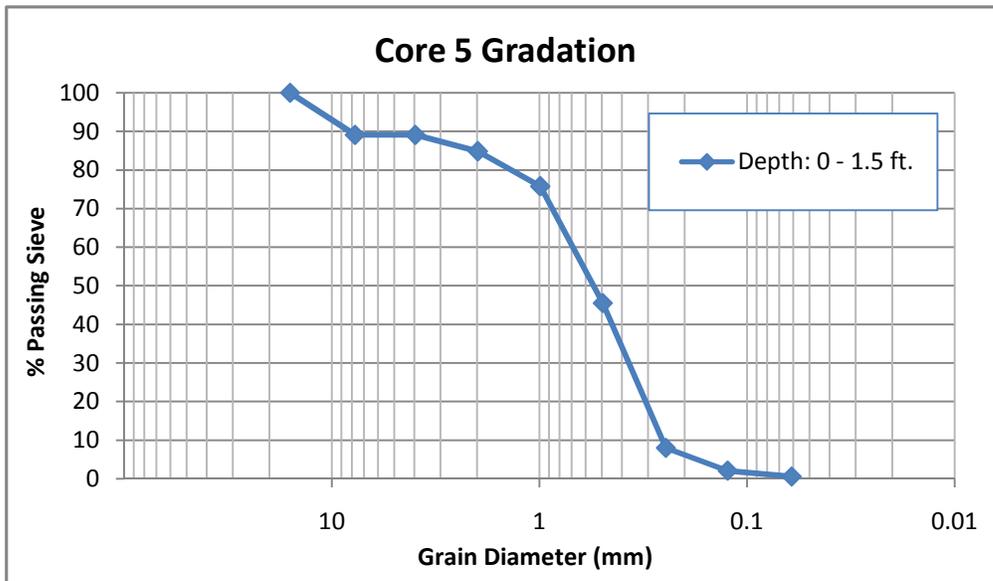
**Depth: 1.5 - 3.0 ft.**

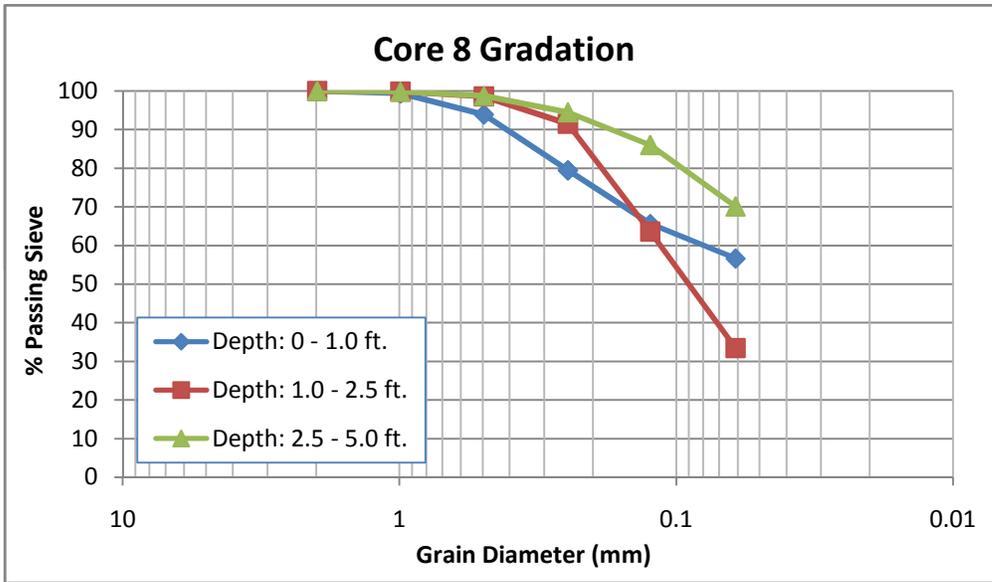
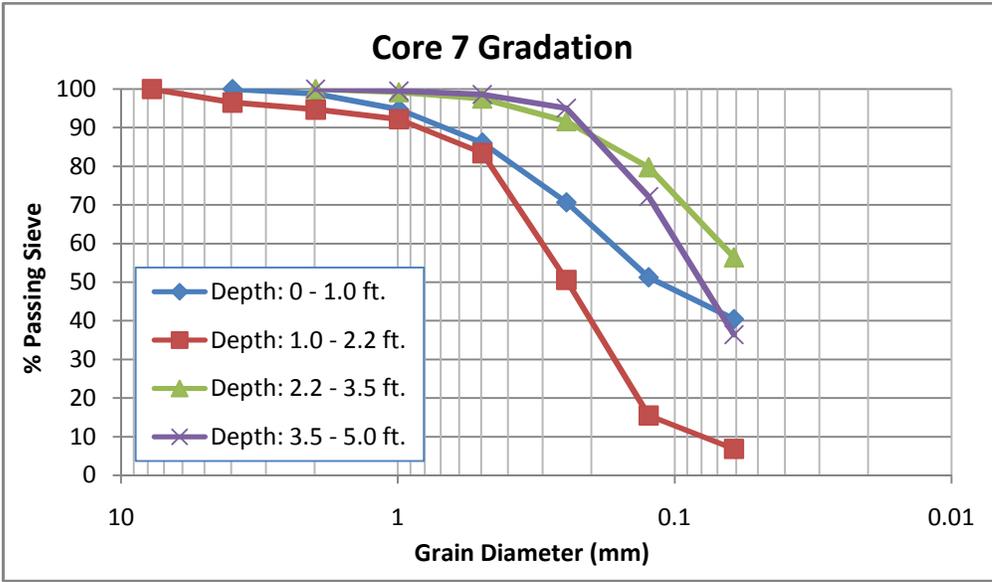
Sieve #	Size(mm)	g retain	% retain		%passed	Cuml. Wt. %
5-inch	127	0				
2.5-inch	63.5	0				
1.25-inch	31.75	0				
0.625-inch	15.88	0				
0.313-inch	7.74	8.3	13.76			100.0
#-5	3.96	0.2	0.33			86.2
#-10	1.98	0.4	0.66			85.9
#-18	0.991	0.8	1.33			85.2
#-35	0.495	10.5	17.41			83.9
#-60	0.246	20.8	34.49			66.5
#-120	0.124	13.4	22.22			32.0
#-230	0.061	3.9	6.47			9.8
	<0.061	2	3.32			3.3
	<b>Total</b>	60.3	100.00			

**Sieve Loss %:**      0

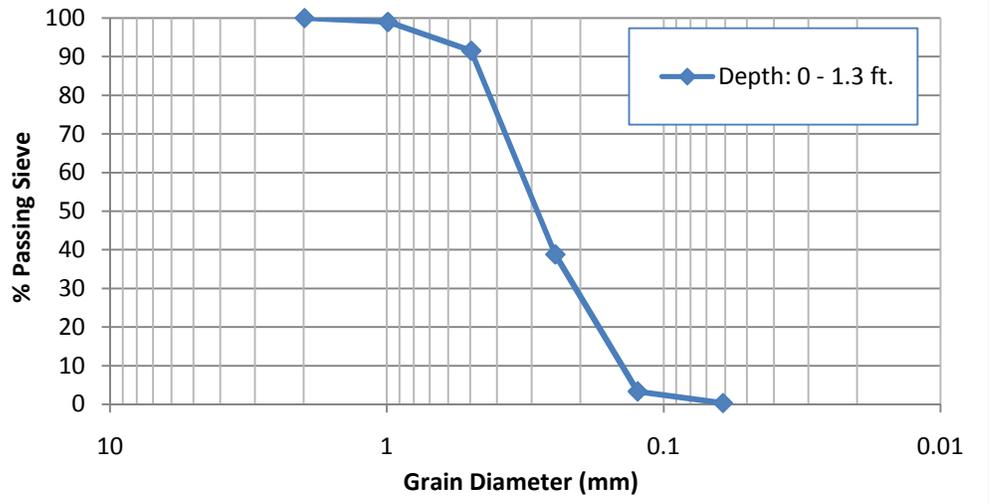


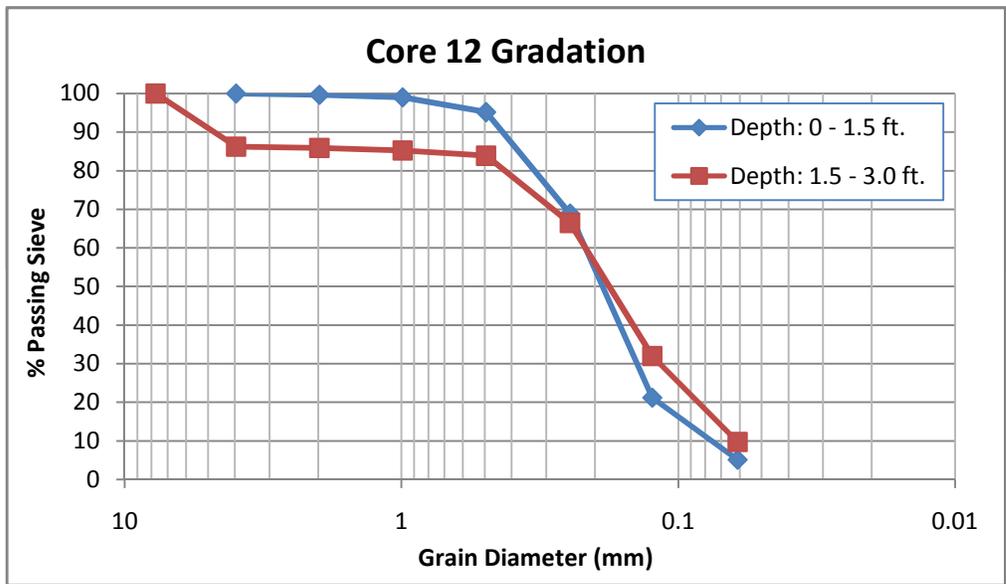
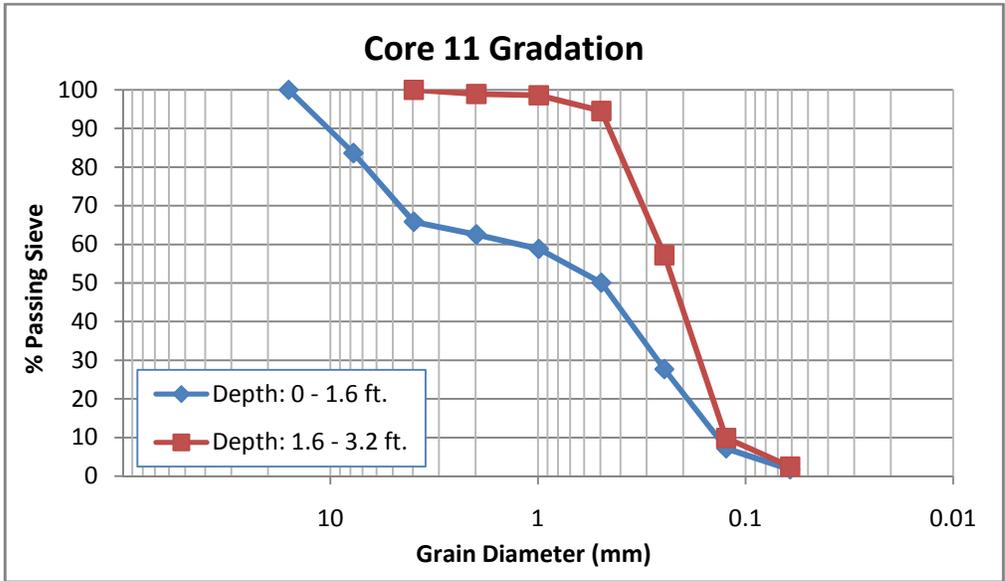






### Core 9 Gradation





**APPENDIX D**  
**SILT AND CLAY HYDROMETER RESULTS**

Southern Oregon University Department of Environmental Studies

ASTM D422 Hydrometer Analysis Data Sheet

<b>Sample Number: C1 0 - 1.2</b>		<b>Sample Wt.(g): 19.3</b>					
<b>Time (minutes)</b>	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	15	11	7	4.5	2.2	1	0.9
Suspension Temperature (C°)	23.8	23.8	23.5	24	23.2	24	24
Temp.-corrected Value (g/L)	16.5	12.5	8.4	6	3.5	2.5	2.4
% Soil Suspension (%)	85	65	43	31	18	13	12

<b>Sample Number: C1 1.2 - 2.5</b>		<b>Sample Wt.(g): 15.1</b>					
<b>Time (minutes)</b>	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	13	9.8	7	5	2.1	2	1.9
Suspension Temperature (C°)	23.2	23.3	24	24	23.5	24	24
Temp.-corrected Value (g/L)	14.3	11.1	8.5	6.5	3.5	3.5	3.4
% Soil Suspension (%)	95	74	56	43	23	23	23

Southern Oregon University Department of Environmental Studies

ASTM D422 Hydrometer Analysis Data Sheet

Sample Number: C4 0 - 2.4      Sample Wt.(g): 17.4

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	15	13.5	8	4.8	2.5	1.6	0.6
Suspension Temperature (C°)	23.8	23.8	24	24	23.5	24	24
Temp.-corrected Value (g/L)	16.5	15.0	9.5	6.3	3.9	3.1	2.1
% Soil Suspension (%)	95	86	55	36	22	18	12

Sample Number: C4 4.8 - 7.2      Sample Wt.(g): 18.1

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	15.7	12.1	6.4	4.9	2.1	1.9	0.9
Suspension Temperature (C°)	24	24	24	24	23.8	24	24
Temp.-corrected Value (g/L)	17.2	13.6	7.9	6.4	3.6	3.4	2.4
% Soil Suspension (%)	95	75	44	35	20	19	13

Sample Number: C8 0 - 1      Sample Wt.(g): 16.5

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	15	14	10	6.2	2.2	2	1.9
Suspension Temperature (C°)	23.9	23.9	23.8	23.8	23.7	24	24
Temp.-corrected Value (g/L)	16.5	15.5	11.5	7.7	3.6	3.5	3.4
% Soil Suspension (%)	100	94	69	46	22	21	21

Southern Oregon University Department of Environmental Studies

ASTM D422 Hydrometer Analysis Data Sheet

Sample Number: C8 2.5 - 5      Sample Wt.(g): 28.1

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	23	19	9.7	6	2.6	2.4	1.2
Suspension Temperature (C <sup>o</sup> )	23.5	23.5	23.9	23.9	23.7	24	24
Temp.-corrected Value (g/L)	24.4	20.4	11.2	7.5	4.0	3.9	2.7
% Soil Suspension (%)	87	73	40	27	14	14	10

Sample Number: C4 2.4 - 4.8      Sample Wt.(g): 19.4

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	17	15	10	6.1	2.9	2.1	1.2
Suspension Temperature (C <sup>o</sup> )	23.5	23.5	23.5	23.5	23.5	24.2	23.8
Temp.-corrected Value (g/L)	18.4	16.4	11.4	7.5	4.3	3.7	2.7
% Soil Suspension (%)	95	84	59	39	22	19	14

Sample Number: C6 5.8 - 7      Sample Wt.(g): 21.1

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	20	15.8	12.5	7.8	3.4	2.5	2.1
Suspension Temperature (C <sup>o</sup> )	24	24	23.8	23.8	23	24.1	23.8
Temp.-corrected Value (g/L)	21.5	17.3	14.0	9.3	4.7	4.0	3.6
% Soil Suspension (%)	102	82	66	44	22	19	17

Southern Oregon University Department of Environmental Studies

ASTM D422 Hydrometer Analysis Data Sheet

Sample Number: C6 0 - 2.8      Sample Wt.(g): 26.8

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	23	20.5	11	7.3	3	2.7	2
Suspension Temperature (C°)	23	23	23	23	23	23.6	23.5
Temp.-corrected Value (g/L)	24.3	21.8	12.3	8.6	4.3	4.1	3.4
% Soil Suspension (%)	90	81	46	32	16	15	13

Sample Number: C6 2.8 - 5.8      Sample Wt.(g): 21.3

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	18	15.5	11	7.5	4.2	3	2.2
Suspension Temperature (C°)	23	23	23	23	23	23.5	23.5
Temp.-corrected Value (g/L)	19.3	16.8	12.3	8.8	5.5	4.4	3.6
% Soil Suspension (%)	90	78	57	41	25	20	17

Sample Number: C7 0-1      Sample Wt.(g): 10.7

Time (minutes)	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	9.5	9	7.5	7	3	2	1.8
Suspension Temperature (C°)	23	23	23	23	23	23.7	23.2
Temp.-corrected Value (g/L)	10.8	10.3	8.8	8.3	4.3	3.4	3.1
% Soil Suspension (%)	100	96	82	77	40	32	29

**Southern Oregon University Department of Environmental Studies**

**ASTM D422 Hydrometer Analysis Data Sheet**

<b>Sample Number: C7 3.5 - 5</b>		<b>Sample Wt.(g): 10.0</b>					
<b>Time (minutes)</b>	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	8	6	4	3	2.4	1.3	1.2
Suspension Temperature (C <sup>o</sup> )	24	24	24.1	24	23.2	24.2	23.8
Temp.-corrected Value (g/L)	9.5	7.5	5.5	4.5	3.7	2.9	2.7
% Soil Suspension (%)	95	75	55	45	37	29	27
<b>Sample Number: C8 1 - 2.5</b>		<b>Sample Wt.(g): 9.3</b>					
<b>Time (minutes)</b>	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	6	4.7	3	2.2	1.5	0.9	0.2
Suspension Temperature (C <sup>o</sup> )	24	24	24.1	24	23.2	24.2	23.5
Temp.-corrected Value (g/L)	7.5	6.2	4.5	3.7	2.8	2.5	1.6
% Soil Suspension (%)	81	67	49	40	30	26	17
<b>Sample Number: C7 2.2 - 3.5</b>		<b>Sample Wt.(g): 20.3</b>					
<b>Time (minutes)</b>	1'	2'30"	10'	31'	213'(3h30)	395'(6h35)	1007(16h47)
Hydrometer Value (g/L)	16	12.3	9.5	6	4	2.6	2.2
Suspension Temperature (C <sup>o</sup> )	23	23	23	23	23	23.5	23.2
Temp.-corrected Value (g/L)	17.3	13.6	10.8	7.3	5.3	4.0	3.5
% Soil Suspension (%)	85	67	53	36	26	20	17

**APPENDIX E**  
**SEDIMENT QUALITY RESULTS**

	Trace Metals - EPA 3050B (mg/Kg wet weight)										
Sample Name	Ag	As	Cd	Cr	Cu	Ni	Pb	Sb	Zn	Hg	TOC
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%
Sampling Method	EPA 3050B	EPA 3050B	EPA 3050B	EPA 3050B	EPA 3050B	EPA 3050B	EPA 3050B	EPA 3050B	EPA 3050B	EPA 7471A	Plumb, 1981
C1 0 - 1.2 ft	<u>0.01</u>	0.79	0.08	13.04	12.86	9.81	1.27	<u>0.1</u>	21.07	0.0093	0.659
C1 1.2 - 2.5 ft	0.04	<u>0.61</u>	0.06	17.32	15.65	10.75	1.58	<u>0.16</u>	23.32	0.014	0.778
C2 0 - 1.0 ft	<u>0.01</u>	1.66	0.11	6.45	7.33	6.39	0.88	<u>0.1</u>	17.13	0.0074	0.162
C3 0 - 1.5 ft	<u>0.02</u>	1.69	0.11	7.85	8.67	8.25	0.97	<u>0.14</u>	17.64	0.011	0.133
C3 1.5 - 3.0 ft	<u>0.02</u>	1.6	0.07	8.85	6.93	6.99	0.91	<u>0.14</u>	17.56	0.0093	0.067
C4 0 - 2.4 ft	0.05	1.37	0.06	13.86	16.74	9.55	6.42	<u>0.1</u>	30.9	0.0406	3.33
C4 2.4 - 4.8 ft	0.03	1.77	0.04	16.02	18.16	11.32	8.4	<u>0.14</u>	33.78	0.0451	3.15
C4 4.8 - 7.2 ft	0.04	1.33	0.07	14.06	17.07	10.64	6.64	<u>0.11</u>	29.89	0.0466	1.66
C5 0 - 1.5 ft	<u>0.01</u>	1.78	0.11	9.91	8.37	6.28	1.17	<u>0.13</u>	19.74	0.073	0.327
C6 0 - 2.8 ft	0.12	0.74	0.2	12.4	15.06	10.16	3.35	<u>0.11</u>	28.01	0.0309	2.86
C6 2.8 - 5.8 ft	0.02	1.42	0.05	15.7	18.52	12.69	1.92	<u>0.16</u>	29.68	0.0215	2.08
C6 5.8 - 7.0 ft	0.04	1.96	0.03	16.42	32.1	12.8	1.9	0.2	32.63	0.0213	1.66
C7 0 - 1.0 ft	0.02	0.86	0.03	9.7	10.48	6.58	1.79	<u>0.1</u>	20.81	0.018	5.18
C7 1.0 - 2.2 ft	<u>0.02</u>	1.23	0.17	9.65	11.66	12.21	1.04	<u>0.13</u>	24.69	0.0062	1.35
C7 2.2 - 3.5 ft	<u>0.01</u>	1.19	<u>0.01</u>	11.45	12.78	10.31	1.24	<u>0.11</u>	22.83	0.013	3.05
C7 3.5 - 5.0 ft	<u>0.02</u>	1.27	0.03	13.93	13.29	12.85	1.22	<u>0.16</u>	26.09	0.011	1.76
C8 0 - 1.0 ft	0.04	0.77	0.03	9.5	10.9	7.17	1.98	<u>0.16</u>	20.58	0.024	4.91
C8 1.0 - 2.5 ft	0.03	<u>0.6</u>	0.05	9.93	10.46	9.74	1.24	<u>0.16</u>	20.75	0.011	1.92
C8 2.5 - 5.0 ft	<u>0.01</u>	1.21	0.03	12.49	13.88	10.49	1.51	<u>0.12</u>	23.44	0.022	2.55
C9 0 - 1.3 ft	<u>0.01</u>	1.18	0.06	7.31	7.57	6.34	1.25	<u>0.11</u>	18.12	ND	0.207
C11 0 - 1.6 ft	<u>0.02</u>	0.8	0.05	6.27	7.02	4.36	1.83	<u>0.14</u>	14.44	ND	0.28
C11 1.6 - 3.2 ft	<u>0.01</u>	0.77	0.05	6.52	6.05	4.91	1.64	<u>0.1</u>	15.18	ND	0.377
C12 0 - 1.5 ft	<u>0.02</u>	0.92	0.16	10.05	9.26	10.03	0.98	<u>0.14</u>	23.36	ND	0.714
C12 1.5 - 3.0 ft	<u>0.02</u>	1.26	0.15	9.31	9.56	9.88	1.09	<u>0.16</u>	22.45	ND	0.51

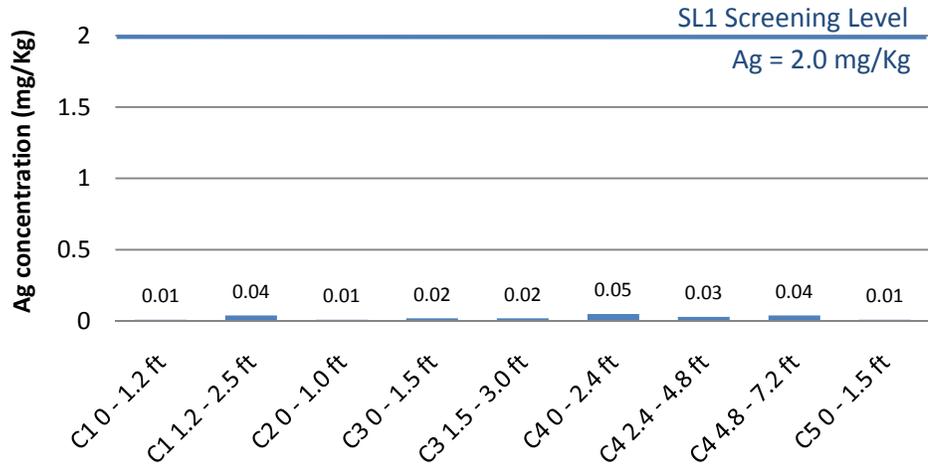
Note: underlined values represent concentrations that are at or below detection limits.

