

**Tom Colligan RG**

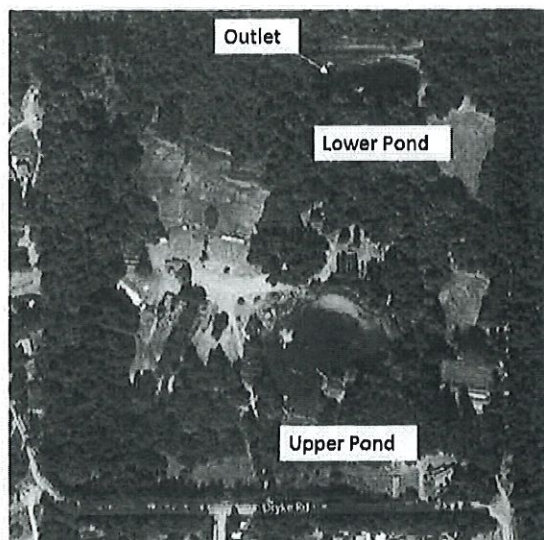
## **SunnyDell Shooting Range Data Memo**

**To:** Andy Smith, Department of Ecology  
**From:** Tom Colligan  
**cc:** Tom Kirkman  
**Date:** April 21, 2015  
**Re:** Results of Groundwater Sampling Event and Lower Pond Soil Sampling and Survey Event

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This memo transmits to Ecology the results of the recently-completed Site wide groundwater sampling as well as the focused soil sampling and elevation survey at the Lower Pond at the Sunnydell Shooting Range.

Both the Lower Pond and Upper Pond are man-made. Both were constructed by Chuck Dryke (now deceased) by digging out of a former peat bog (Upper Pond) and a naturally marshy area near the northern boundary of the property (Lower Pond). The site grade drops off grade substantially from the relatively flat active shooting area to the Upper Pond and so collects naturally collects site run off. Due to complaints from the adjacent neighbor about occasional flooding of their property from the Lower Pond, Mr. Dryke created a berm around the western edge of the Lower Pond to raise the pond elevation and also installed a pump to lower the pond level. The pump pumped water from the Lower Pond to the Upper Pond, which has more capacity and no natural recharge.





Some of the soil brought in to create the berm originated elsewhere on site, in particular from active shooting areas and so was lead contaminated to some degree. Outside of this berm area, the Lower Pond area was demonstrated by RI sampling to have low levels of lead as it was never used for target shooting.

The soil sampling and elevation survey was in response to the finding that lead levels at the western edge of the pond remain above cleanup levels following two attempts at the excavation that was specified in the 2012 final cleanup action plan. The soil sampling approach was laid out to Ecology in an email transmitted to you on October 13, 2014. The goal of the recent sampling was two-fold:

- 1) Define extent of residual contamination of lead in both surface and shallow subsurface soils to the west of that pond where the berm was placed.
- 2) Perform a survey to establish the elevations across that area, to determine whether additional excavation would cause breaching of the pond.

Outline of Pond Berm Area that was sampled, looking south.



#### **GROUND WATER RESULTS**

Per the Cleanup Action Plan, the site wells are to be sampled once every five years beginning in 2014. The four existing monitoring wells were sampling on September 15, 2014 using a peristaltic pump to purge out three well casing volumes. The samples were collected in

preserved polyethylene jars and were field filtered using a 0.45 micron filter attached to the end of the discharge tubing. Fresh polyethylene tubing was used at each well sampled. No unusual conditions were noted during sampling. Samples were analyzed at ALS Laboratories in Everett WA for lead. The well locations are shown on Figure 1. Results are in micrograms per liter (ug/L or ppb) as follows:

- MW-1- Downgradient of Upper Pond: 13 ug/L
- MW-2 Downgradient of Upper Pond: 1.0 U (not detected)
- MW-3 Inbetween Lower and Upper Ponds 1.0 U (not detected)
- MW-5 Downgradient of Lower Pond 1.0 U (not detected)

Per the Cleanup Action Plan, the cleanup level for lead in groundwater is 15 ug/L. Therefore, the site groundwater remains in compliance with the cleanup level.