Sample Name	Organochloride Pesticides - EPA 8081 (nanogram/kg)																						
	4,4'-DDE µg/Kg	4,4'-DDE MRL µg/Kg	alpha-BHC µg/Kg	gamma- BHC µg/Kg	beta-BHC µg/Kg	delta-BHC µg/Kg	Heptachlor µg/Kg	Aldrin µg/Kg	Heptachlor epoxide µg/Kg	gamma- Chlordane µg/Kg	alpha- Chlordane µg/Kg	Endosulfan I µg/Kg	Dieldrin µg/Kg	Endrin µg/Kg	4,4'-DDD µg/Kg	Endosulfan II µg/Kg	4,4'-DDT µg/Kg	Endrin aldehyde µg/Kg	Methoxychlor µg/Kg	Endosulfan sulfate µg/Kg	Endrin ketone µg/Kg	Chlordane µg/Kg	Toxaphene µg/Kg
Units	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081
Sampling Method	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081	EPA 8081
C1 0 - 1.2 ft	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C1 1.2 - 2.5 ft	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2 0 - 1.0 ft	ND	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3 0 - 1.5 ft	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3 1.5 - 3.0 ft	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 0 - 2.4 ft	6	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 2.4 - 4.8 ft	10	48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 4.8 - 7.2 ft	9	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C5 0 - 1.5 ft	ND	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C6 0 - 2.8 ft	ND	97	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C6 2.8 - 5.8 ft	ND	99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C6 5.8 - 7.0 ft	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C7 0 - 1.0 ft	ND	97	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C7 1.0 - 2.2 ft	ND	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C7 2.2 - 3.5 ft	ND	48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C7 3.5 - 5.0 ft	ND	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C8 0 - 1.0 ft	ND	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C8 1.0 - 2.5 ft	ND	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C8 2.5 - 5.0 ft	ND	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C9 0 - 1.3 ft	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C11 0 - 1.6 ft	ND	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C11 1.6 - 3.2 ft	ND	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C12 0 - 1.5 ft	ND	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C12 1.5 - 3.0 ft	ND	48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

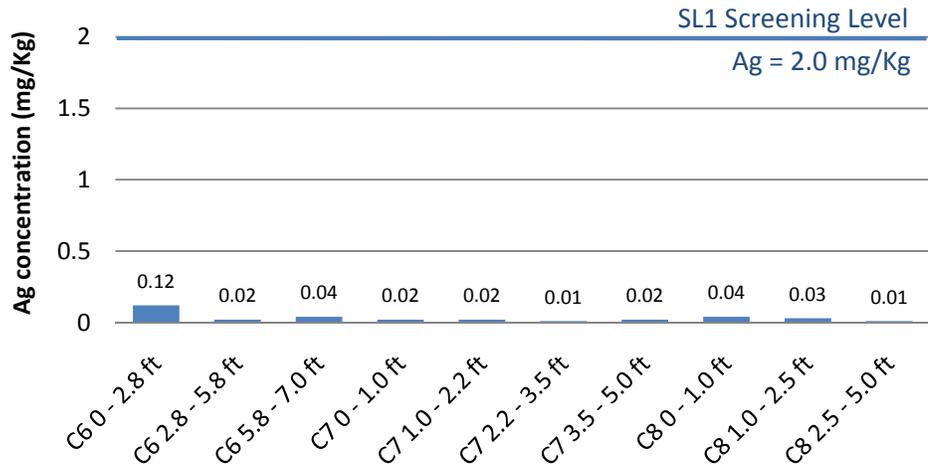
Max	10
Min	6
SL1 Limit (marine)	16

	PCBs/Solids						
Sample Name	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
Units	$\mu\text{g/Kg}$						
Sampling Method	EPA 8082						
C1 0 - 1.2 ft	ND						
C1 1.2 - 2.5 ft	ND						
C2 0 - 1.0 ft	ND						
C3 0 - 1.5 ft	ND						
C3 1.5 - 3.0 ft	ND						
C4 0 - 2.4 ft	ND						
C4 2.4 - 4.8 ft	ND						
C4 4.8 - 7.2 ft	ND						
C5 0 - 1.5 ft	ND						
C6 0 - 2.8 ft	ND						
C6 2.8 - 5.8 ft	ND						
C6 5.8 - 7.0 ft	ND						
C7 0 - 1.0 ft	ND						
C7 1.0 - 2.2 ft	ND						
C7 2.2 - 3.5 ft	ND						
C7 3.5 - 5.0 ft	ND						
C8 0 - 1.0 ft	ND						
C8 1.0 - 2.5 ft	ND						
C8 2.5 - 5.0 ft	ND						
C9 0 - 1.3 ft	ND						
C11 0 - 1.6 ft	ND						
C11 1.6 - 3.2 ft	ND						
C12 0 - 1.5 ft	ND						
C12 1.5 - 3.0 ft	ND						

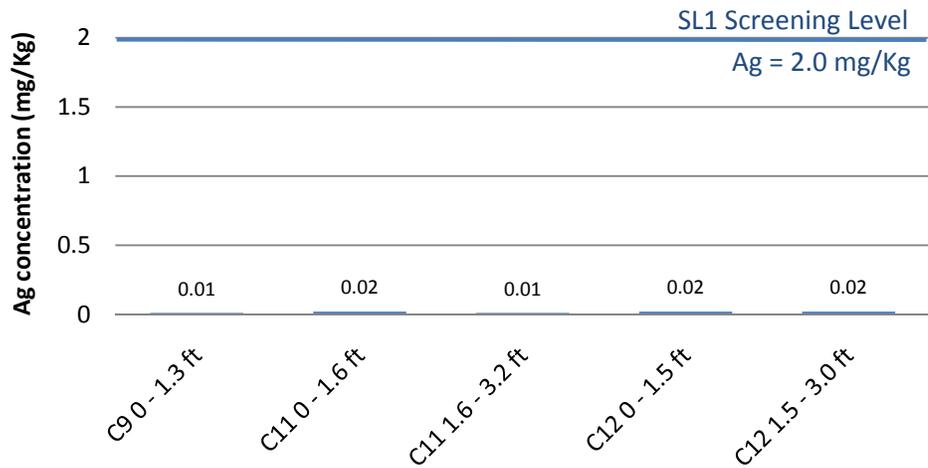
### Sediment Concentrations of Silver (Ag) at Sites 1-5



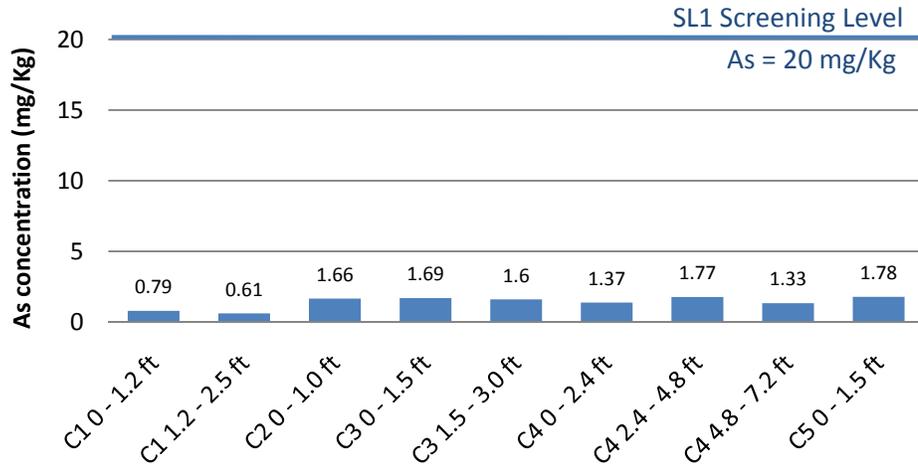
### Sediment Concentrations of Silver (Ag) at Sites 6-8



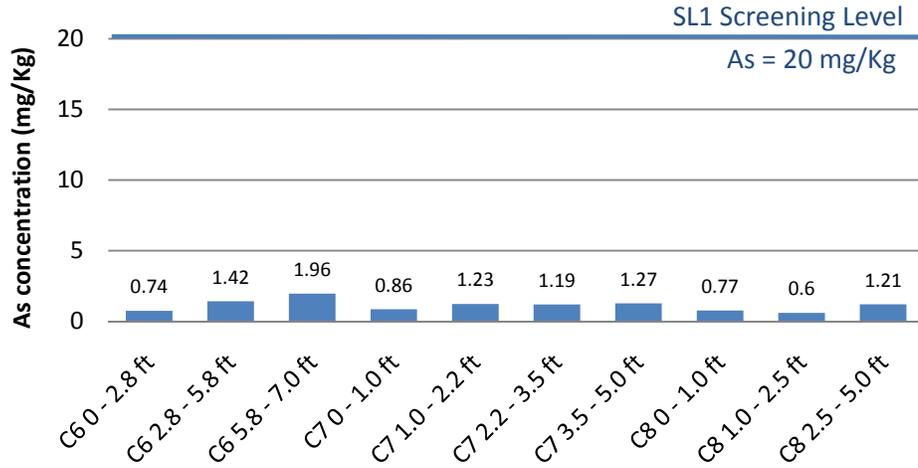
### Sediment Concentrations of Silver (Ag) at Sites 9-12



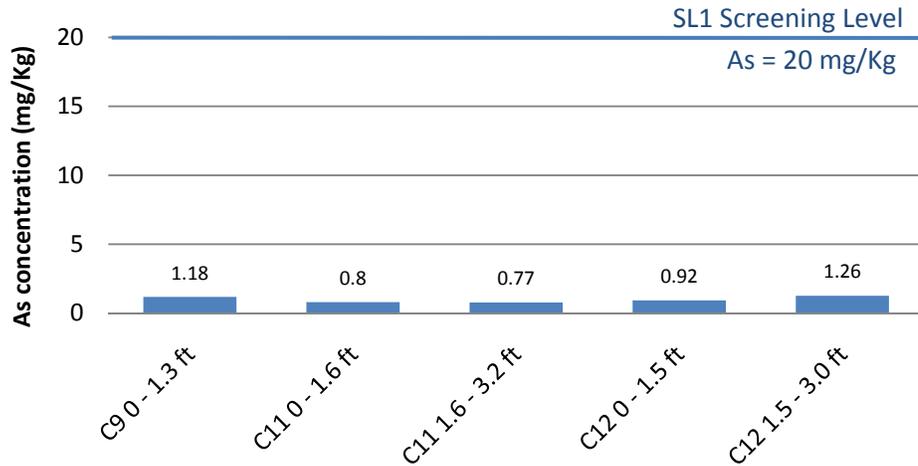
### Sediment Concentrations of Arsenic (As) at Sites 1-5



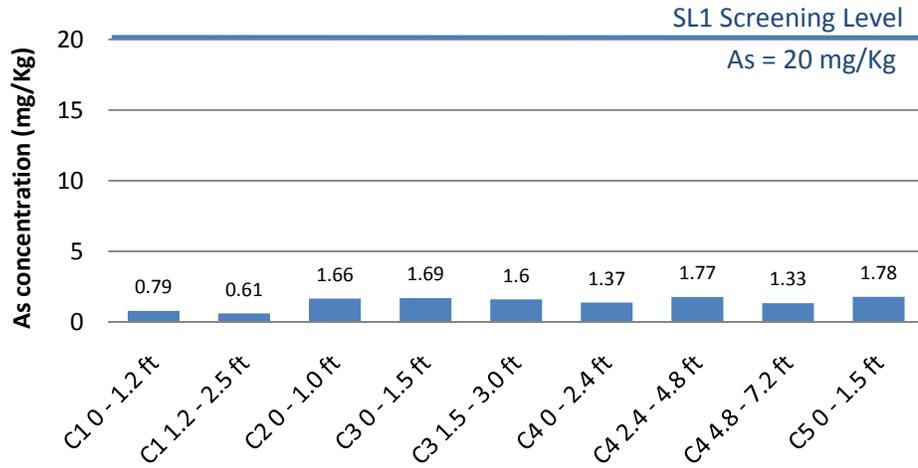
### Sediment Concentrations of Arsenic (As) at Sites 6-8



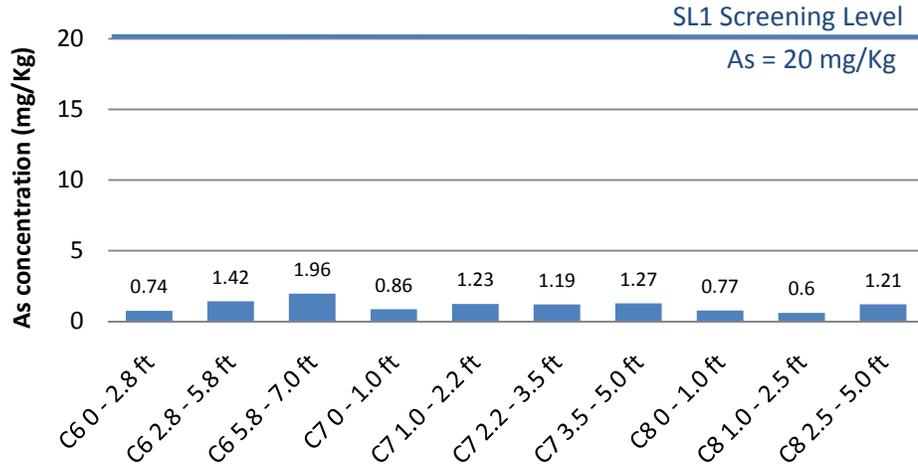
### Sediment Concentrations of Arsenic (As) at Sites 9-12



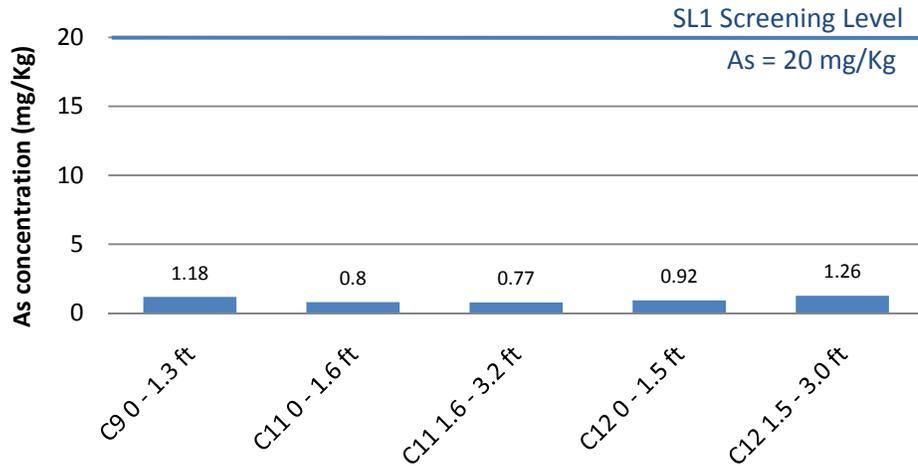
### Sediment Concentrations of Arsenic (As) at Sites 1-5



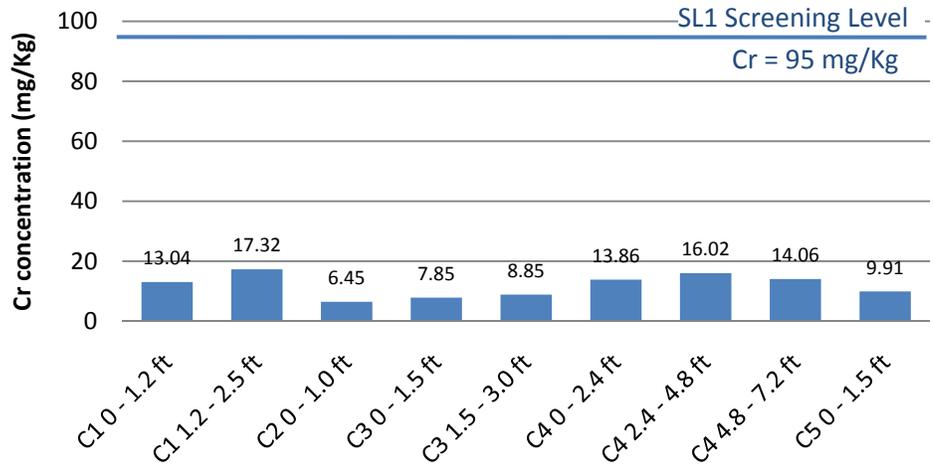
### Sediment Concentrations of Arsenic (As) at Sites 6-8



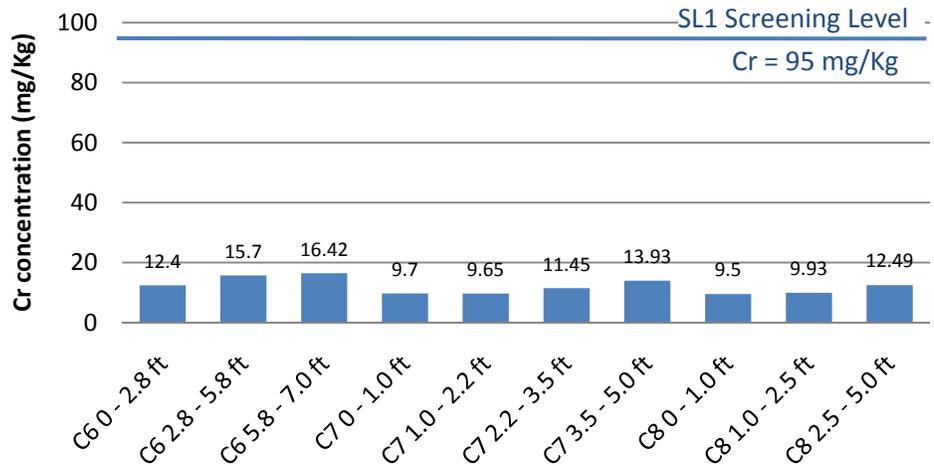
### Sediment Concentrations of Arsenic (As) at Sites 9-12



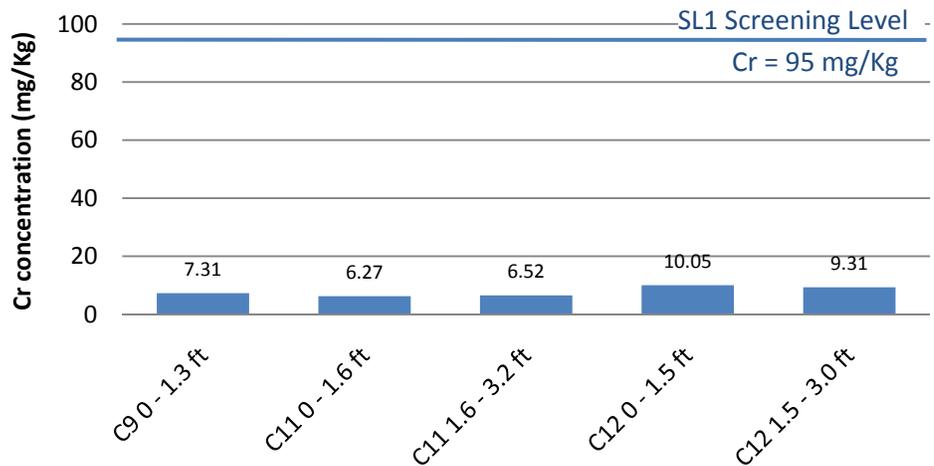
### Sediment Concentrations of Chromium (Cr) at Sites 1-5



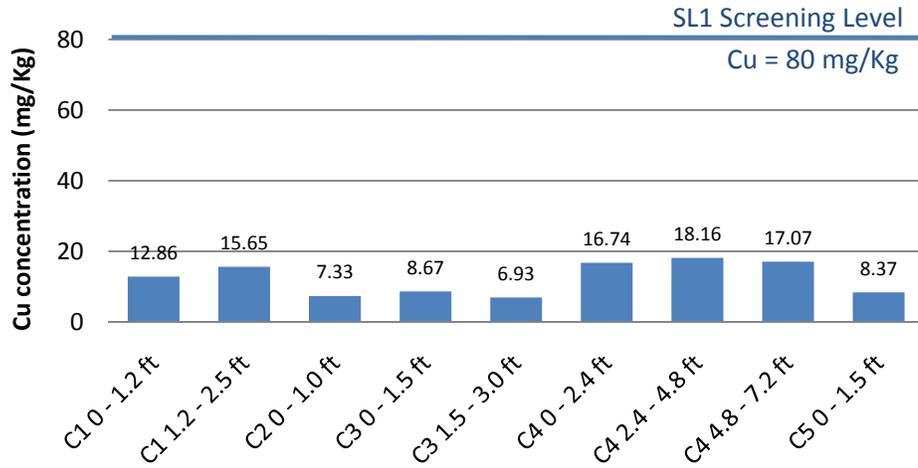
### Sediment Concentrations of Chromium (Cr) at Sites 6-8



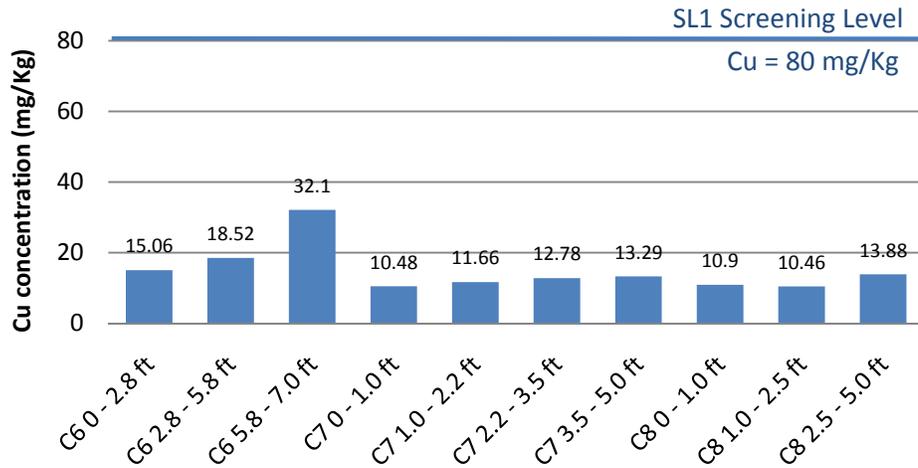
### Sediment Concentrations of Chromium (Cr) at Sites 9-12



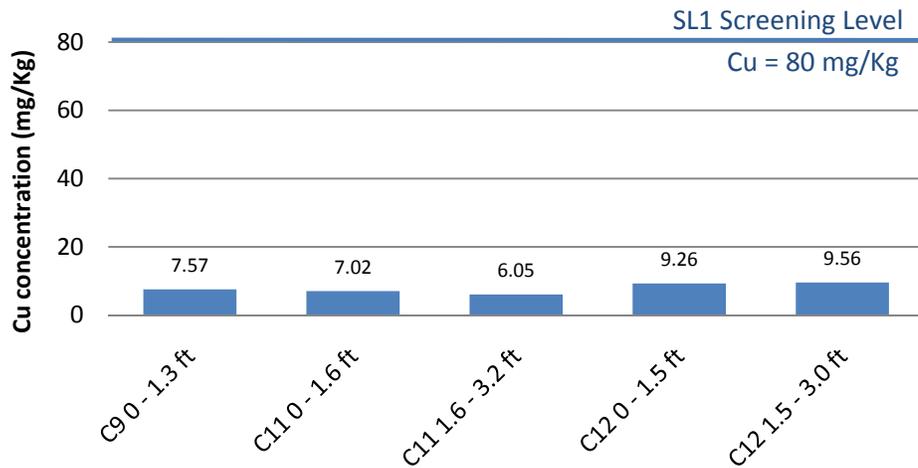
### Sediment Concentrations of Copper (Cu) at Sites 1-5



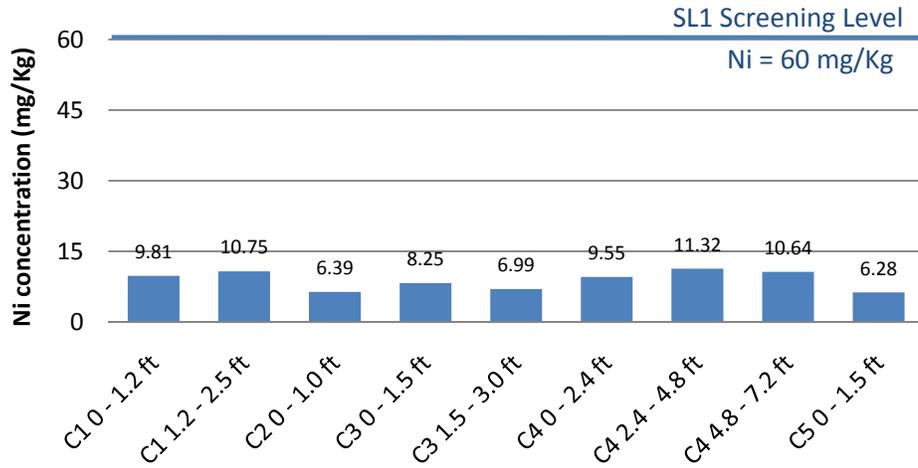
### Sediment Concentrations of Copper (Cu) at Sites 6-8



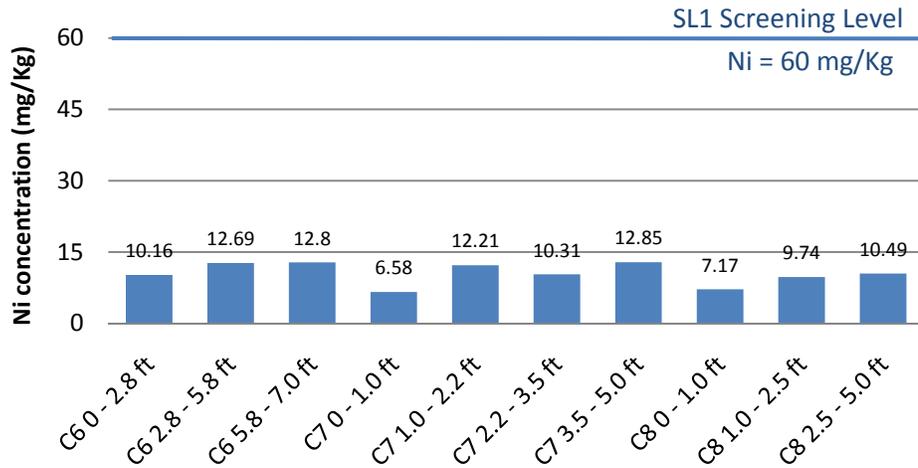
### Sediment Concentrations of Copper (Cu) at Sites 9-12



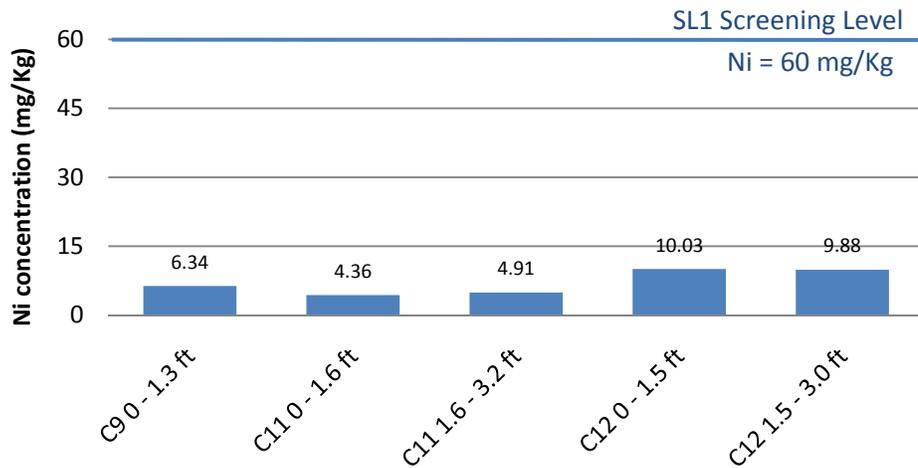
### Sediment Concentrations of Nickel (Ni) at Sites 1-5



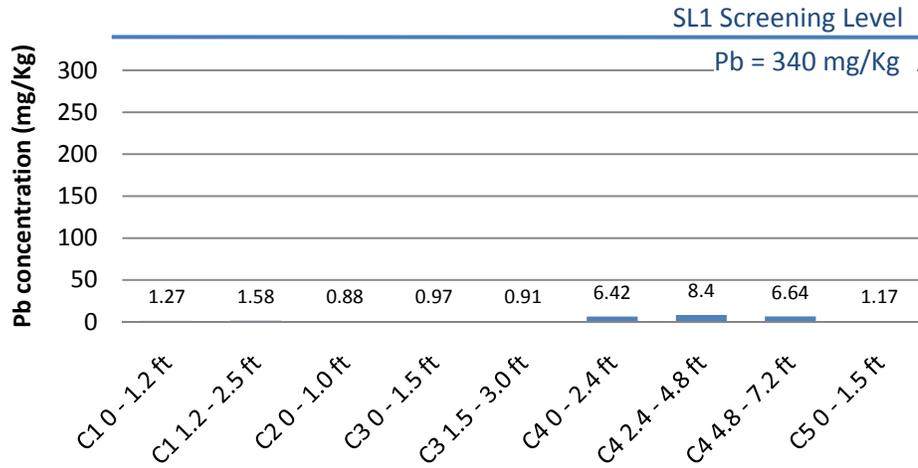
### Sediment Concentrations of Nickel (Ni) at Sites 6-8



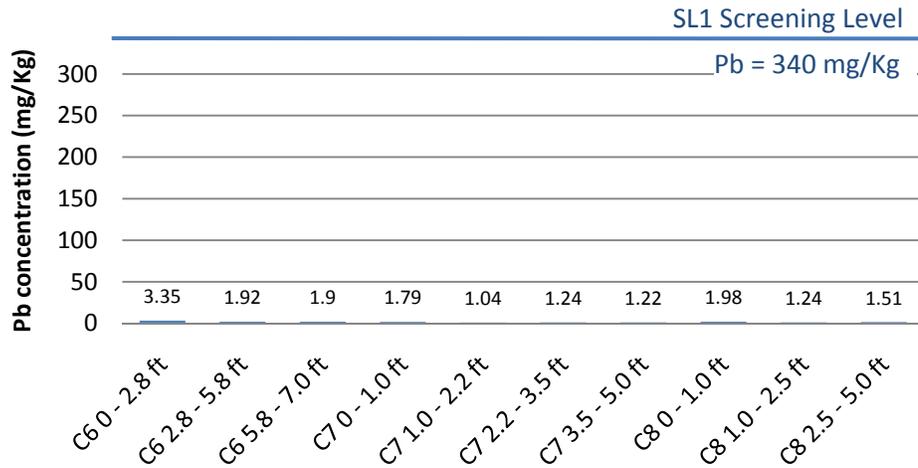
### Sediment Concentrations of Nickel (Ni) at Sites 9-12



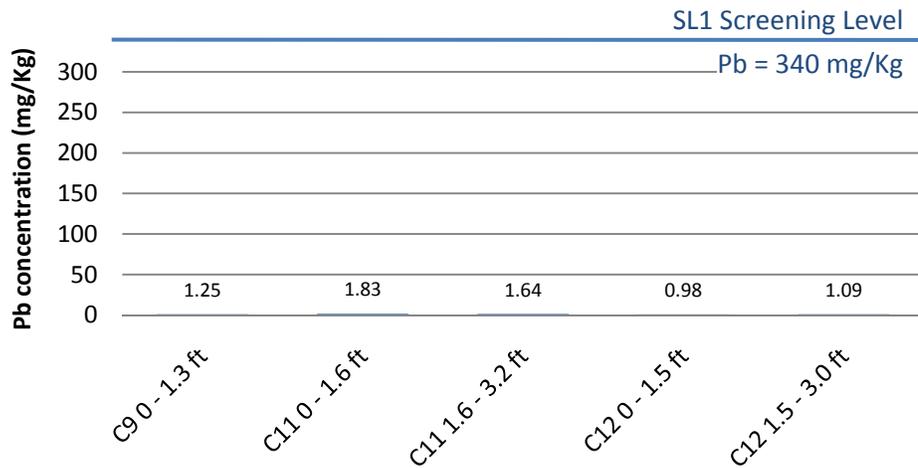
### Sediment Concentrations of Lead (Pb) at Sites 1-5



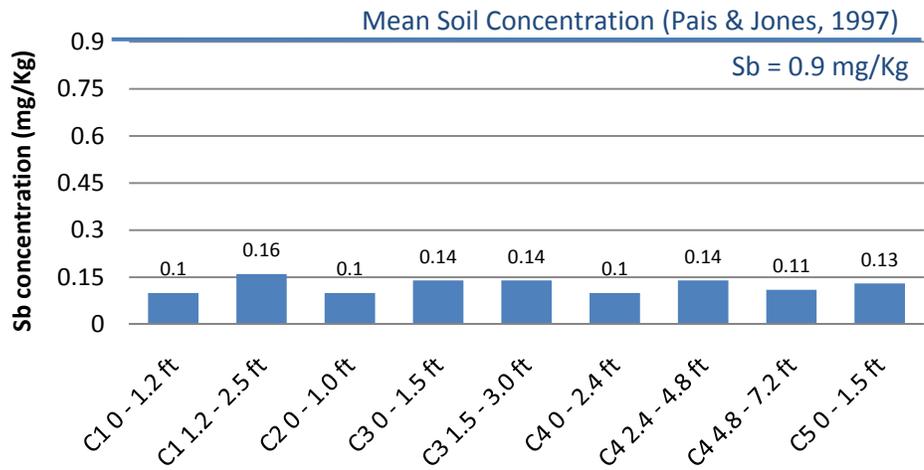
### Sediment Concentrations of Lead (Pb) at Sites 6-8



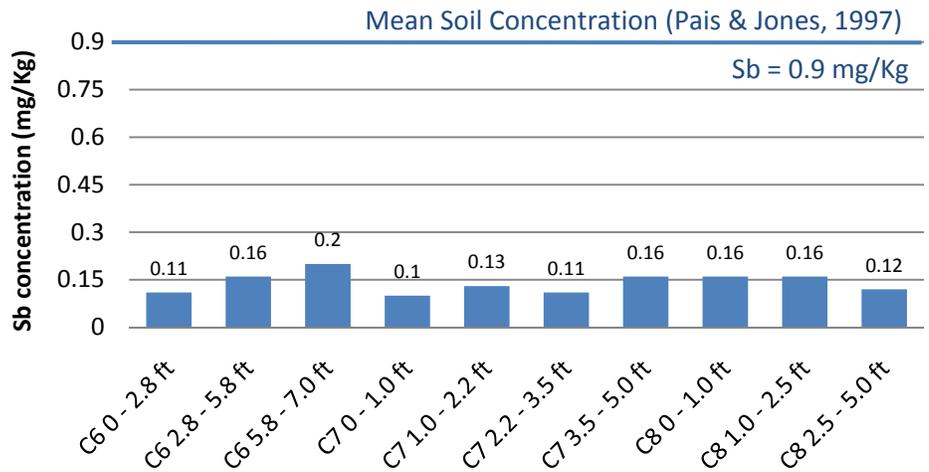
### Sediment Concentrations of Lead (Pb) at Sites 9-12



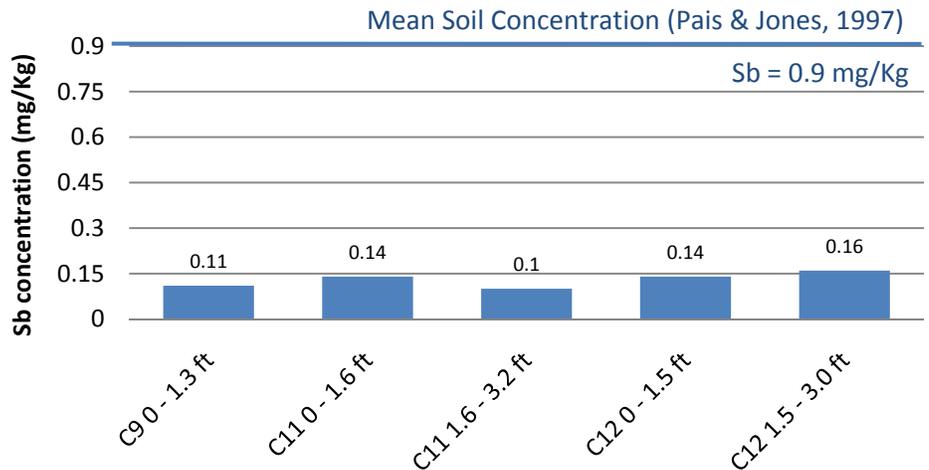
### Sediment Concentrations of Antimony (Sb) at Sites 1-5



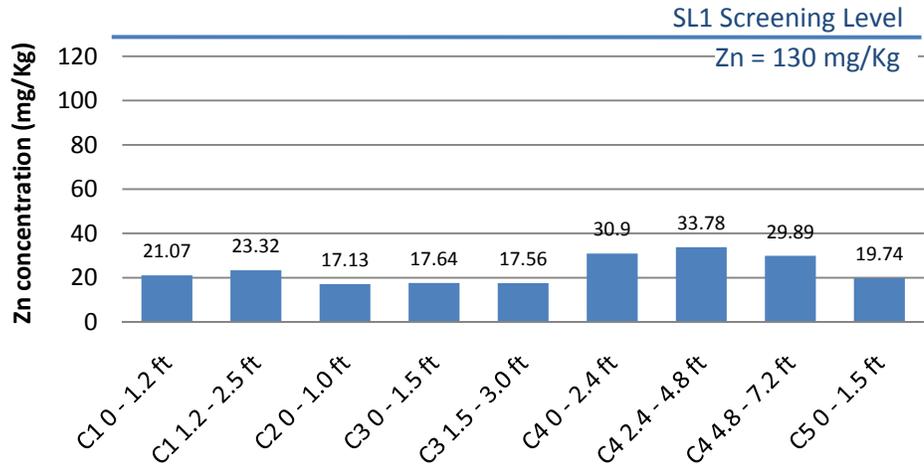
### Sediment Concentrations of Antimony (Sb) at Sites 6-8



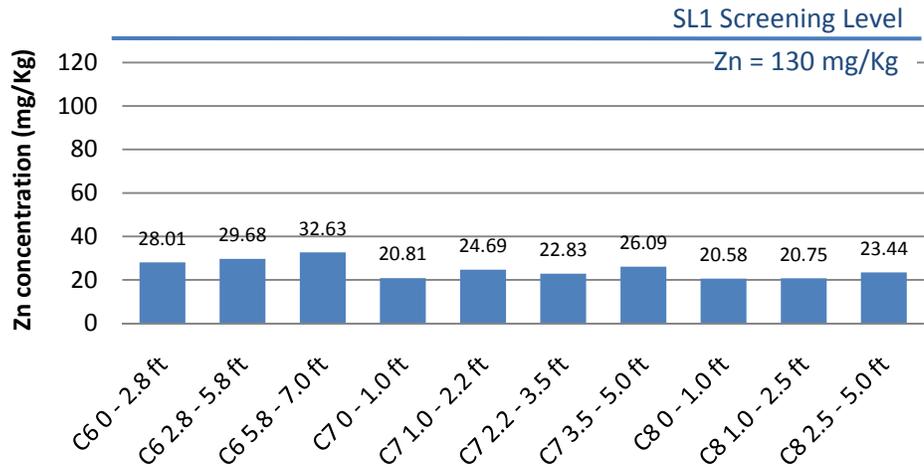
### Sediment Concentrations of Antimony (Sb) at Sites 9-12