### SOIL SAMPLING RESULTS

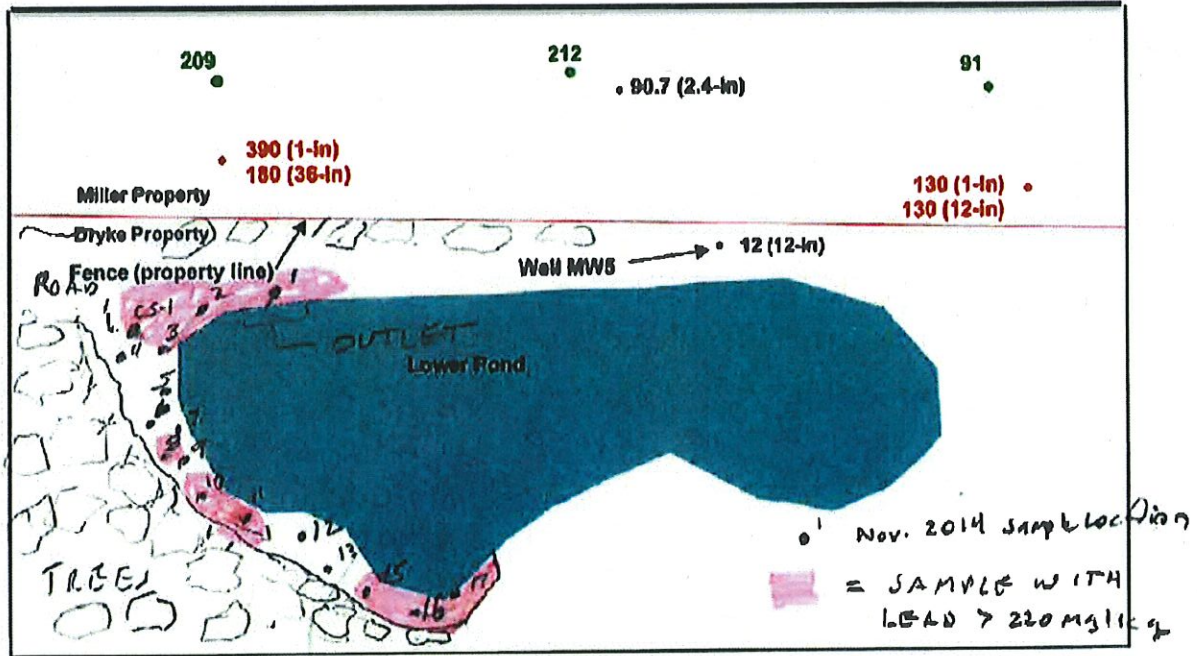
The sampling went as planned on November 26, 2014, with seventeen samples collected at regular intervals along the entire the western berm of the pond, beginning at the current pond outlet. At 10 of these locations, samples were collected from deeper soil, collected by post holing down to a depth of 3 feet below grade. Samples were collected using a trowel. The samples were homogenized in a stainless steel bowl prior to being placed in the sample jars. The lead results of the sampling are in the table below. Sample locations are shown in the figure below the table. Samples with concentrations above the site cleanup level of 220 mg/kg are in bold.

Sample ID	Depth below grade	Lead (mg/kg)
CS-1	1 foot	<b>516</b>
1-1	1 foot	<b>707</b>
2-1	1 foot	<b>400</b>
3-1	1 foot	<b>295</b>
4-1	1 foot	176
5-1	1 foot	65
6-1	1 foot	163
7-1	1 foot	151



8-1	1 foot	<b>272</b>
9-1	1 foot	164
10-1	1 foot	<b>219</b>
11-1	1 foot	<b>261</b>
12-1	1 foot	9
13-1	1 foot	103
14-1	1 foot	<b>318</b>
15-1	1 foot	<b>1,450</b>
16-1	1 foot	<b>321</b>
CS-3	3 feet	65
1-3	3 feet	7.5
2-3	3 feet	123
4-3	3 feet	177
6-3	3 feet	163
8-3	3 feet	<b>241</b>
11-3	3 feet	30
12-3	3 feet	8
14-3	3 feet	37
15-3	3 feet	<b>537</b>

Soil Sampling Locations. North is up.



## DISCUSSION

The results indicate that lead contamination occurs irregularly across three separate areas, a northern area around the outlet of the pond, a more narrow middle area and a southern area. Importantly, the depth of contamination is mostly restricted to the upper 1 foot of soil. Only two samples from the 3 foot depth interval contaminated lead above the cleanup level. Figure 2 shows these areas in highlight.

## SURVEY

An elevation survey was conducted using transit and rod to determine land survey elevations in areas that were sampled. The survey results were relative to the ground surface at nearby well MW-5 at elevation 220 feet MSL. Results supported the rather obvious visual impression that the lowest area (i.e., the pond outlet) is located at the northwest end of the pond close to sample 1-1. The elevation of the "spillway" was measured at 218.25 ft MSL. The land surface then rises along the berm to the south. Direct evidence of this area being the low point is demonstrated by the photograph below which shows actual pond overflow to the adjacent property during the past winter.

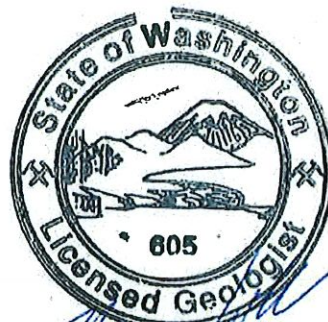


Pond Overflow from Outlet During Recent Flooding Event



**RECOMMENDATIONS**

Further excavation of contaminated soil in the area of the pond outlet would exacerbate the current situation of pond overflow, as it would lower the berm by a minimum of one foot. It would also damage existing vegetation and would be considered work in a wetlands so difficult to permit under the Clean Water Act. Given that this area is of limited use and the soil well covered by vegetation, there is no immediate human health risk. The best solution may be to place a thin (6") cover of soil over the surface soils, rather than further excavation. This would be protective of the environment and also help alleviate the frequency of pond overflow by raising the ground surface elevation in this area.



Thomas Henry Colliga