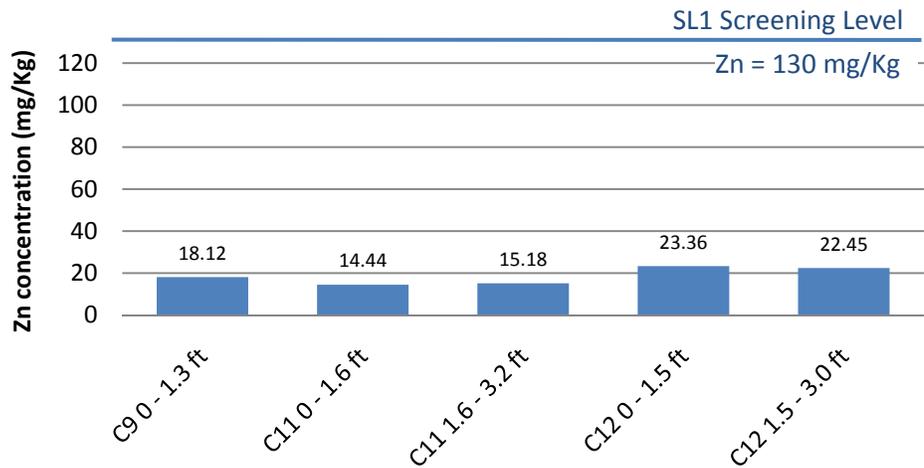
### Sediment Concentrations of Zinc (Zn) at Sites 1-5



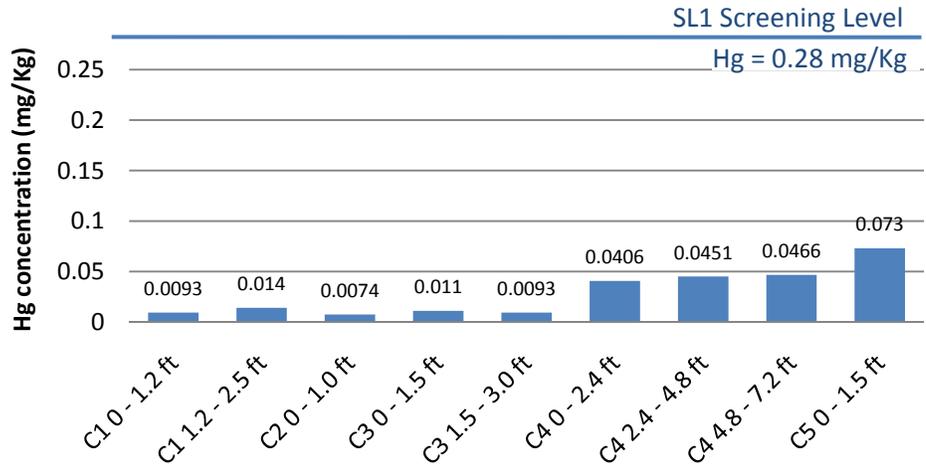
### Sediment Concentrations of Zinc (Zn) at Sites 6-8



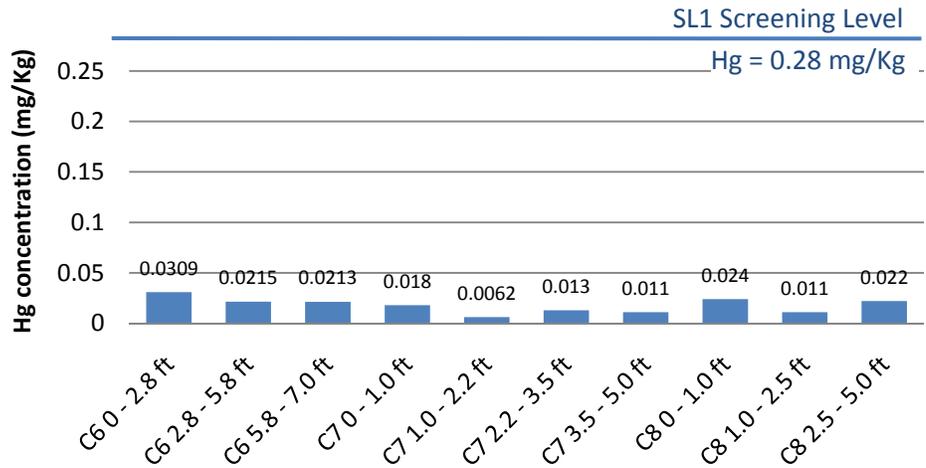
### Sediment Concentrations of Zinc (Zn) at Sites 9-12



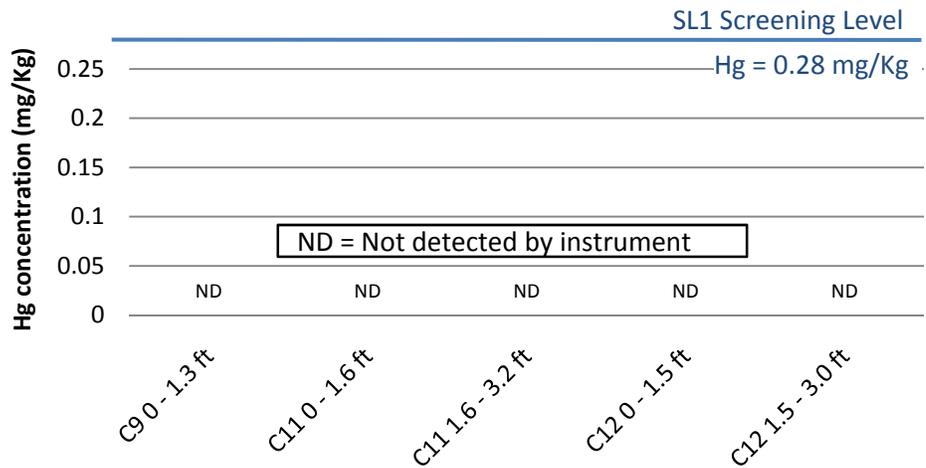
### Sediment Concentrations of Mercury (Hg) at Sites 1-5



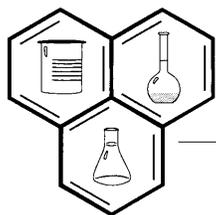
### Sediment Concentrations of Mercury (Hg) at Sites 6-8



### Sediment Concentrations of Mercury (Hg) at Sites 9-12



**APPENDIX F**  
**SEDIMENT QUALITY ANALYSIS FORMS**



# NEILSON RESEARCH CORPORATION

*Environmental Testing Laboratory*

8/3/09

Jason Kent  
HDR Engineering  
1001 SW 5th Street  
Suite 1800  
Portland, OR 97204

TEL: (503) 423-3825

FAX:

RE: Proj 95884-10 - JC SAP

Order No.: 0907409

Dear Jason Kent:

Neilson Research Corporation received 8 sample(s) on 7/16/09 for the analyses presented in the following report.

The results relate only to the parameters tested or to the sample as received by the laboratory. This report shall not be reproduced except in full, without the written approval of Neilson Research Corporation. If you have any questions regarding these test results, please feel free to call.

Sincerely,  
Neilson Research Corporation

Fay L. Fowler

Project Manager

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

**CLIENT:** HDR Engineering  
**Project:** Proj 95884-10 - JC SAP  
**Lab Order:** 0907409

**Date:** 03-Aug-09

## CASE NARRATIVE

The analyses were performed according to the guidelines in the Neilson Research Corporation Quality Assurance Program. This report contains analytical results for the sample(s) as received by the laboratory.

Neilson Research Corporation certifies that this report is in compliance with the requirements of NELAP. No unusual difficulties were experienced during analysis of this batch except as noted below or qualified with data flags on the reports.

Notes: TOC analyses performed by Analytical Resources, Tukwila, WA.

Analytical Comments for METHOD EPA8081\_S, 0907409 All samples in the workorder were diluted due to matrix interference.

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C1 0-1.2'

Sample Location: C1 0-1.2'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-01

Collection Date: 7/14/09 2:30:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		25	µg/Kg	10	7/30/09
gamma-BHC (Lindane)	A	ND		25	µg/Kg	10	7/30/09
beta-BHC	A	ND		25	µg/Kg	10	7/30/09
delta-BHC	A	ND		25	µg/Kg	10	7/30/09
Heptachlor	A	ND		25	µg/Kg	10	7/30/09
Aldrin	A	ND		25	µg/Kg	10	7/30/09
Heptachlor epoxide	A	ND		25	µg/Kg	10	7/30/09
gamma-Chlordane	A	ND		25	µg/Kg	10	7/30/09
alpha-Chlordane	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDE	A	ND		25	µg/Kg	10	7/30/09
Endosulfan I	A	ND		25	µg/Kg	10	7/30/09
Dieldrin	A	ND		25	µg/Kg	10	7/30/09
Endrin	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDD	A	ND		25	µg/Kg	10	7/30/09
Endosulfan II	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDT	A	ND		25	µg/Kg	10	7/30/09
Endrin aldehyde	A	ND		25	µg/Kg	10	7/30/09
Methoxychlor	A	ND		120	µg/Kg	10	7/30/09
Endosulfan sulfate	A	ND		25	µg/Kg	10	7/30/09
Endrin ketone	A	ND		25	µg/Kg	10	7/30/09
Chlordane	A	ND		120	µg/Kg	10	7/30/09
Toxaphene	A	ND		250	µg/Kg	10	7/30/09
Surr: Tetrachloro-m-xylene		93.1		0	%REC	10	7/30/09
Surr: Decachlorobiphenyl		114		0	%REC	10	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/27/09
Surr: Decachlorobiphenyl		114		0	%REC	1	7/27/09
Surr: Tetrachloro-m-xylene		106		0	%REC	1	7/27/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C1 0-1.2'  
Sample Location: C1 0-1.2'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-01  
Collection Date: 7/14/09 2:30:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	0.0093	J	0.0398	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		0.659	SC	0.02	%	1	7/20/09

#### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

ORELAP 100016  
EPA OR00028

## Analysis Report

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C1 1.2-2.5'

Sample Location: C1 1.2-2.5'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-02

Collection Date: 7/14/09 2:30:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution		
						Factor	Date Analyzed	
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY	
alpha-BHC	A	ND		25	µg/Kg	10	7/30/09	
gamma-BHC (Lindane)	A	ND		25	µg/Kg	10	7/30/09	
beta-BHC	A	ND		25	µg/Kg	10	7/30/09	
delta-BHC	A	ND		25	µg/Kg	10	7/30/09	
Heptachlor	A	ND		25	µg/Kg	10	7/30/09	
Aldrin	A	ND		25	µg/Kg	10	7/30/09	
Heptachlor epoxide	A	ND		25	µg/Kg	10	7/30/09	
gamma-Chlordane	A	ND		25	µg/Kg	10	7/30/09	
alpha-Chlordane	A	ND		25	µg/Kg	10	7/30/09	
4,4'-DDE	A	ND		25	µg/Kg	10	7/30/09	
Endosulfan I	A	ND		25	µg/Kg	10	7/30/09	
Dieldrin	A	ND		25	µg/Kg	10	7/30/09	
Endrin	A	ND		25	µg/Kg	10	7/30/09	
4,4'-DDD	A	ND		25	µg/Kg	10	7/30/09	
Endosulfan II	A	ND		25	µg/Kg	10	7/30/09	
4,4'-DDT	A	ND		25	µg/Kg	10	7/30/09	
Endrin aldehyde	A	ND		25	µg/Kg	10	7/30/09	
Methoxychlor	A	ND		120	µg/Kg	10	7/30/09	
Endosulfan sulfate	A	ND		25	µg/Kg	10	7/30/09	
Endrin ketone	A	ND		25	µg/Kg	10	7/30/09	
Chlordane	A	ND		120	µg/Kg	10	7/30/09	
Toxaphene	A	ND		250	µg/Kg	10	7/30/09	
Surr: Tetrachloro-m-xylene		87.5		0	%REC	10	7/30/09	
Surr: Decachlorobiphenyl		108		0	%REC	10	7/30/09	
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY	
Aroclor 1016	A	ND		12	µg/Kg	1	7/27/09	
Aroclor 1221	A	ND		12	µg/Kg	1	7/27/09	
Aroclor 1232	A	ND		12	µg/Kg	1	7/27/09	
Aroclor 1242	A	ND		12	µg/Kg	1	7/27/09	
Aroclor 1248	A	ND		12	µg/Kg	1	7/27/09	
Aroclor 1254	A	ND		12	µg/Kg	1	7/27/09	
Aroclor 1260	A	ND		12	µg/Kg	1	7/27/09	
Surr: Decachlorobiphenyl		121		0	%REC	1	7/27/09	
Surr: Tetrachloro-m-xylene		115		0	%REC	1	7/27/09	

**Qualifiers:**  
 ND - Not Detected at the Reporting Limit  
 J - Analyte detected below quantitation limits  
 B - Analyte detected in the associated Method Blank  
 \* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits  
 R - RPD outside accepted recovery limits  
 E - Value above quantitation range  
 MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C1 1.2-2.5'

Sample Location: C1 1.2-2.5'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-02

Collection Date: 7/14/09 2:30:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.014	J	0.0404	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		0.778	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C2 0-1'

Sample Location: C2 0-1'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-03

Collection Date: 7/14/09 2:05:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		24	µg/Kg	10	7/30/09
gamma-BHC (Lindane)	A	ND		24	µg/Kg	10	7/30/09
beta-BHC	A	ND		24	µg/Kg	10	7/30/09
delta-BHC	A	ND		24	µg/Kg	10	7/30/09
Heptachlor	A	ND		24	µg/Kg	10	7/30/09
Aldrin	A	ND		24	µg/Kg	10	7/30/09
Heptachlor epoxide	A	ND		24	µg/Kg	10	7/30/09
gamma-Chlordane	A	ND		24	µg/Kg	10	7/30/09
alpha-Chlordane	A	ND		24	µg/Kg	10	7/30/09
4,4'-DDE	A	ND		24	µg/Kg	10	7/30/09
Endosulfan I	A	ND		24	µg/Kg	10	7/30/09
Dieldrin	A	ND		24	µg/Kg	10	7/30/09
Endrin	A	ND		24	µg/Kg	10	7/30/09
4,4'-DDD	A	ND		24	µg/Kg	10	7/30/09
Endosulfan II	A	ND		24	µg/Kg	10	7/30/09
4,4'-DDT	A	ND		24	µg/Kg	10	7/30/09
Endrin aldehyde	A	ND		24	µg/Kg	10	7/30/09
Methoxychlor	A	ND		120	µg/Kg	10	7/30/09
Endosulfan sulfate	A	ND		24	µg/Kg	10	7/30/09
Endrin ketone	A	ND		24	µg/Kg	10	7/30/09
Chlordane	A	ND		120	µg/Kg	10	7/30/09
Toxaphene	A	ND		240	µg/Kg	10	7/30/09
Surr: Tetrachloro-m-xylene		81.7		0	%REC	10	7/30/09
Surr: Decachlorobiphenyl		110		0	%REC	10	7/30/09

### PCBs/Solids by EPA\_8082

Analyst: BAY

Aroclor 1016	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/27/09
Surr: Decachlorobiphenyl		119		0	%REC	1	7/27/09
Surr: Tetrachloro-m-xylene		112		0	%REC	1	7/27/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C2 0-1'  
Sample Location: C2 0-1'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-03  
Collection Date: 7/14/09 2:05:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	0.0074	J	0.0396	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		0.162	SC	0.02	%	1	7/20/09

#### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

ORELAP 100016  
EPA OR00028

## Analysis Report

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C3 0-1.5'

Sample Location: C3 0-1.5'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-04

Collection Date: 7/14/09 1:00:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		25	µg/Kg	10	7/30/09
gamma-BHC (Lindane)	A	ND		25	µg/Kg	10	7/30/09
beta-BHC	A	ND		25	µg/Kg	10	7/30/09
delta-BHC	A	ND		25	µg/Kg	10	7/30/09
Heptachlor	A	ND		25	µg/Kg	10	7/30/09
Aldrin	A	ND		25	µg/Kg	10	7/30/09
Heptachlor epoxide	A	ND		25	µg/Kg	10	7/30/09
gamma-Chlordane	A	ND		25	µg/Kg	10	7/30/09
alpha-Chlordane	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDE	A	ND		25	µg/Kg	10	7/30/09
Endosulfan I	A	ND		25	µg/Kg	10	7/30/09
Dieldrin	A	ND		25	µg/Kg	10	7/30/09
Endrin	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDD	A	ND		25	µg/Kg	10	7/30/09
Endosulfan II	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDT	A	ND		25	µg/Kg	10	7/30/09
Endrin aldehyde	A	ND		25	µg/Kg	10	7/30/09
Methoxychlor	A	ND		120	µg/Kg	10	7/30/09
Endosulfan sulfate	A	ND		25	µg/Kg	10	7/30/09
Endrin ketone	A	ND		25	µg/Kg	10	7/30/09
Chlordane	A	ND		120	µg/Kg	10	7/30/09
Toxaphene	A	ND		250	µg/Kg	10	7/30/09
Surr: Tetrachloro-m-xylene		88.5		0	%REC	10	7/30/09
Surr: Decachlorobiphenyl		113		0	%REC	10	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		101		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		78.4		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: **C3 0-1.5'**

Sample Location: **C3 0-1.5'**

Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907362**

NRC Sample ID **0907362-04**

Collection Date: **7/14/09 1:00:00 PM**

Received Date: **7/15/09 7:35:00 AM**

Reported Date: **8/3/09 12:24:03 PM**

Matrix: **Solid**

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.011	J	0.0405	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		0.133	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C3 1.5-3'

Sample Location: C3 1.5-3'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-05

Collection Date: 7/14/09 1:00:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC		Qual	MRL	Units	Dilution Factor	Date Analyzed
	Accredited	Result					
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		25	µg/Kg	10	7/30/09
gamma-BHC (Lindane)	A	ND		25	µg/Kg	10	7/30/09
beta-BHC	A	ND		25	µg/Kg	10	7/30/09
delta-BHC	A	ND		25	µg/Kg	10	7/30/09
Heptachlor	A	ND		25	µg/Kg	10	7/30/09
Aldrin	A	ND		25	µg/Kg	10	7/30/09
Heptachlor epoxide	A	ND		25	µg/Kg	10	7/30/09
gamma-Chlordane	A	ND		25	µg/Kg	10	7/30/09
alpha-Chlordane	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDE	A	ND		25	µg/Kg	10	7/30/09
Endosulfan I	A	ND		25	µg/Kg	10	7/30/09
Dieldrin	A	ND		25	µg/Kg	10	7/30/09
Endrin	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDD	A	ND		25	µg/Kg	10	7/30/09
Endosulfan II	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDT	A	ND		25	µg/Kg	10	7/30/09
Endrin aldehyde	A	ND		25	µg/Kg	10	7/30/09
Methoxychlor	A	ND		120	µg/Kg	10	7/30/09
Endosulfan sulfate	A	ND		25	µg/Kg	10	7/30/09
Endrin ketone	A	ND		25	µg/Kg	10	7/30/09
Chlordane	A	ND		120	µg/Kg	10	7/30/09
Toxaphene	A	ND		250	µg/Kg	10	7/30/09
Surr: Tetrachloro-m-xylene		83.6		0	%REC	10	7/30/09
Surr: Decachlorobiphenyl		101		0	%REC	10	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/27/09
Surr: Decachlorobiphenyl		101		0	%REC	1	7/27/09
Surr: Tetrachloro-m-xylene		98.2		0	%REC	1	7/27/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C3 1.5-3'

Sample Location: C3 1.5-3'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-05

Collection Date: 7/14/09 1:00:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.0093	J	0.0407	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		0.0670	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C3 1.5-3'

Sample Location: C3 1.5-3'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-05

Collection Date: 7/14/09 1:00:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		25	µg/Kg	10	7/30/09
gamma-BHC (Lindane)	A	ND		25	µg/Kg	10	7/30/09
beta-BHC	A	ND		25	µg/Kg	10	7/30/09
delta-BHC	A	ND		25	µg/Kg	10	7/30/09
Heptachlor	A	ND		25	µg/Kg	10	7/30/09
Aldrin	A	ND		25	µg/Kg	10	7/30/09
Heptachlor epoxide	A	ND		25	µg/Kg	10	7/30/09
gamma-Chlordane	A	ND		25	µg/Kg	10	7/30/09
alpha-Chlordane	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDE	A	ND		25	µg/Kg	10	7/30/09
Endosulfan I	A	ND		25	µg/Kg	10	7/30/09
Dieldrin	A	ND		25	µg/Kg	10	7/30/09
Endrin	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDD	A	ND		25	µg/Kg	10	7/30/09
Endosulfan II	A	ND		25	µg/Kg	10	7/30/09
4,4'-DDT	A	ND		25	µg/Kg	10	7/30/09
Endrin aldehyde	A	ND		25	µg/Kg	10	7/30/09
Methoxychlor	A	ND		120	µg/Kg	10	7/30/09
Endosulfan sulfate	A	ND		25	µg/Kg	10	7/30/09
Endrin ketone	A	ND		25	µg/Kg	10	7/30/09
Chlordane	A	ND		120	µg/Kg	10	7/30/09
Toxaphene	A	ND		250	µg/Kg	10	7/30/09
Surr: Tetrachloro-m-xylene		83.6		0	%REC	10	7/30/09
Surr: Decachlorobiphenyl		101		0	%REC	10	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/27/09
Surr: Decachlorobiphenyl		101		0	%REC	1	7/27/09
Surr: Tetrachloro-m-xylene		98.2		0	%REC	1	7/27/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C3 1.5-3'

Sample Location: C3 1.5-3'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-05

Collection Date: 7/14/09 1:00:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.0093	J	0.0407	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		0.0670	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C4 0-2.4'

Sample Location: C4 0-2.4'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-06

Collection Date: 7/14/09 11:05:00 AM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		49	µg/Kg	20	7/30/09
gamma-BHC (Lindane)	A	ND		49	µg/Kg	20	7/30/09
beta-BHC	A	ND		49	µg/Kg	20	7/30/09
delta-BHC	A	ND		49	µg/Kg	20	7/30/09
Heptachlor	A	ND		49	µg/Kg	20	7/30/09
Aldrin	A	ND		49	µg/Kg	20	7/30/09
Heptachlor epoxide	A	ND		49	µg/Kg	20	7/30/09
gamma-Chlordane	A	ND		49	µg/Kg	20	7/30/09
alpha-Chlordane	A	ND		49	µg/Kg	20	7/30/09
4,4'-DDE	A	6	J	49	µg/Kg	20	7/30/09
Endosulfan I	A	ND		49	µg/Kg	20	7/30/09
Dieldrin	A	ND		49	µg/Kg	20	7/30/09
Endrin	A	ND		49	µg/Kg	20	7/30/09
4,4'-DDD	A	ND		49	µg/Kg	20	7/30/09
Endosulfan II	A	ND		49	µg/Kg	20	7/30/09
4,4'-DDT	A	ND		49	µg/Kg	20	7/30/09
Endrin aldehyde	A	ND		49	µg/Kg	20	7/30/09
Methoxychlor	A	ND		240	µg/Kg	20	7/30/09
Endosulfan sulfate	A	ND		49	µg/Kg	20	7/30/09
Endrin ketone	A	ND		49	µg/Kg	20	7/30/09
Chlordane	A	ND		240	µg/Kg	20	7/30/09
Toxaphene	A	ND		490	µg/Kg	20	7/30/09
Surr: Tetrachloro-m-xylene		82.1		0	%REC	20	7/30/09
Surr: Decachlorobiphenyl		111		0	%REC	20	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/27/09
Surr: Decachlorobiphenyl		126		0	%REC	1	7/27/09
Surr: Tetrachloro-m-xylene		106		0	%REC	1	7/27/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: **C4 0-2.4'**  
Sample Location: **C4 0-2.4'**  
Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907362**  
NRC Sample ID **0907362-06**  
Collection Date: **7/14/09 11:05:00 AM**  
Received Date: **7/15/09 7:35:00 AM**  
Reported Date: **8/3/09 12:24:03 PM**  
Matrix: **Solid**

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.0406		0.0402	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		3.33	SC	0.02	%	1	7/20/09

#### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C4 2.4-4.8'

Sample Location: C4 2.4-4.8'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-07

Collection Date: 7/14/09 11:05:00 AM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		48	µg/Kg	20	7/30/09
gamma-BHC (Lindane)	A	ND		48	µg/Kg	20	7/30/09
beta-BHC	A	ND		48	µg/Kg	20	7/30/09
delta-BHC	A	ND		48	µg/Kg	20	7/30/09
Heptachlor	A	ND		48	µg/Kg	20	7/30/09
Aldrin	A	ND		48	µg/Kg	20	7/30/09
Heptachlor epoxide	A	ND		48	µg/Kg	20	7/30/09
gamma-Chlordane	A	ND		48	µg/Kg	20	7/30/09
alpha-Chlordane	A	ND		48	µg/Kg	20	7/30/09
4,4'-DDE	A	10	J	48	µg/Kg	20	7/30/09
Endosulfan I	A	ND		48	µg/Kg	20	7/30/09
Dieldrin	A	ND		48	µg/Kg	20	7/30/09
Endrin	A	ND		48	µg/Kg	20	7/30/09
4,4'-DDD	A	ND		48	µg/Kg	20	7/30/09
Endosulfan II	A	ND		48	µg/Kg	20	7/30/09
4,4'-DDT	A	ND		48	µg/Kg	20	7/30/09
Endrin aldehyde	A	ND		48	µg/Kg	20	7/30/09
Methoxychlor	A	ND		240	µg/Kg	20	7/30/09
Endosulfan sulfate	A	ND		48	µg/Kg	20	7/30/09
Endrin ketone	A	ND		48	µg/Kg	20	7/30/09
Chlordane	A	ND		240	µg/Kg	20	7/30/09
Toxaphene	A	ND		480	µg/Kg	20	7/30/09
Surr: Tetrachloro-m-xylene		87.9		0	%REC	20	7/30/09
Surr: Decachlorobiphenyl		111		0	%REC	20	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		128		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		109		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C4 2.4-4.8'  
Sample Location: C4 2.4-4.8'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-07  
Collection Date: 7/14/09 11:05:00 AM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	0.0451		0.0406	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		3.15	SC	0.02	%	1	7/20/09

#### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C4 4.8-7.2'

Sample Location: C4 4.8-7.2'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-08

Collection Date: 7/14/09 11:05:00 AM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		49	µg/Kg	20	7/30/09
gamma-BHC (Lindane)	A	ND		49	µg/Kg	20	7/30/09
beta-BHC	A	ND		49	µg/Kg	20	7/30/09
delta-BHC	A	ND		49	µg/Kg	20	7/30/09
Heptachlor	A	ND		49	µg/Kg	20	7/30/09
Aldrin	A	ND		49	µg/Kg	20	7/30/09
Heptachlor epoxide	A	ND		49	µg/Kg	20	7/30/09
gamma-Chlordane	A	ND		49	µg/Kg	20	7/30/09
alpha-Chlordane	A	ND		49	µg/Kg	20	7/30/09
4,4'-DDE	A	9	J	49	µg/Kg	20	7/30/09
Endosulfan I	A	ND		49	µg/Kg	20	7/30/09
Dieldrin	A	ND		49	µg/Kg	20	7/30/09
Endrin	A	ND		49	µg/Kg	20	7/30/09
4,4'-DDD	A	ND		49	µg/Kg	20	7/30/09
Endosulfan II	A	ND		49	µg/Kg	20	7/30/09
4,4'-DDT	A	ND		49	µg/Kg	20	7/30/09
Endrin aldehyde	A	ND		49	µg/Kg	20	7/30/09
Methoxychlor	A	ND		240	µg/Kg	20	7/30/09
Endosulfan sulfate	A	ND		49	µg/Kg	20	7/30/09
Endrin ketone	A	ND		49	µg/Kg	20	7/30/09
Chlordane	A	ND		240	µg/Kg	20	7/30/09
Toxaphene	A	ND		490	µg/Kg	20	7/30/09
Surr: Tetrachloro-m-xylene		89.4		0	%REC	20	7/30/09
Surr: Decachlorobiphenyl		101		0	%REC	20	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/27/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/27/09
Surr: Decachlorobiphenyl		125		0	%REC	1	7/27/09
Surr: Tetrachloro-m-xylene		101		0	%REC	1	7/27/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C4 4.8-7.2'  
Sample Location: C4 4.8-7.2'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-08  
Collection Date: 7/14/09 11:05:00 AM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.0466		0.0399	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		1.66	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C5 0-1.5'  
Sample Location: C5 0-1.5'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-09  
Collection Date: 7/14/09 3:10:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		50	µg/Kg	20	7/30/09
gamma-BHC (Lindane)	A	ND		50	µg/Kg	20	7/30/09
beta-BHC	A	ND		50	µg/Kg	20	7/30/09
delta-BHC	A	ND		50	µg/Kg	20	7/30/09
Heptachlor	A	ND		50	µg/Kg	20	7/30/09
Aldrin	A	ND		50	µg/Kg	20	7/30/09
Heptachlor epoxide	A	ND		50	µg/Kg	20	7/30/09
gamma-Chlordane	A	ND		50	µg/Kg	20	7/30/09
alpha-Chlordane	A	ND		50	µg/Kg	20	7/30/09
4,4'-DDE	A	ND		50	µg/Kg	20	7/30/09
Endosulfan I	A	ND		50	µg/Kg	20	7/30/09
Dieldrin	A	ND		50	µg/Kg	20	7/30/09
Endrin	A	ND		50	µg/Kg	20	7/30/09
4,4'-DDD	A	ND		50	µg/Kg	20	7/30/09
Endosulfan II	A	ND		50	µg/Kg	20	7/30/09
4,4'-DDT	A	ND		50	µg/Kg	20	7/30/09
Endrin aldehyde	A	ND		50	µg/Kg	20	7/30/09
Methoxychlor	A	ND		250	µg/Kg	20	7/30/09
Endosulfan sulfate	A	ND		50	µg/Kg	20	7/30/09
Endrin ketone	A	ND		50	µg/Kg	20	7/30/09
Chlordane	A	ND		250	µg/Kg	20	7/30/09
Toxaphene	A	ND		500	µg/Kg	20	7/30/09
Surr: Tetrachloro-m-xylene		93.8		0	%REC	20	7/30/09
Surr: Decachlorobiphenyl		103		0	%REC	20	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		130		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		99.2		0	%REC	1	7/28/09

**Qualifiers:** ND - Not Detected at the Reporting Limit S - Spike Recovery outside accepted recovery limits  
J - Analyte detected below quantitation limits R - RPD outside accepted recovery limits  
B - Analyte detected in the associated Method Blank E - Value above quantitation range  
\* - Value exceeds Maximum Contaminant Level MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C5 0-1.5'  
Sample Location: C5 0-1.5'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-09  
Collection Date: 7/14/09 3:10:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	0.0073	J	0.0402	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		0.327	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA\_OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C7 0-1'

Sample Location: C7 0-1'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-10

Collection Date: 7/14/09 5:35:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		97	µg/Kg	40	7/30/09
gamma-BHC (Lindane)	A	ND		97	µg/Kg	40	7/30/09
beta-BHC	A	ND		97	µg/Kg	40	7/30/09
delta-BHC	A	ND		97	µg/Kg	40	7/30/09
Heptachlor	A	ND		97	µg/Kg	40	7/30/09
Aldrin	A	ND		97	µg/Kg	40	7/30/09
Heptachlor epoxide	A	ND		97	µg/Kg	40	7/30/09
gamma-Chlordane	A	ND		97	µg/Kg	40	7/30/09
alpha-Chlordane	A	ND		97	µg/Kg	40	7/30/09
4,4'-DDE	A	ND		97	µg/Kg	40	7/30/09
Endosulfan I	A	ND		97	µg/Kg	40	7/30/09
Dieldrin	A	ND		97	µg/Kg	40	7/30/09
Endrin	A	ND		97	µg/Kg	40	7/30/09
4,4'-DDD	A	ND		97	µg/Kg	40	7/30/09
Endosulfan II	A	ND		97	µg/Kg	40	7/30/09
4,4'-DDT	A	ND		97	µg/Kg	40	7/30/09
Endrin aldehyde	A	ND		97	µg/Kg	40	7/30/09
Methoxychlor	A	ND		490	µg/Kg	40	7/30/09
Endosulfan sulfate	A	ND		97	µg/Kg	40	7/30/09
Endrin ketone	A	ND		97	µg/Kg	40	7/30/09
Chlordane	A	ND		490	µg/Kg	40	7/30/09
Toxaphene	A	ND		970	µg/Kg	40	7/30/09
Surr: Tetrachloro-m-xylene		83.5		0	%REC	40	7/30/09
Surr: Decachlorobiphenyl		110		0	%REC	40	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		120		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		90.6		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C7 0-1'  
Sample Location: C7 0-1'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-10  
Collection Date: 7/14/09 5:35:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.018	J	0.0404	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		5.18	SC	0.02	%	1	7/20/09

#### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA\_OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C7 1-2.2'  
Sample Location: C7 1-2.2'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-11  
Collection Date: 7/14/09 5:35:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		50	µg/Kg	20	7/30/09
gamma-BHC (Lindane)	A	ND		50	µg/Kg	20	7/30/09
beta-BHC	A	ND		50	µg/Kg	20	7/30/09
delta-BHC	A	ND		50	µg/Kg	20	7/30/09
Heptachlor	A	ND		50	µg/Kg	20	7/30/09
Aldrin	A	ND		50	µg/Kg	20	7/30/09
Heptachlor epoxide	A	ND		50	µg/Kg	20	7/30/09
gamma-Chlordane	A	ND		50	µg/Kg	20	7/30/09
alpha-Chlordane	A	ND		50	µg/Kg	20	7/30/09
4,4'-DDE	A	ND		50	µg/Kg	20	7/30/09
Endosulfan I	A	ND		50	µg/Kg	20	7/30/09
Dieldrin	A	ND		50	µg/Kg	20	7/30/09
Endrin	A	ND		50	µg/Kg	20	7/30/09
4,4'-DDD	A	ND		50	µg/Kg	20	7/30/09
Endosulfan II	A	ND		50	µg/Kg	20	7/30/09
4,4'-DDT	A	ND		50	µg/Kg	20	7/30/09
Endrin aldehyde	A	ND		50	µg/Kg	20	7/30/09
Methoxychlor	A	ND		250	µg/Kg	20	7/30/09
Endosulfan sulfate	A	ND		50	µg/Kg	20	7/30/09
Endrin ketone	A	ND		50	µg/Kg	20	7/30/09
Chlordane	A	ND		250	µg/Kg	20	7/30/09
Toxaphene	A	ND		500	µg/Kg	20	7/30/09
Surr: Tetrachloro-m-xylene		76.8		0	%REC	20	7/30/09
Surr: Decachlorobiphenyl		100		0	%REC	20	7/30/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		96.9		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		77.7		0	%REC	1	7/28/09

**Qualifiers:**  
 ND - Not Detected at the Reporting Limit  
 J - Analyte detected below quantitation limits  
 B - Analyte detected in the associated Method Blank  
 \* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits  
 R - RPD outside accepted recovery limits  
 E - Value above quantitation range  
 MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C7 1-2.2'  
Sample Location: C7 1-2.2'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-11  
Collection Date: 7/14/09 5:35:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	0.0062	J	0.0406	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		1.35	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C7 2.2-3.5'

Sample Location: C7 2.2-3.5'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-12

Collection Date: 7/14/09 5:35:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC		Qual	MRL	Units	Dilution	
	Accredited	Result				Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							
							Analyst: BAY
alpha-BHC	A	ND		48	µg/Kg	20	7/30/09
gamma-BHC (Lindane)	A	ND		48	µg/Kg	20	7/30/09
beta-BHC	A	ND		48	µg/Kg	20	7/30/09
delta-BHC	A	ND		48	µg/Kg	20	7/30/09
Heptachlor	A	ND		48	µg/Kg	20	7/30/09
Aldrin	A	ND		48	µg/Kg	20	7/30/09
Heptachlor epoxide	A	ND		48	µg/Kg	20	7/30/09
gamma-Chlordane	A	ND		48	µg/Kg	20	7/30/09
alpha-Chlordane	A	ND		48	µg/Kg	20	7/30/09
4,4'-DDE	A	ND		48	µg/Kg	20	7/30/09
Endosulfan I	A	ND		48	µg/Kg	20	7/30/09
Dieldrin	A	ND		48	µg/Kg	20	7/30/09
Endrin	A	ND		48	µg/Kg	20	7/30/09
4,4'-DDD	A	ND		48	µg/Kg	20	7/30/09
Endosulfan II	A	ND		48	µg/Kg	20	7/30/09
4,4'-DDT	A	ND		48	µg/Kg	20	7/30/09
Endrin aldehyde	A	ND		48	µg/Kg	20	7/30/09
Methoxychlor	A	ND		240	µg/Kg	20	7/30/09
Endosulfan sulfate	A	ND		48	µg/Kg	20	7/30/09
Endrin ketone	A	ND		48	µg/Kg	20	7/30/09
Chlordane	A	ND		240	µg/Kg	20	7/30/09
Toxaphene	A	ND		480	µg/Kg	20	7/30/09
Surr: Tetrachloro-m-xylene		98.8		0	%REC	20	7/30/09
Surr: Decachlorobiphenyl		120		0	%REC	20	7/30/09

### PCBs/Solids by EPA\_8082

Analyst: BAY

Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		98.2		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		79.5		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C7 2.2-3.5'

Sample Location: C7 2.2-3.5'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-12

Collection Date: 7/14/09 5:35:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.013	J	0.0398	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		3.05	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

ORELAP 100016  
EPA OR00028

## Analysis Report

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C7 3.5-5'

Sample Location: C7 3.5-5'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-13

Collection Date: 7/14/09 5:35:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		24	µg/Kg	10	7/31/09
gamma-BHC (Lindane)	A	ND		24	µg/Kg	10	7/31/09
beta-BHC	A	ND		24	µg/Kg	10	7/31/09
delta-BHC	A	ND		24	µg/Kg	10	7/31/09
Heptachlor	A	ND		24	µg/Kg	10	7/31/09
Aldrin	A	ND		24	µg/Kg	10	7/31/09
Heptachlor epoxide	A	ND		24	µg/Kg	10	7/31/09
gamma-Chlordane	A	ND		24	µg/Kg	10	7/31/09
alpha-Chlordane	A	ND		24	µg/Kg	10	7/31/09
4,4'-DDE	A	ND		24	µg/Kg	10	7/31/09
Endosulfan I	A	ND		24	µg/Kg	10	7/31/09
Dieldrin	A	ND		24	µg/Kg	10	7/31/09
Endrin	A	ND		24	µg/Kg	10	7/31/09
4,4'-DDD	A	ND		24	µg/Kg	10	7/31/09
Endosulfan II	A	ND		24	µg/Kg	10	7/31/09
4,4'-DDT	A	ND		24	µg/Kg	10	7/31/09
Endrin aldehyde	A	ND		24	µg/Kg	10	7/31/09
Methoxychlor	A	ND		120	µg/Kg	10	7/31/09
Endosulfan sulfate	A	ND		24	µg/Kg	10	7/31/09
Endrin ketone	A	ND		24	µg/Kg	10	7/31/09
Chlordane	A	ND		120	µg/Kg	10	7/31/09
Toxaphene	A	ND		240	µg/Kg	10	7/31/09
Surr: Tetrachloro-m-xylene		92.6		0	%REC	10	7/31/09
Surr: Decachlorobiphenyl		111		0	%REC	10	7/31/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		95.6		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		77.8		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: **C7 3.5-5'**

Sample Location: **C7 3.5-5'**

Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907362**

NRC Sample ID **0907362-13**

Collection Date: **7/14/09 5:35:00 PM**

Received Date: **7/15/09 7:35:00 AM**

Reported Date: **8/3/09 12:24:03 PM**

Matrix: **Solid**

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.011	J	0.0407	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		1.76	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C8 0-1'

Sample Location: C8 0-1'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-14

Collection Date: 7/14/09 5:00:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							<i>Analyst: BAY</i>
alpha-BHC	A	ND		250	µg/Kg	100	7/31/09
gamma-BHC (Lindane)	A	ND		250	µg/Kg	100	7/31/09
beta-BHC	A	ND		250	µg/Kg	100	7/31/09
delta-BHC	A	ND		250	µg/Kg	100	7/31/09
Heptachlor	A	ND		250	µg/Kg	100	7/31/09
Aldrin	A	ND		250	µg/Kg	100	7/31/09
Heptachlor epoxide	A	ND		250	µg/Kg	100	7/31/09
gamma-Chlordane	A	ND		250	µg/Kg	100	7/31/09
alpha-Chlordane	A	ND		250	µg/Kg	100	7/31/09
4,4'-DDE	A	ND		250	µg/Kg	100	7/31/09
Endosulfan I	A	ND		250	µg/Kg	100	7/31/09
Dieldrin	A	ND		250	µg/Kg	100	7/31/09
Endrin	A	ND		250	µg/Kg	100	7/31/09
4,4'-DDD	A	ND		250	µg/Kg	100	7/31/09
Endosulfan II	A	ND		250	µg/Kg	100	7/31/09
4,4'-DDT	A	ND		250	µg/Kg	100	7/31/09
Endrin aldehyde	A	ND		250	µg/Kg	100	7/31/09
Methoxychlor	A	ND		1200	µg/Kg	100	7/31/09
Endosulfan sulfate	A	ND		250	µg/Kg	100	7/31/09
Endrin ketone	A	ND		250	µg/Kg	100	7/31/09
Chlordane	A	ND		1200	µg/Kg	100	7/31/09
Toxaphene	A	ND		2500	µg/Kg	100	7/31/09
Surr: Tetrachloro-m-xylene		110		0	%REC	100	7/31/09
Surr: Decachlorobiphenyl		258	S1	0	%REC	100	7/31/09

### PCBs/Solids by EPA\_8082

*Analyst: BAY*

Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		107		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		78.5		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C8 0-1'

Sample Location: C8 0-1'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907362

NRC Sample ID 0907362-14

Collection Date: 7/14/09 5:00:00 PM

Received Date: 7/15/09 7:35:00 AM

Reported Date: 8/3/09 12:24:03 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	0.024	J	0.0408	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		4.91	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C8 1-2.5'  
Sample Location: C8 1-2.5'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-15  
Collection Date: 7/14/09 5:00:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							<i>Analyst: BAY</i>
alpha-BHC	A	ND		49	µg/Kg	20	7/31/09
gamma-BHC (Lindane)	A	ND		49	µg/Kg	20	7/31/09
beta-BHC	A	ND		49	µg/Kg	20	7/31/09
delta-BHC	A	ND		49	µg/Kg	20	7/31/09
Heptachlor	A	ND		49	µg/Kg	20	7/31/09
Aldrin	A	ND		49	µg/Kg	20	7/31/09
Heptachlor epoxide	A	ND		49	µg/Kg	20	7/31/09
gamma-Chlordane	A	ND		49	µg/Kg	20	7/31/09
alpha-Chlordane	A	ND		49	µg/Kg	20	7/31/09
4,4'-DDE	A	ND		49	µg/Kg	20	7/31/09
Endosulfan I	A	ND		49	µg/Kg	20	7/31/09
Dieldrin	A	ND		49	µg/Kg	20	7/31/09
Endrin	A	ND		49	µg/Kg	20	7/31/09
4,4'-DDD	A	ND		49	µg/Kg	20	7/31/09
Endosulfan II	A	ND		49	µg/Kg	20	7/31/09
4,4'-DDT	A	ND		49	µg/Kg	20	7/31/09
Endrin aldehyde	A	ND		49	µg/Kg	20	7/31/09
Methoxychlor	A	ND		240	µg/Kg	20	7/31/09
Endosulfan sulfate	A	ND		49	µg/Kg	20	7/31/09
Endrin ketone	A	ND		49	µg/Kg	20	7/31/09
Chlordane	A	ND		240	µg/Kg	20	7/31/09
Toxaphene	A	ND		490	µg/Kg	20	7/31/09
Surr: Tetrachloro-m-xylene		94.0		0	%REC	20	7/31/09
Surr: Decachlorobiphenyl		114		0	%REC	20	7/31/09
<b>PCBs/Solids by EPA_8082</b>							<i>Analyst: BAY</i>
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		103		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		71.2		0	%REC	1	7/28/09

**Qualifiers:** ND - Not Detected at the Reporting Limit      S - Spike Recovery outside accepted recovery limits  
 J - Analyte detected below quantitation limits      R - RPD outside accepted recovery limits  
 B - Analyte detected in the associated Method Blank      E - Value above quantitation range  
 \* - Value exceeds Maximum Contaminant Level      MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C8 1-2.5'  
Sample Location: C8 1-2.5'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907362  
NRC Sample ID 0907362-15  
Collection Date: 7/14/09 5:00:00 PM  
Received Date: 7/15/09 7:35:00 AM  
Reported Date: 8/3/09 12:24:03 PM  
Matrix: Solid

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	0.011	J	0.0399	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		1.92	SC	0.02	%	1	7/20/09

#### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: **C8 2.5-5'**

Sample Location: **C8 2.5-5'**

Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907362**

NRC Sample ID **0907362-16**

Collection Date: **7/14/09 5:00:00 PM**

Received Date: **7/15/09 7:35:00 AM**

Reported Date: **8/3/09 12:24:03 PM**

Matrix: **Solid**

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: <b>BAY</b>
alpha-BHC	A	ND		50	µg/Kg	20	7/31/09
gamma-BHC (Lindane)	A	ND		50	µg/Kg	20	7/31/09
beta-BHC	A	ND		50	µg/Kg	20	7/31/09
delta-BHC	A	ND		50	µg/Kg	20	7/31/09
Heptachlor	A	ND		50	µg/Kg	20	7/31/09
Aldrin	A	ND		50	µg/Kg	20	7/31/09
Heptachlor epoxide	A	ND		50	µg/Kg	20	7/31/09
gamma-Chlordane	A	ND		50	µg/Kg	20	7/31/09
alpha-Chlordane	A	ND		50	µg/Kg	20	7/31/09
4,4'-DDE	A	ND		50	µg/Kg	20	7/31/09
Endosulfan I	A	ND		50	µg/Kg	20	7/31/09
Dieldrin	A	ND		50	µg/Kg	20	7/31/09
Endrin	A	ND		50	µg/Kg	20	7/31/09
4,4'-DDD	A	ND		50	µg/Kg	20	7/31/09
Endosulfan II	A	ND		50	µg/Kg	20	7/31/09
4,4'-DDT	A	ND		50	µg/Kg	20	7/31/09
Endrin aldehyde	A	ND		50	µg/Kg	20	7/31/09
Methoxychlor	A	ND		250	µg/Kg	20	7/31/09
Endosulfan sulfate	A	ND		50	µg/Kg	20	7/31/09
Endrin ketone	A	ND		50	µg/Kg	20	7/31/09
Chlordane	A	ND		250	µg/Kg	20	7/31/09
Toxaphene	A	ND		500	µg/Kg	20	7/31/09
Surr: Tetrachloro-m-xylene		99.4		0	%REC	20	7/31/09
Surr: Decachlorobiphenyl		109		0	%REC	20	7/31/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: <b>BAY</b>
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		103		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		78.8		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: **C8 2.5-5'**

Sample Location: **C8 2.5-5'**

Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907362**

NRC Sample ID **0907362-16**

Collection Date: **7/14/09 5:00:00 PM**

Received Date: **7/15/09 7:35:00 AM**

Reported Date: **8/3/09 12:24:03 PM**

Matrix: **Solid**

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.022	J	0.0411	mg/Kg	1	7/21/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		2.55	SC	0.02	%	1	7/20/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

## DATA FLAGS

- B Analyte detected in the associated Method Blank.
- C Sample(s) does not meet NELAC/ORELAP sample acceptance criteria. See Case Narrative.
- CU Cleanup performed prior to analysis: either H<sub>2</sub>SO<sub>4</sub>/Silica Gel or Florosil.
- D1 The diesel elution pattern for the sample is not typical.
- D2 The sample appears to be a heavier hydrocarbon range than diesel.
- D3 The sample appears to be a lighter hydrocarbon range than diesel.
- D4 Detected hydrocarbons do not have pattern and range consistent with typical petroleum products and may be due to biogenic interference.
- D5 Detected hydrocarbons in the diesel range appear to be weathered diesel.
- E Estimated value.
- ER Elevated reporting limit due to matrix.
- G1 The gasoline elution pattern for the sample is not typical.
- G2 The sample appears to be a heavier hydrocarbon range than gasoline.
- G3 The sample appears to be a lighter hydrocarbon range than gasoline.
- G4 Detected hydrocarbons in the gasoline range appear to be weathered gasoline.
- HP Sample re-analysis performed outside of method specified holding time.
- HR Sample received outside of method specified holding time.
- HS Sample analyzed for volatile organics contained headspace.
- HT At the client's request, the sample was analyzed outside of method specified holding time.
- H Analysis performed outside of method specified holding time.
- J Analyte detected below the Minimum Reporting Limit (MRL) and above the Method Detection Limit (MDL). The J flag result is an estimated value.
- MI Surrogate or Matrix Spike recovery is out of control limits due to matrix interference.
- N See Case Narrative.
- NI Some QA criteria may be outside control limits. Insufficient sample remains for reanalysis.
- Q Closing CCV or LCS exceeded high recovery limits, but associated samples are non-detect and the sample results are not affected. Data meets EPA/NELAC requirements.
- R RPD outside accepted recovery limits.
- R1 Analyses are not controlled on RPD values from sample concentration less than 10 times the reporting limit.
- R2 Analyses are not controlled on RPD values from sample concentration less than 5 times the reporting limit.
- R3 The RPD and/or % recovery for the DUP or QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
- R4 Duplicate analysis failed due to result being at or near method reporting limit.
- RPD Relative percent difference.
- Reporting Limits: Report limits (MDLs, MRLs & PQLs) are adjusted based on variations in sample preparation amounts, analytical dilutions, and percent solids, where applicable.
- S Spike recovery outside accepted recovery limits.
- S1 Surrogate or Matrix Spike recovery is outside of control limits due to dilution necessary for analysis.
- SC Sub-contracted to another laboratory for analysis.
- TCLP Toxicity Characteristic Leaching Procedure – Sample submitted contained < 0.5% solids.
- X1 The motor oil elution pattern for the sample is not typical.
- X2 The sample appears to be a heavier hydrocarbon range than motor oil.
- X3 The sample appears to be a lighter hydrocarbon range than motor oil.
- \* Value exceeds Maximum Contaminant Level
- # Value exceeds regulatory level for TCLP contaminant.

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: **C6 0-2.8'**

Sample Location: **C6 0-2.8'**

Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907409**

NRC Sample ID **0907409-01**

Collection Date: **7/15/09 2:45:00 PM**

Received Date: **7/16/09 10:09:00 AM**

Reported Date: **8/3/09 12:33:32 PM**

Matrix: **Solid**

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							<i>Analyst: BAY</i>
alpha-BHC	A	ND		97	µg/Kg	40	7/31/09
gamma-BHC (Lindane)	A	ND		97	µg/Kg	40	7/31/09
beta-BHC	A	ND		97	µg/Kg	40	7/31/09
delta-BHC	A	ND		97	µg/Kg	40	7/31/09
Heptachlor	A	ND		97	µg/Kg	40	7/31/09
Aldrin	A	ND		97	µg/Kg	40	7/31/09
Heptachlor epoxide	A	ND		97	µg/Kg	40	7/31/09
gamma-Chlordane	A	ND		97	µg/Kg	40	7/31/09
alpha-Chlordane	A	ND		97	µg/Kg	40	7/31/09
4,4'-DDE	A	ND		97	µg/Kg	40	7/31/09
Endosulfan I	A	ND		97	µg/Kg	40	7/31/09
Dieldrin	A	ND		97	µg/Kg	40	7/31/09
Endrin	A	ND		97	µg/Kg	40	7/31/09
4,4'-DDD	A	ND		97	µg/Kg	40	7/31/09
Endosulfan II	A	ND		97	µg/Kg	40	7/31/09
4,4'-DDT	A	ND		97	µg/Kg	40	7/31/09
Endrin aldehyde	A	ND		97	µg/Kg	40	7/31/09
Methoxychlor	A	ND		480	µg/Kg	40	7/31/09
Endosulfan sulfate	A	ND		97	µg/Kg	40	7/31/09
Endrin ketone	A	ND		97	µg/Kg	40	7/31/09
Chlordane	A	ND		480	µg/Kg	40	7/31/09
Toxaphene	A	ND		970	µg/Kg	40	7/31/09
Surr: Tetrachloro-m-xylene		110		0	%REC	40	7/31/09
Surr: Decachlorobiphenyl		173	S1	0	%REC	40	7/31/09

### PCBs/Solids by EPA\_8082

*Analyst: BAY*

Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		106		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		76.1		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: **C6 0-2.8'**

Sample Location: **C6 0-2.8'**

Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907409**

NRC Sample ID **0907409-01**

Collection Date: **7/15/09 2:45:00 PM**

Received Date: **7/16/09 10:09:00 AM**

Reported Date: **8/3/09 12:33:32 PM**

Matrix: **Solid**

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.0309		0.0206	mg/Kg	1	7/23/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		2.86	SC	0.02	%	1	7/23/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C6 2.8-5.8'

Sample Location: C6 2.8-5.8'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-02

Collection Date: 7/15/09 2:45:00 PM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:32 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							<i>Analyst: BAY</i>
alpha-BHC	A	ND		99	µg/Kg	40	7/31/09
gamma-BHC (Lindane)	A	ND		99	µg/Kg	40	7/31/09
beta-BHC	A	ND		99	µg/Kg	40	7/31/09
delta-BHC	A	ND		99	µg/Kg	40	7/31/09
Heptachlor	A	ND		99	µg/Kg	40	7/31/09
Aldrin	A	ND		99	µg/Kg	40	7/31/09
Heptachlor epoxide	A	ND		99	µg/Kg	40	7/31/09
gamma-Chlordane	A	ND		99	µg/Kg	40	7/31/09
alpha-Chlordane	A	ND		99	µg/Kg	40	7/31/09
4,4'-DDE	A	ND		99	µg/Kg	40	7/31/09
Endosulfan I	A	ND		99	µg/Kg	40	7/31/09
Dieldrin	A	ND		99	µg/Kg	40	7/31/09
Endrin	A	ND		99	µg/Kg	40	7/31/09
4,4'-DDD	A	ND		99	µg/Kg	40	7/31/09
Endosulfan II	A	ND		99	µg/Kg	40	7/31/09
4,4'-DDT	A	ND		99	µg/Kg	40	7/31/09
Endrin aldehyde	A	ND		99	µg/Kg	40	7/31/09
Methoxychlor	A	ND		500	µg/Kg	40	7/31/09
Endosulfan sulfate	A	ND		99	µg/Kg	40	7/31/09
Endrin ketone	A	ND		99	µg/Kg	40	7/31/09
Chlordane	A	ND		500	µg/Kg	40	7/31/09
Toxaphene	A	ND		990	µg/Kg	40	7/31/09
Surr: Tetrachloro-m-xylene		103		0	%REC	40	7/31/09
Surr: Decachlorobiphenyl		174	S1	0	%REC	40	7/31/09

### PCBs/Solids by EPA\_8082

*Analyst: BAY*

Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		105		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		78.9		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

S - Spike Recovery outside accepted recovery limits

J - Analyte detected below quantitation limits

R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

E - Value above quantitation range

\* - Value exceeds Maximum Contaminant Level

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C6 2.8-5.8'

Sample Location: C6 2.8-5.8'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-02

Collection Date: 7/15/09 2:45:00 PM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:32 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	0.0215		0.02	mg/Kg	1	7/23/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		2.08	SC	0.02	%	1	7/23/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: **C6 5.8-7'**  
Sample Location: **C6 5.8-7'**  
Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907409**  
NRC Sample ID **0907409-03**  
Collection Date: **7/15/09 2:45:00 PM**  
Received Date: **7/16/09 10:09:00 AM**  
Reported Date: **8/3/09 12:33:32 PM**  
Matrix: **Solid**

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							<i>Analyst: BAY</i>
alpha-BHC	A	ND		25	µg/Kg	10	7/31/09
gamma-BHC (Lindane)	A	ND		25	µg/Kg	10	7/31/09
beta-BHC	A	ND		25	µg/Kg	10	7/31/09
delta-BHC	A	ND		25	µg/Kg	10	7/31/09
Heptachlor	A	ND		25	µg/Kg	10	7/31/09
Aldrin	A	ND		25	µg/Kg	10	7/31/09
Heptachlor epoxide	A	ND		25	µg/Kg	10	7/31/09
gamma-Chlordane	A	ND		25	µg/Kg	10	7/31/09
alpha-Chlordane	A	ND		25	µg/Kg	10	7/31/09
4,4'-DDE	A	ND		25	µg/Kg	10	7/31/09
Endosulfan I	A	ND		25	µg/Kg	10	7/31/09
Dieldrin	A	ND		25	µg/Kg	10	7/31/09
Endrin	A	ND		25	µg/Kg	10	7/31/09
4,4'-DDD	A	ND		25	µg/Kg	10	7/31/09
Endosulfan II	A	ND		25	µg/Kg	10	7/31/09
4,4'-DDT	A	ND		25	µg/Kg	10	7/31/09
Endrin aldehyde	A	ND		25	µg/Kg	10	7/31/09
Methoxychlor	A	ND		120	µg/Kg	10	7/31/09
Endosulfan sulfate	A	ND		25	µg/Kg	10	7/31/09
Endrin ketone	A	ND		25	µg/Kg	10	7/31/09
Chlordane	A	ND		120	µg/Kg	10	7/31/09
Toxaphene	A	ND		250	µg/Kg	10	7/31/09
Surr: Tetrachloro-m-xylene		93.4		0	%REC	10	7/31/09
Surr: Decachlorobiphenyl		112		0	%REC	10	7/31/09
<b>PCBs/Solids by EPA_8082</b>							<i>Analyst: BAY</i>
Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		108		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		82.6		0	%REC	1	7/28/09

**Qualifiers:**  
 ND - Not Detected at the Reporting Limit  
 J - Analyte detected below quantitation limits  
 B - Analyte detected in the associated Method Blank  
 \* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits  
 R - RPD outside accepted recovery limits  
 E - Value above quantitation range  
 MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C6 5.8-7'

Sample Location: C6 5.8-7'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-03

Collection Date: 7/15/09 2:45:00 PM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:32 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	0.0213		0.0201	mg/Kg	1	7/23/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		1.66	SC	0.02	%	1	7/23/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C9 0-1.3'

Sample Location: C9 0-1.3'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-04

Collection Date: 7/15/09 1:40:00 PM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:32 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		25	µg/Kg	10	7/31/09
gamma-BHC (Lindane)	A	ND		25	µg/Kg	10	7/31/09
beta-BHC	A	ND		25	µg/Kg	10	7/31/09
delta-BHC	A	ND		25	µg/Kg	10	7/31/09
Heptachlor	A	ND		25	µg/Kg	10	7/31/09
Aldrin	A	ND		25	µg/Kg	10	7/31/09
Heptachlor epoxide	A	ND		25	µg/Kg	10	7/31/09
gamma-Chlordane	A	ND		25	µg/Kg	10	7/31/09
alpha-Chlordane	A	ND		25	µg/Kg	10	7/31/09
4,4'-DDE	A	ND		25	µg/Kg	10	7/31/09
Endosulfan I	A	ND		25	µg/Kg	10	7/31/09
Dieldrin	A	ND		25	µg/Kg	10	7/31/09
Endrin	A	ND		25	µg/Kg	10	7/31/09
4,4'-DDD	A	ND		25	µg/Kg	10	7/31/09
Endosulfan II	A	ND		25	µg/Kg	10	7/31/09
4,4'-DDT	A	ND		25	µg/Kg	10	7/31/09
Endrin aldehyde	A	ND		25	µg/Kg	10	7/31/09
Methoxychlor	A	ND		120	µg/Kg	10	7/31/09
Endosulfan sulfate	A	ND		25	µg/Kg	10	7/31/09
Endrin ketone	A	ND		25	µg/Kg	10	7/31/09
Chlordane	A	ND		120	µg/Kg	10	7/31/09
Toxaphene	A	ND		250	µg/Kg	10	7/31/09
Surr: Tetrachloro-m-xylene		90.4		0	%REC	10	7/31/09
Surr: Decachlorobiphenyl		110		0	%REC	10	7/31/09

### PCBs/Solids by EPA\_8082

Analyst: BAY

Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		97.1		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		78.6		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: **C9 0-1.3'**

Sample Location: **C9 0-1.3'**

Project: **Proj 95884-10 - JC SAP**

Lab Order: **0907409**

NRC Sample ID **0907409-04**

Collection Date: **7/15/09 1:40:00 PM**

Received Date: **7/16/09 10:09:00 AM**

Reported Date: **8/3/09 12:33:32 PM**

Matrix: **Solid**

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	ND		0.0201	mg/Kg	1	7/23/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		0.207	SC	0.02	%	1	7/23/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street  
Portland, OR 97204

Client Sample ID: C11 0-1.6'

Sample Location: C11 0-1.6'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-05

Collection Date: 7/15/09 11:05:00 AM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:32 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							<i>Analyst: BAY</i>
alpha-BHC	A	ND		49	µg/Kg	20	7/31/09
gamma-BHC (Lindane)	A	ND		49	µg/Kg	20	7/31/09
beta-BHC	A	ND		49	µg/Kg	20	7/31/09
delta-BHC	A	ND		49	µg/Kg	20	7/31/09
Heptachlor	A	ND		49	µg/Kg	20	7/31/09
Aldrin	A	ND		49	µg/Kg	20	7/31/09
Heptachlor epoxide	A	ND		49	µg/Kg	20	7/31/09
gamma-Chlordane	A	ND		49	µg/Kg	20	7/31/09
alpha-Chlordane	A	ND		49	µg/Kg	20	7/31/09
4,4'-DDE	A	ND		49	µg/Kg	20	7/31/09
Endosulfan I	A	ND		49	µg/Kg	20	7/31/09
Dieldrin	A	ND		49	µg/Kg	20	7/31/09
Endrin	A	ND		49	µg/Kg	20	7/31/09
4,4'-DDD	A	ND		49	µg/Kg	20	7/31/09
Endosulfan II	A	ND		49	µg/Kg	20	7/31/09
4,4'-DDT	A	ND		49	µg/Kg	20	7/31/09
Endrin aldehyde	A	ND		49	µg/Kg	20	7/31/09
Methoxychlor	A	ND		240	µg/Kg	20	7/31/09
Endosulfan sulfate	A	ND		49	µg/Kg	20	7/31/09
Endrin ketone	A	ND		49	µg/Kg	20	7/31/09
Chlordane	A	ND		240	µg/Kg	20	7/31/09
Toxaphene	A	ND		490	µg/Kg	20	7/31/09
Surr: Tetrachloro-m-xylene		98.7		0	%REC	20	7/31/09
Surr: Decachlorobiphenyl		117		0	%REC	20	7/31/09

### PCBs/Solids by EPA\_8082

*Analyst: BAY*

Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		98.6		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		83.0		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C11 0-1.6'

Sample Location: C11 0-1.6'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-05

Collection Date: 7/15/09 11:05:00 AM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:32 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: BAR
Mercury	A	ND		0.0201	mg/Kg	1	7/23/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: SUB
Organic Carbon, Total		0.280	SC	0.02	%	1	7/23/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C11 1.6-3.2'

Sample Location: C11 1.6-3.2'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-06

Collection Date: 7/15/09 11:05:00 AM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:32 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		24	µg/Kg	10	7/31/09
gamma-BHC (Lindane)	A	ND		24	µg/Kg	10	7/31/09
beta-BHC	A	ND		24	µg/Kg	10	7/31/09
delta-BHC	A	ND		24	µg/Kg	10	7/31/09
Heptachlor	A	ND		24	µg/Kg	10	7/31/09
Aldrin	A	ND		24	µg/Kg	10	7/31/09
Heptachlor epoxide	A	ND		24	µg/Kg	10	7/31/09
gamma-Chlordane	A	ND		24	µg/Kg	10	7/31/09
alpha-Chlordane	A	ND		24	µg/Kg	10	7/31/09
4,4'-DDE	A	ND		24	µg/Kg	10	7/31/09
Endosulfan I	A	ND		24	µg/Kg	10	7/31/09
Dieldrin	A	ND		24	µg/Kg	10	7/31/09
Endrin	A	ND		24	µg/Kg	10	7/31/09
4,4'-DDD	A	ND		24	µg/Kg	10	7/31/09
Endosulfan II	A	ND		24	µg/Kg	10	7/31/09
4,4'-DDT	A	ND		24	µg/Kg	10	7/31/09
Endrin aldehyde	A	ND		24	µg/Kg	10	7/31/09
Methoxychlor	A	ND		120	µg/Kg	10	7/31/09
Endosulfan sulfate	A	ND		24	µg/Kg	10	7/31/09
Endrin ketone	A	ND		24	µg/Kg	10	7/31/09
Chlordane	A	ND		120	µg/Kg	10	7/31/09
Toxaphene	A	ND		240	µg/Kg	10	7/31/09
Surr: Tetrachloro-m-xylene		98.7		0	%REC	10	7/31/09
Surr: Decachlorobiphenyl		112		0	%REC	10	7/31/09

### PCBs/Solids by EPA\_8082

Analyst: BAY

Aroclor 1016	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/28/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/28/09
Surr: Decachlorobiphenyl		98.8		0	%REC	1	7/28/09
Surr: Tetrachloro-m-xylene		79.6		0	%REC	1	7/28/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

HDR Engineering  
1001 SW 5th Street  
Portland, OR 97204  
Client Sample ID: C11 1.6-3.2'  
Sample Location: C11 1.6-3.2'  
Project: Proj 95884-10 - JC SAP

Lab Order: 0907409  
NRC Sample ID 0907409-06  
Collection Date: 7/15/09 11:05:00 AM  
Received Date: 7/16/09 10:09:00 AM  
Reported Date: 8/3/09 12:33:33 PM  
Matrix: Solid

### ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	ND		0.0198	mg/Kg	1	7/23/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		0.377	SC	0.02	%	1	7/23/09

#### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street  
Portland, OR 97204

Client Sample ID: C12 0-1.5'

Sample Location: C12 0-1.5'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-07

Collection Date: 7/15/09 10:30:00 AM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:33 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		120	µg/Kg	50	7/31/09
gamma-BHC (Lindane)	A	ND		120	µg/Kg	50	7/31/09
beta-BHC	A	ND		120	µg/Kg	50	7/31/09
delta-BHC	A	ND		120	µg/Kg	50	7/31/09
Heptachlor	A	ND		120	µg/Kg	50	7/31/09
Aldrin	A	ND		120	µg/Kg	50	7/31/09
Heptachlor epoxide	A	ND		120	µg/Kg	50	7/31/09
gamma-Chlordane	A	ND		120	µg/Kg	50	7/31/09
alpha-Chlordane	A	ND		120	µg/Kg	50	7/31/09
4,4'-DDE	A	ND		120	µg/Kg	50	7/31/09
Endosulfan I	A	ND		120	µg/Kg	50	7/31/09
Dieldrin	A	ND		120	µg/Kg	50	7/31/09
Endrin	A	ND		120	µg/Kg	50	7/31/09
4,4'-DDD	A	ND		120	µg/Kg	50	7/31/09
Endosulfan II	A	ND		120	µg/Kg	50	7/31/09
4,4'-DDT	A	ND		120	µg/Kg	50	7/31/09
Endrin aldehyde	A	ND		120	µg/Kg	50	7/31/09
Methoxychlor	A	ND		620	µg/Kg	50	7/31/09
Endosulfan sulfate	A	ND		120	µg/Kg	50	7/31/09
Endrin ketone	A	ND		120	µg/Kg	50	7/31/09
Chlordane	A	ND		620	µg/Kg	50	7/31/09
Toxaphene	A	ND		1200	µg/Kg	50	7/31/09
Surr: Tetrachloro-m-xylene		118		0	%REC	50	7/31/09
Surr: Decachlorobiphenyl		233	S1	0	%REC	50	7/31/09
<b>PCBs/Solids by EPA_8082</b>							Analyst: BAY
Aroclor 1016	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/29/09
Surr: Decachlorobiphenyl		103		0	%REC	1	7/29/09
Surr: Tetrachloro-m-xylene		99.0		0	%REC	1	7/29/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR0028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C12 0-1.5'

Sample Location: C12 0-1.5'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-07

Collection Date: 7/15/09 10:30:00 AM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:33 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	ND		0.0203	mg/Kg	1	7/23/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		0.714	SC	0.02	%	1	7/23/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street

Portland, OR 97204

Client Sample ID: C12 1.5-3'

Sample Location: C12 1.5-3'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-08

Collection Date: 7/15/09 10:30:00 AM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:33 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC		Qual	MRL	Units	Dilution	
	Accredited	Result				Factor	Date Analyzed
<b>Organochlorine Pesticides by EPA 8081</b>							Analyst: BAY
alpha-BHC	A	ND		48	µg/Kg	20	7/31/09
gamma-BHC (Lindane)	A	ND		48	µg/Kg	20	7/31/09
beta-BHC	A	ND		48	µg/Kg	20	7/31/09
delta-BHC	A	ND		48	µg/Kg	20	7/31/09
Heptachlor	A	ND		48	µg/Kg	20	7/31/09
Aldrin	A	ND		48	µg/Kg	20	7/31/09
Heptachlor epoxide	A	ND		48	µg/Kg	20	7/31/09
gamma-Chlordane	A	ND		48	µg/Kg	20	7/31/09
alpha-Chlordane	A	ND		48	µg/Kg	20	7/31/09
4,4'-DDE	A	ND		48	µg/Kg	20	7/31/09
Endosulfan I	A	ND		48	µg/Kg	20	7/31/09
Dieldrin	A	ND		48	µg/Kg	20	7/31/09
Endrin	A	ND		48	µg/Kg	20	7/31/09
4,4'-DDD	A	ND		48	µg/Kg	20	7/31/09
Endosulfan II	A	ND		48	µg/Kg	20	7/31/09
4,4'-DDT	A	ND		48	µg/Kg	20	7/31/09
Endrin aldehyde	A	ND		48	µg/Kg	20	7/31/09
Methoxychlor	A	ND		240	µg/Kg	20	7/31/09
Endosulfan sulfate	A	ND		48	µg/Kg	20	7/31/09
Endrin ketone	A	ND		48	µg/Kg	20	7/31/09
Chlordane	A	ND		240	µg/Kg	20	7/31/09
Toxaphene	A	ND		480	µg/Kg	20	7/31/09
Surr: Tetrachloro-m-xylene		102		0	%REC	20	7/31/09
Surr: Decachlorobiphenyl		114		0	%REC	20	7/31/09

### PCBs/Solids by EPA\_8082

Analyst: BAY

Aroclor 1016	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1221	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1232	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1242	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1248	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1254	A	ND		12	µg/Kg	1	7/29/09
Aroclor 1260	A	ND		12	µg/Kg	1	7/29/09
Surr: Decachlorobiphenyl		106		0	%REC	1	7/29/09
Surr: Tetrachloro-m-xylene		91.4		0	%REC	1	7/29/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

## Analysis Report

ORELAP 100016  
EPA OR00028

### HDR Engineering

1001 SW 5th Street  
Portland, OR 97204

Client Sample ID: C12 1.5-3'

Sample Location: C12 1.5-3'

Project: Proj 95884-10 - JC SAP

Lab Order: 0907409

NRC Sample ID 0907409-08

Collection Date: 7/15/09 10:30:00 AM

Received Date: 7/16/09 10:09:00 AM

Reported Date: 8/3/09 12:33:33 PM

Matrix: Solid

## ANALYTICAL RESULTS

Analyses	NELAC Accredited	Result	Qual	MRL	Units	Dilution Factor	Date Analyzed
<b>Trace Metals by EPA 7471A</b>							Analyst: <b>BAR</b>
Mercury	A	ND		0.0201	mg/Kg	1	7/23/09
<b>Total Organic Carbon by Plumb 1981</b>							Analyst: <b>SUB</b>
Organic Carbon, Total		0.510	SC	0.02	%	1	7/23/09

### Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

\* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

MRL - Minimum Reporting Limit

# Neilson Research Corporation

## DATA FLAGS

- B Analyte detected in the associated Method Blank.
- C Sample(s) does not meet NELAC/ORELAP sample acceptance criteria. See Case Narrative.
- CU Cleanup performed prior to analysis: either H<sub>2</sub>SO<sub>4</sub>/Silica Gel or Florosil.
- D1 The diesel elution pattern for the sample is not typical.
- D2 The sample appears to be a heavier hydrocarbon range than diesel.
- D3 The sample appears to be a lighter hydrocarbon range than diesel.
- D4 Detected hydrocarbons do not have pattern and range consistent with typical petroleum products and may be due to biogenic interference.
- D5 Detected hydrocarbons in the diesel range appear to be weathered diesel.
- E Estimated value.
- ER Elevated reporting limit due to matrix.
- G1 The gasoline elution pattern for the sample is not typical.
- G2 The sample appears to be a heavier hydrocarbon range than gasoline.
- G3 The sample appears to be a lighter hydrocarbon range than gasoline.
- G4 Detected hydrocarbons in the gasoline range appear to be weathered gasoline.
- HP Sample re-analysis performed outside of method specified holding time.
- HR Sample received outside of method specified holding time.
- HS Sample analyzed for volatile organics contained headspace.
- HT At the client's request, the sample was analyzed outside of method specified holding time.
- H Analysis performed outside of method specified holding time.
- J Analyte detected below the Minimum Reporting Limit (MRL) and above the Method Detection Limit (MDL). The J flag result is an estimated value.
- MI Surrogate or Matrix Spike recovery is out of control limits due to matrix interference.
- N See Case Narrative.
- NI Some QA criteria may be outside control limits. Insufficient sample remains for reanalysis.
- Q Closing CCV or LCS exceeded high recovery limits, but associated samples are non-detect and the sample results are not affected. Data meets EPA/NELAC requirements.
- R RPD outside accepted recovery limits.
- R1 Analyses are not controlled on RPD values from sample concentration less than 10 times the reporting limit.
- R2 Analyses are not controlled on RPD values from sample concentration less than 5 times the reporting limit.
- R3 The RPD and/or % recovery for the DUP or QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
- R4 Duplicate analysis failed due to result being at or near method reporting limit.
- RPD Relative percent difference.
- Reporting Limits: Report limits (MDLs, MRLs & PQLs) are adjusted based on variations in sample preparation amounts, analytical dilutions, and percent solids, where applicable.
- S Spike recovery outside accepted recovery limits.
- S1 Surrogate or Matrix Spike recovery is outside of control limits due to dilution necessary for analysis.
- SC Sub-contracted to another laboratory for analysis.
- TCLP Toxicity Characteristic Leaching Procedure – Sample submitted contained < 0.5% solids.
- X1 The motor oil elution pattern for the sample is not typical.
- X2 The sample appears to be a heavier hydrocarbon range than motor oil.
- X3 The sample appears to be a lighter hydrocarbon range than motor oil.
- \* Value exceeds Maximum Contaminant Level
- # Value exceeds regulatory level for TCLP contaminant.

# Neilson Research Corporation

Date: 03-Aug-09

CLIENT: HDR Engineering

Work Order: 0907409

Project: Proj 95884-10 - JC SAP

## ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8081\_S

Sample ID: MB-18682	SampType: MBLK	TestCode: EPA8081_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46321						
Client ID: ZZZZ	Batch ID: 18682	TestNo: EPA 8081	(EPA 3550B)	Analysis Date: 7/30/09	SeqNo: 691060						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

alpha-BHC	ND	2.5									
gamma-BHC (Lindane)	ND	2.5									
beta-BHC	ND	2.5									
delta-BHC	ND	2.5									
Heptachlor	ND	2.5									
Aldrin	ND	2.5									
Heptachlor epoxide	ND	2.5									
gamma-Chlordane	ND	2.5									
alpha-Chlordane	ND	2.5									
4,4'-DDE	ND	2.5									
Endosulfan I	ND	2.5									
Dieldrin	ND	2.5									
Endrin	ND	2.5									
4,4'-DDD	ND	2.5									
Endosulfan II	ND	2.5									
4,4'-DDT	ND	2.5									
Endrin aldehyde	ND	2.5									
Methoxychlor	ND	12									
Endosulfan sulfate	ND	2.5									
Endrin ketone	ND	2.5									
Chlordane	ND	12									
Toxaphene	ND	25									
Surr: Tetrachloro-m-xylene	12.85	0	12.5	0	103	60	140				
Surr: Decachlorobiphenyl	15.08	0	12.5	0	121	60	140				

Sample ID: LCS-18682	SampType: LCS	TestCode: EPA8081_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46321						
Client ID: ZZZZ	Batch ID: 18682	TestNo: EPA 8081	(EPA 3550B)	Analysis Date: 7/31/09	SeqNo: 691061						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

**Qualifiers:** E Value above quantitation range H Holding times for preparation or analysis exceeded J Analyte detected below quantitation limits  
 ND Not Detected at the Minimum Reporting Limit R RPD outside accepted recovery limits S Spike Recovery outside accepted recovery limits

# Neilson Research Corporation

Date: 03-Aug-09

**CLIENT:** HDR Engineering  
**Work Order:** 0907409  
**Project:** Proj 95884-10 - JC SAP

## ANALYTICAL QC SUMMARY REPORT

**TestCode:** EPA8081\_S

Sample ID: **LCS-18682**    SampType: **LCS**    TestCode: **EPA8081\_S**    Units: **µg/Kg**    Prep Date: **7/22/09**    RunNo: **46321**  
 Client ID: **ZZZZZ**    Batch ID: **18682**    TestNo: **EPA 8081**    (EPA 3550B)    Analysis Date: **7/31/09**    SeqNo: **691061**

Analyte	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
alpha-BHC	2.5	12.5	0	109	60	140				
gamma-BHC (Lindane)	2.5	12.5	0	108	60	140				
beta-BHC	2.5	12.5	0	101	60	140				
delta-BHC	2.5	12.5	0	109	60	140				
Heptachlor	2.5	12.5	0	109	60	140				
Aldrin	2.5	12.5	0	103	60	140				
Heptachlor epoxide	2.5	12.5	0	103	60	140				
gamma-Chlordane	2.5	12.5	0	104	60	140				
alpha-Chlordane	2.5	12.5	0	103	60	140				
4,4'-DDE	2.5	12.5	0	106	60	140				
Endosulfan I	2.5	12.5	0	104	60	140				
Dieldrin	2.5	12.5	0	107	60	140				
Endrin	2.5	12.5	0	111	60	140				
4,4'-DDD	2.5	12.5	0	106	60	140				
Endosulfan II	2.5	12.5	0	111	60	140				
4,4'-DDT	2.5	12.5	0	129	60	140				
Endrin aldehyde	2.5	12.5	0	102	60	140				
Endosulfan sulfate	2.5	12.5	0	109	60	140				
Surr: Tetrachloro-m-xylene	0	12.5	0	109	60	140				
Surr: Decachlorobiphenyl	0	12.5	0	129	60	140				

Sample ID: **0907409-08AMS**    SampType: **MS**    TestCode: **EPA8081\_S**    Units: **µg/Kg**    Prep Date: **7/22/09**    RunNo: **46321**  
 Client ID: **C12.1.5-3'**    Batch ID: **18682**    TestNo: **EPA 8081**    (EPA 3550B)    Analysis Date: **7/31/09**    SeqNo: **691063**

Analyte	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
alpha-BHC	50	12.39	0	101	40	160				
gamma-BHC (Lindane)	50	12.39	0	105	40	160				
beta-BHC	50	12.39	0	110	40	160				
delta-BHC	50	12.39	0	105	40	160				

**Qualifiers:** E Value above quantitation range    H Holding times for preparation or analysis exceeded    J Analyte detected below quantitation limits  
 ND Not Detected at the Minimum Reporting Limit    R RPD outside accepted recovery limits    S Spike Recovery outside accepted recovery limits

# Neilson Research Corporation

Date: 03-Aug-09

CLIENT: HDR Engineering

Work Order: 0907409

Project: Proj 95884-10 - JC SAP

## ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8081\_S

Sample ID: 0907409-08AMS	SampType: MS	TestCode: EPA8081_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46321						
Client ID: C12 1.5-3'	Batch ID: 18682	TestNo: EPA 8081	(EPA 3550B)	Analysis Date: 7/31/09	SeqNo: 691063						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Heptachlor	ND	50	12.39	0	107	40	160				
Aldrin	ND	50	12.39	0	108	40	160				
Heptachlor epoxide	ND	50	12.39	0	111	40	160				
gamma-Chlordane	ND	50	12.39	0	110	40	160				
alpha-Chlordane	ND	50	12.39	0	112	40	160				
4,4'-DDE	ND	50	12.39	0	110	40	160				
Endosulfan I	ND	50	12.39	0	112	40	160				
Dieldrin	ND	50	12.39	0	112	40	160				
Endrin	ND	50	12.39	0	107	40	160				
4,4'-DDD	ND	50	12.39	0	112	40	160				
Endosulfan II	ND	50	12.39	0	116	40	160				
4,4'-DDT	ND	50	12.39	0	112	40	160				
Endrin aldehyde	ND	50	12.39	0	110	40	160				
Methoxychlor	ND	250	12.39	0	112	40	160				
Endosulfan sulfate	ND	50	12.39	0	119	40	160				
Surr: Tetrachloro-m-xylene	11.85	0	12.39	0	95.7	60	140				
Surr: Decachlorobiphenyl	13.42	0	12.39	0	108	60	140				

Sample ID: 0907409-08AMS	SampType: MSD	TestCode: EPA8081_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46321						
Client ID: C12 1.5-3'	Batch ID: 18682	TestNo: EPA 8081	(EPA 3550B)	Analysis Date: 7/31/09	SeqNo: 691064						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

alpha-BHC	ND	49	12.29	0	98.4	40	160	0	0	25	
gamma-BHC (Lindane)	ND	49	12.29	0	103	40	160	0	0	25	
beta-BHC	ND	49	12.29	0	111	40	160	0	0	25	
delta-BHC	ND	49	12.29	0	105	40	160	0	0	25	
Heptachlor	ND	49	12.29	0	104	40	160	0	0	25	
Aldrin	ND	49	12.29	0	106	40	160	0	0	25	
Heptachlor epoxide	ND	49	12.29	0	110	40	160	0	0	25	

**Qualifiers:** E Value above quantitation range H Holding times for preparation or analysis exceeded J Analyte detected below quantitation limits  
 ND Not Detected at the Minimum Reporting Limit R RPD outside accepted recovery limits S Spike Recovery outside accepted recovery limits

# Neilson Research Corporation

Date: 03-Aug-09

CLIENT: HDR Engineering

Work Order: 0907409

Project: Proj 95884-10 - JC SAP

## ANALYTICAL QC SUMMARY REPORT

TestCode: EPA8081\_S

Sample ID: 0907409-08AMSD	SampType: MSD	TestCode: EPA8081_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46321						
Client ID: C12 1.5-3'	Batch ID: 18682	TestNo: EPA 8081	(EPA 3550B)	Analysis Date: 7/31/09	SeqNo: 691064						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
gamma-Chlordane	ND	49	12.29	0	111	40	160	0	0	25	
alpha-Chlordane	ND	49	12.29	0	113	40	160	0	0	25	
4,4'-DDE	ND	49	12.29	0	111	40	160	0	0	25	
Endosulfan I	ND	49	12.29	0	112	40	160	0	0	25	
Dieldrin	ND	49	12.29	0	112	40	160	0	0	25	
Endrin	ND	49	12.29	0	108	40	160	0	0	25	
4,4'-DDD	ND	49	12.29	0	117	40	160	0	0	25	
Endosulfan II	ND	49	12.29	0	118	40	160	0	0	25	
4,4'-DDT	ND	49	12.29	0	114	40	160	0	0	25	
Endrin aldehyde	ND	49	12.29	0	114	40	160	0	0	25	
Methoxychlor	ND	250	12.29	0	121	40	160	0	0	25	
Endosulfan sulfate	ND	49	12.29	0	121	40	160	0	0	25	
Surr: Tetrachloro-m-xylene	11.14	0	12.29	0	90.6	60	140	0	0	25	
Surr: Decachlorobiphenyl	13.67	0	12.29	0	111	60	140	0	0	25	

**Qualifiers:** E Value above quantitation range H Holding times for preparation or analysis exceeded J Analyte detected below quantitation limits  
 ND Not Detected at the Minimum Reporting Limit R RPD outside accepted recovery limits S Spike Recovery outside accepted recovery limits

# Neilson Research Corporation

Date: 03-Aug-09

CLIENT: HDR Engineering

Work Order: 0907409

Project: Proj 95884-10 - JC SAP

## ANALYTICAL QC SUMMARY REPORT

TestCode: HG\_S\_7471

Sample ID: MB-18673	SampType: MBLK	TestCode: HG_S_7471	Units: mg/Kg	Prep Date: 7/21/09	RunNo: 46227						
Client ID: ZZZZ	Batch ID: 18673	TestNo: EPA 7471A	(EPA 7471A)	Analysis Date: 7/23/09	SeqNo: 689753						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.0106									

Sample ID: LCS-18673	SampType: LCS	TestCode: HG_S_7471	Units: mg/Kg	Prep Date: 7/21/09	RunNo: 46227						
Client ID: ZZZZ	Batch ID: 18673	TestNo: EPA 7471A	(EPA 7471A)	Analysis Date: 7/23/09	SeqNo: 689754						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	3.383	0.203	3.86	0	87.7	50	150				

Sample ID: 0907411-09AMS	SampType: MS	TestCode: HG_S_7471	Units: mg/Kg-dry	Prep Date: 7/21/09	RunNo: 46227						
Client ID: ZZZZ	Batch ID: 18673	TestNo: EPA 7471A	(EPA 7471A)	Analysis Date: 7/23/09	SeqNo: 689764						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	20.68	0.349	17.44	1.755	109	75	125				

Sample ID: 0907411-09AMSD	SampType: MSD	TestCode: HG_S_7471	Units: mg/Kg-dry	Prep Date: 7/21/09	RunNo: 46227						
Client ID: ZZZZ	Batch ID: 18673	TestNo: EPA 7471A	(EPA 7471A)	Analysis Date: 7/23/09	SeqNo: 689765						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	17.66	0.348	17.39	1.755	91.5	75	125	20.68	15.7		25

Qualifiers: E Value above quantitation range H Holding times for preparation or analysis exceeded J Analyte detected below quantitation limits  
 ND Not Detected at the Minimum Reporting Limit R RPD outside accepted recovery limits S Spike Recovery outside accepted recovery limits

# Neilson Research Corporation

Date: 03-Aug-09

CLIENT: HDR Engineering

Work Order: 0907409

Project: Proj 95884-10 - JC SAP

## ANALYTICAL QC SUMMARY REPORT

TestCode: PCB\_S

Sample ID: MB-18681	SampType: MBLK	TestCode: PCB_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46279						
Client ID: ZZZZ	Batch ID: 18681	TestNo: EPA_8082	(EPA 3550B)	Analysis Date: 7/28/09	SeqNo: 690388						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Aroclor 1016	ND	12									
Aroclor 1221	ND	12									
Aroclor 1232	ND	12									
Aroclor 1242	ND	12									
Aroclor 1248	ND	12									
Aroclor 1254	ND	12									
Aroclor 1260	ND	12									
Surr: Decachlorobiphenyl	14.00	0	12.5	0	112	60	140				
Surr: Tetrachloro-m-xylene	11.96	0	12.5	0	95.6	60	140				

Sample ID: LCS-18681	SampType: LCS	TestCode: PCB_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46279						
Client ID: ZZZZ	Batch ID: 18681	TestNo: EPA_8082	(EPA 3550B)	Analysis Date: 7/28/09	SeqNo: 690389						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Aroclor 1016	117.0	12	125	0	93.6	60	140				
Aroclor 1260	114.5	12	125	0	91.6	60	140				
Surr: Decachlorobiphenyl	13.00	0	12.5	0	104	60	140				
Surr: Tetrachloro-m-xylene	11.55	0	12.5	0	92.4	60	140				

Sample ID: 0907409-07AMS	SampType: MS	TestCode: PCB_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46279						
Client ID: C12 0-1.5'	Batch ID: 18681	TestNo: EPA_8082	(EPA 3550B)	Analysis Date: 7/29/09	SeqNo: 690532						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Aroclor 1016	122.8	12	123.3	0	99.6	40	160				
Aroclor 1260	120.0	12	123.3	0	97.4	40	160				
Surr: Decachlorobiphenyl	14.27	0	12.33	0	116	60	140				
Surr: Tetrachloro-m-xylene	11.65	0	12.33	0	94.5	60	140				

**Qualifiers:** E Value above quantitation range H Holding times for preparation or analysis exceeded J Analyte detected below quantitation limits  
 ND Not Detected at the Minimum Reporting Limit R RPD outside accepted recovery limits S Spike Recovery outside accepted recovery limits

**Neilson Research Corporation**

Date: 03-Aug-09

CLIENT: HDR Engineering

Work Order: 0907409

Project: Proj 95884-10 - JC SAP

**ANALYTICAL QC SUMMARY REPORT**

TestCode: PCB\_S

Sample ID: 0907409-07AMSD	SampType: MSD	TestCode: PCB_S	Units: µg/Kg	Prep Date: 7/22/09	RunNo: 46279						
Client ID: C12 0-1.5'	Batch ID: 18681	TestNo: EPA_8082	(EPA 3550B)	Analysis Date: 7/29/09	SeqNo: 690533						
Analyte	Result	MRL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Aroclor 1016	104.1	12	120.6	0	86.3	40	160	122.8	16.5	25	
Aroclor 1260	98.99	12	120.6	0	82.1	40	160	120	19.2	25	
Surr: Decachlorobiphenyl	11.11	0	12.06	0	92.1	60	140	0	0	0	
Surr: Tetrachloro-m-xylene	10.16	0	12.06	0	84.2	60	140	0	0	0	

**Qualifiers:** E Value above quantitation range H Holding times for preparation or analysis exceeded J Analyte detected below quantitation limits  
 ND Not Detected at the Minimum Reporting Limit R RPD outside accepted recovery limits S Spike Recovery outside accepted recovery limits



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

July 24, 2009

Fay Fowler  
Neilson Research Corporation  
245 South Grape Street  
Medford, OR 97501

**Client Project: 0907409**  
**ARI ID: PH18**

Dear Ms. Fowler:

Please find enclosed the original Chain of Custody, sample receipt documentation, and the final data for the project referenced above. Analytical Resources, Inc. accepted eight sediment samples in good condition on July 17, 2009. For further details regarding sample receipt please refer to the enclosed Cooler Receipt Form.

The samples were analyzed for Total Organic Carbon, as requested on the Chain of Custody.

The analysis was completed routinely.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Respectfully,  
ANALYTICAL RESOURCES, INC.

A handwritten signature in black ink, appearing to read "Eric Branson", with a long horizontal line extending to the right.

Eric Branson  
Project Manager  
(206) 695-6213  
[eric@arilabs.com](mailto:eric@arilabs.com)  
[www.arilabs.com](http://www.arilabs.com)

- Enclosures -





# Cooler Receipt Form

ARI Client: Nelson Research  
 COC No(s): \_\_\_\_\_ (NA)  
 Assigned ARI Job No: PH19

Project Name: 0907409  
 Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_  
 Tracking No: 7916783498685 NA

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES  NO   
 Were custody papers included with the cooler? ..... YES  NO   
 Were custody papers properly filled out (ink, signed, etc.) ..... YES  NO   
 Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)..... 3.4  
 If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 487405

Cooler Accepted by: AV Date: 7/17/09 Time: 1216

*Complete custody forms and attach all shipping documents*

**Log-in Phase:**

Was a temperature blank included in the cooler? ..... YES  NO   
 What kind of packing material was used? ... Bubble Wrap  Wet Ice  Gel Packs  Baggies  Foam Block  Paper  Other: \_\_\_\_\_  
 Was sufficient ice used (if appropriate)? ..... NA YES  NO   
 Were all bottles sealed in individual plastic bags? ..... YES  NO   
 Did all bottles arrive in good condition (unbroken)? ..... YES  NO   
 Were all bottle labels complete and legible? ..... YES  NO   
 Did the number of containers listed on COC match with the number of containers received? ..... YES  NO   
 Did all bottle labels and tags agree with custody papers? ..... YES  NO   
 Were all bottles used correct for the requested analyses? ..... YES  NO   
 Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... NA  YES  NO   
 Were all VOC vials free of air bubbles? ..... NA  YES  NO   
 Was sufficient amount of sample sent in each bottle? ..... YES  NO

Samples Logged by: WA Date: 7/17/09 Time: 1348

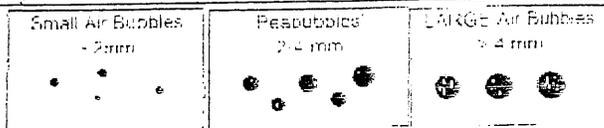
**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

Sample 0907409 - 05B Lid broken in transit. Sample not compromised. (sample still intact.)

By: \_\_\_\_\_ Date: \_\_\_\_\_



Small → "sm"  
 Peabubbles → "pb"  
 Large → "lg"  
 Headspace → "hs"

From: Origin ID: MFRA (541) 770-5678  
Kim Ramsay  
Neilson Research Corporation  
245 South Grape Street  
Medford, OR 97501



Ship Date: 16JUL09  
ActWgt: 21.0 LB  
CAD: 7718540/NET9060  
Account#: S\*\*\*\*\*

Delivery Address Bar Code



Ref #  
Invoice #  
PO #  
Dept #

SHIP TO: (206) 695-6200 BILL SENDER

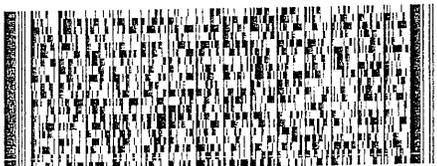
Sue Dunning  
Analytical Resources Inc.  
4611 S 134TH PL STE 100

TUKWILA, WA 98168

FRI - 17JUL A1

TRK# 7967 8349 8685  
0201

STANDARD OVERNIGHT



98168  
WA-US  
SEA

85 BFIA



After printing this label:

1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

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SAMPLE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:   
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Client ID: 0907409-01B  
ARI ID: 09-17010 PH18A

Analyte	Date	Method	Units	RL	Sample
Total Solids	07/22/09 072209#1	EPA 160.3	Percent	0.01	43.60
Total Organic Carbon	07/23/09 072309#1	Plumb, 1981	Percent	0.020	2.86

RL Analytical reporting limit  
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:  
Reported: 07/24/09

A handwritten signature in black ink, appearing to be "WJ", written over the "Data Release Authorized" text.

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Client ID: 0907409-02B  
ARI ID: 09-17011 PH18B

Analyte	Date	Method	Units	RL	Sample
Total Solids	07/22/09 072209#1	EPA 160.3	Percent	0.01	60.20
Total Organic Carbon	07/23/09 072309#1	Plumb, 1981	Percent	0.020	2.08

RL Analytical reporting limit  
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized: *[Signature]*  
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Client ID: 0907409-03B  
ARI ID: 09-17012 PH18C

Analyte	Date	Method	Units	RL	Sample
Total Solids	07/22/09 072209#1	EPA 160.3	Percent	0.01	65.50
Total Organic Carbon	07/23/09 072309#1	Plumb, 1981	Percent	0.020	1.66

RL Analytical reporting limit  
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:   
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Client ID: 0907409-04B  
ARI ID: 09-17013 PH18D

Analyte	Date	Method	Units	RL	Sample
Total Solids	07/22/09 072209#1	EPA 160.3	Percent	0.01	81.20
Total Organic Carbon	07/23/09 072309#1	Plumb, 1981	Percent	0.020	0.207

RL Analytical reporting limit  
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized  
Reported: 07/24/09

A handwritten signature in black ink, appearing to be 'M. Neilson', written over the 'Data Release Authorized' text.

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

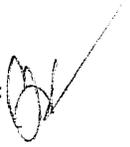
Client ID: 0907409-05B  
ARI ID: 09-17014 PH18E

Analyte	Date	Method	Units	RL	Sample
Total Solids	07/22/09 072209#1	EPA 160.3	Percent	0.01	82.20
Total Organic Carbon	07/23/09 072309#1	Plumb, 1981	Percent	0.020	0.280

RL Analytical reporting limit  
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:   
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Client ID: 0907409-06B  
ARI ID: 09-17015 PH18F

Analyte	Date	Method	Units	RL	Sample
Total Solids	07/22/09 072209#1	EPA 160.3	Percent	0.01	78.30
Total Organic Carbon	07/23/09 072309#1	Plumb, 1981	Percent	0.020	0.377

RL Analytical reporting limit  
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:   
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Client ID: 0907409-07B  
ARI ID: 09-17016 PH18G

Analyte	Date	Method	Units	RL	Sample
Total Solids	07/22/09 072209#1	EPA 160.3	Percent	0.01	68.90
Total Organic Carbon	07/23/09 072309#1	Plumb, 1981	Percent	0.020	0.714

RL Analytical reporting limit  
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:   
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Client ID: 0907409-08B  
ARI ID: 09-17017 PH18H

Analyte	Date	Method	Units	RL	Sample
Total Solids	07/22/09 072209#1	EPA 160.3	Percent	0.01	77.30
Total Organic Carbon	07/23/09 072309#1	Plumb, 1981	Percent	0.020	0.510

RL Analytical reporting limit  
U Undetected at reported detection limit

MS/MSD RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized  
Reported: 07/24/09

A handwritten signature in black ink, appearing to be 'M' or 'B', written over the text 'Data Release Authorized'.

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Analyte	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: PH18A Client ID: 0907409-01B						
Total Organic Carbon	07/23/09	Percent	2.86	7.84	4.21	118.4%

REPLICATE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:   
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: 07/15/09  
Date Received: 07/17/09

Analyte	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: PH18A Client ID: 0907409-01B					
Total Solids	07/22/09	Percent	43.60	44.00 43.60	0.5%
Total Organic Carbon	07/23/09	Percent	2.86	2.68 2.69	3.7%

LAB CONTROL RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized: *[Signature]*  
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: NA  
Date Received: NA

Analyte	Date	Units	LCS	Spike Added	Recovery
Total Organic Carbon	07/23/09	Percent	0.537	0.500	107.4%

METHOD BLANK RESULTS-CONVENTIONALS  
PH16-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:   
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: NA  
Date Received: NA

Analyte	Date	Units	Blank
Total Solids	07/22/09	Percent	< 0.01 U
Total Organic Carbon	07/23/09	Percent	< 0.020 U

STANDARD REFERENCE RESULTS-CONVENTIONALS  
PH18-Neilson Research Corporation



Matrix: Sediment  
Data Release Authorized:   
Reported: 07/24/09

Project: NA  
Event: 0907409  
Date Sampled: NA  
Date Received: NA

Analyte/SRM ID	Date	Units	SRM	True Value	Recovery
Total Organic Carbon NIST #8704	07/23/09	Percent	3.78	3.35	112.8%



**SEDIMENT ANALYSIS – GOLD RAY DAM, JACKSON COUNTY, OREGON**  
**DATA TRANSMITTAL REPORT**

*ERIC DITTMER, STEVE PETROVIC, and CHARLES LANE*  
*SOUTHERN OREGON UNIVERSITY*

**INTRODUCTION**

Southern Oregon University (SOU) has worked with both Jackson County and HDR Inc. (HDR), assisting in sampling and analysis of sediment found behind Gold Ray Dam in Jackson County. We collaborated with Gravity Inc. in July 2009 to collect core samples at sites determined by HDR and approved by the US Army Corps of Engineers. The samples were analyzed for grain size distribution and heavy metals at SOU laboratories, and for mercury and organics at Neilson Labs in Medford. Laboratory analyses were performed using requisite methodologies for : (1) sieve, (2) hydrometer, and (3) metals; analytical results are attached. It is our understanding that analysis of these data is the responsibility of HDR.

**METHODOLOGY**

Field sampling –

Field sampling was accomplished by use of boat-mounted Vibra-Core (equipment and personnel from Gravity, Inc.). Field sampling included 12 coring attempts and the collection of 11 cores. Refusal for one core was due to the presence of large-diameter cobbles which prohibited penetration. Recovered cores were photographed in 3 foot intervals. Sediment samples were collected every 3 feet of core recovered; additional samples taken where abrupt soil stratigraphic changes were evident.

Lab analyses –

- a) Grain size distribution followed ASTM D422 protocols utilizing requisite sieve sizes and < 230 sieve clay fraction definition for hydrometer procedures.
- b) Metals analyses - In order to prepare the sediment samples for metals determination, acid-peroxide digestion of the sediment samples was performed using EPA Method 3050B. Following the digestion procedure, the metals concentrations were determined with a Perkin-Elmer Optima 2100 Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES) using EPA Method 6010C.

**RESULTS**

(A) Sieve analyses (24), (B) Hydrometer analyses (11), and (C) metals analyses (24) are attached.

No particular difficulties were encountered in the sieve analyses; as instructed, hydrogen peroxide was not used in the process, and some organics (primarily woody debris) are reflected in some of the coarse fractions. However, several of the samples with predominantly coarser grain sizes did not yield enough fine material (less than 5 grams passing the 230 sieve) to yield accurate hydrometer results. We attempted to contact US Army Corps of Engineers but did not receive a returned call verifying the validity of our decision not to run hydrometer tests with such small sample sizes. We have, however, retained the low-weight (<5g) samples.

The concentration of each metal (Ag, As, Cd, Cr, Cu, Ni, Pb, Sb and Zn) is reported (see Metals Analysis attachment, Table 2) using concentration units of parts per million (wet weight). All underlined entries represent metal concentrations that are at or below detection limits. The ICP-AES detection limits are reported in Table 1 of the Metals Analysis attachment. The response of all quality control standards and blanks to check instrument performance fell within recommended EPA levels with the exception of Sb. Although the recovery of Sb from a spiked blank (i.e. Laboratory Control Sample) was always greater than 90%, the recovery of Sb from a spiked soil sample ranged from 27 – 55%. The measured concentrations of Sb in the sediment samples exceeded instrumental detection levels in only one of 24 samples. That sample registered 0.20 ppm, which indicates that none of the samples could contain more than 0.8 ppm given these recovery levels.

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## Metals Analyses – Gold Ray Dam Sediment Analysis Project

**Table 1 – Instrumental Detection Limits for Optima 2100 ICP-AES. Detection limits were based on seven replicates of a 2 ug/L standard.**

Element	Instrumental Detection Limits (ug/L)
Ag	0.19
As	6.5
Cd	0.18
Cr	0.15
Cu	0.64
Ni	0.45
Pb	2.4
Sb	1.7
Zn	0.64

**Table 2– Metal Concentration in Gold Ray Dam Sediment in parts per million (ug/g). Underlined samples represent analyte concentrations that are at or below detection limits.**

Sample Name	Sediment Concentration (ppm wet weight)								
	Ag	As	Cd	Cr	Cu	Ni	Pb	Sb	Zn
C1 0 - 1.2	<u>0.01</u>	0.79	0.08	13.04	12.86	9.81	1.27	<u>0.10</u>	21.07
C1 1.2 - 2.5	0.04	<u>0.61</u>	0.06	17.32	15.65	10.75	1.58	<u>0.16</u>	23.32
C2 0 - 1	<u>0.01</u>	1.66	0.11	6.45	7.33	6.39	0.88	<u>0.10</u>	17.13
C3 0 - 1.5	<u>0.02</u>	1.69	0.11	7.85	8.67	8.25	0.97	<u>0.14</u>	17.64
C3 1.5 - 3	<u>0.02</u>	1.60	0.07	8.85	6.93	6.99	0.91	<u>0.14</u>	17.56
C4 0 - 2.4	0.05	1.37	0.06	13.86	16.74	9.55	6.42	<u>0.10</u>	30.90
C4 2.4 - 4.8	0.03	1.77	0.04	16.02	18.16	11.32	8.40	<u>0.14</u>	33.78
C4 4.8 - 7.2	0.04	1.33	0.07	14.06	17.07	10.64	6.64	<u>0.11</u>	29.89
C5 0 - 1.5	<u>0.01</u>	1.78	0.11	9.91	8.37	6.28	1.17	<u>0.13</u>	19.74
C6 0 - 2.8	0.12	0.74	0.20	12.40	15.06	10.16	3.35	<u>0.11</u>	28.01
C6 2.8 - 5.8	0.02	1.42	0.05	15.70	18.52	12.69	1.92	<u>0.16</u>	29.68
C6 5.8 - 7	0.04	1.96	0.03	16.42	32.10	12.80	1.90	0.20	32.63
C7 0 - 1	0.02	0.86	0.03	9.70	10.48	6.58	1.79	<u>0.10</u>	20.81
C7 1 - 2.2	<u>0.02</u>	1.23	0.17	9.65	11.66	12.21	1.04	<u>0.13</u>	24.69
C7 2.2 - 3.5	<u>0.01</u>	1.19	<u>0.01</u>	11.45	12.78	10.31	1.24	<u>0.11</u>	22.83
C7 3.5 - 5	<u>0.02</u>	1.27	0.03	13.93	13.29	12.85	1.22	<u>0.16</u>	26.09
C8 0 - 1	0.04	0.77	0.03	9.50	10.90	7.17	1.98	<u>0.16</u>	20.58
C8 1 - 2.5	0.03	<u>0.60</u>	0.05	9.93	10.46	9.74	1.24	<u>0.16</u>	20.75
C8 2.5 - 5	<u>0.01</u>	1.21	0.03	12.49	13.88	10.49	1.51	<u>0.12</u>	23.44
C9 0 - 1.3	<u>0.01</u>	1.18	0.06	7.31	7.57	6.34	1.25	<u>0.11</u>	18.12
C11 0 - 1.6	<u>0.02</u>	0.80	0.05	6.27	7.02	4.36	1.83	<u>0.14</u>	14.44

C11 1.6 - 3.2	<u>0.01</u>	0.77	0.05	6.52	6.05	4.91	1.64	<u>0.10</u>	15.18
C12 0 - 1.5	<u>0.02</u>	0.92	0.16	10.05	9.26	10.03	0.98	<u>0.14</u>	23.36
C12 1.5 - 3	<u>0.02</u>	1.26	0.15	9.31	9.56	9.88	1.09	<u>0.16</u>	22.45