INTERIM ACTION REPORT
ABRAHAM LINCOLN ELEMENTARY SCHOOL
WENATCHEE, WASHINGTON

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Prepared by Washington State Department of Ecology
Toxics Cleanup Program
Jeff Newschwander (509) 454-7842

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1.0 INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

The purpose of this report is to detail cleanup activities conducted at Lincoln Elementary school in 2006.

1.2 AREA WIDE INTRODUCTION

Area-wide soil contamination is defined as contamination with concentrations above state cleanup levels that is dispersed over a large geographic area. The soil contamination in this case is a result of central Washington's orchard industry. Much of the region consists of current or former orchard land, where long-term pesticide application has taken its toll. Lead-arsenate, a pesticide commonly used between 1905 and 1947 to control the coddling moth, has been identified as the primary source of increased lead and arsenic concentrations.

Due to their chemical structure, lead and arsenic tend to bond with soil particles and often remain at or near ground surface level for decades, creating an exposure pathway through inhalation and/or ingestion.

Although lead and arsenic are naturally occurring elements, elevated concentrations have been proven to have a negative impact on human health. Young children are generally more susceptible than adults, which is why Ecology has focused remediation efforts on schools.

Because of the expansive nature of area-wide contamination, traditional methods of remediation are not feasible. Therefore, the Area-Wide Soil Contamination Task Force was established in 2002 to identify and pursue effective statewide strategies. Recommendations from the Task Force included soil testing, qualitative evaluations, and protective measures at child-use areas.

In the central Washington region, Okanogan, Chelan, Douglas, and Yakima counties were targeted based on the large volume of apple and pear production during the first half of the 20th century. Aerial photography from 1927 and 1947 that showed a high number of school properties located on former orchard land in the Wenatchee area. Therefore, Ecology's Central Regional Office (CRO) began initial sampling in Wenatchee in 2002.

Because these sampling results showed several schools with lead and arsenic concentrations exceeding state cleanup standards, soil testing was implemented in the four priority counties (Chelan, Douglas, Okanogan, and Yakima). Over 100 public schools were tested for lead and arsenic during the summer of 2005. Of the schools sampled, Ecology's CRO identified 35 schools with soil contamination exceeding state cleanup standards.

The 35 schools were then prioritized for remedial activities. Remedial activities started during the summer of 2006. Four Wenatchee area schools, including Lincoln Elementary, were chosen for initial activities due to close proximity between properties and summer break schedule. North Omak Elementary, Brewster High School, Manson Elementary, and Naches Valley Intermediate were chosen for remediation following completion of soil excavation and mixing activities in Wenatchee.

2.0 SITE DESCRIPTION

Lincoln Elementary School (the site) is located at 1224 Methow Street, within the Wenatchee city limits in Chelan County, Washington. More specifically, the site is located at 47º24'24.30" and -120º18'30.23" (GPS Coordinates) in the NW ¼ of the NE ¼ of Section 15, Township 22 North, Range 20 East. The site is approximately ¾ mile west of the State Highway 28 and 4 ½ miles south of State Highway 97.

Situated on the eastern boundary of the Wenatchee Mountains, this location is approximately 820 feet above sea level within the Wenatchee Valley. Mission Ridge is located approximately 5 miles west of the site and the Columbia River is located about ½ mile east of the site. Relief is between 0% and 5% across the site. Ecology well log records suggest depth to groundwater is about 15-20 feet below ground surface. Groundwater will generally flow east toward the Columbia River.

According to the United States Department of Agriculture (USDA) Soil Survey of Chelan Area Washington, local soils are described as Cashmere sandy loam. Cashmere soils were generally formed of alluvial and colluvial deposits of material such as granite, gneiss, schist, and basalt. Orchard cultivation is common on Cashmere soils. The soil type is typically located on terraces, alluvial fans, and foot slopes with 0-25% grade.

The Soil Survey describes the following soil horizons:

- At 0-8 inches below ground surface (bgs), soil consists of a dark-gray sandy loam. Moderate, medium granular structure. Soil has a moderate, medium, granular structure and is soft and very friable, non-sticky and non-plastic. Well impregnated with fine roots with few fine tubular pores. Mildly alkaline.
- At 8-21 inches bgs, soil is a dark-gray gravelly sandy loam with a moderate, medium granular structure. Soil remains soft and very friable, non-sticky and non-plastic. Well impregnated with fine roots and many fine tubular pores. Gravel content is approximately 20% and pH is mildly alkaline.
- Between 21 and 28 inches bgs, soil becomes brown gravelly sandy loam with moderate, medium granular structure. Soil remains soft and very friable, non-sticky and non-plastic. Well impregnated with fine roots and many fine tubular pores. Gravel content is approximately 15% and pH is mildly alkaline.
- At 28-60 inches bgs, soil becomes pale-brown gravelly sandy loam with moderate, medium granular structure. Soil is soft and very friable and is non-sticky and non-plastic. Few fine roots penetrate to this depth and fine tubular pores are common. Gravel content is 20%. Soil is mildly alkaline.

During excavation and deep mixing activities, soil appeared generally as described above.

3.0 SITE HISTORY

The Site was identified as a candidate for Area-Wide cleanup in 2002 as part of a pilot project conducted by Ecology’s Central Regional Office (CRO). The project focused on devising appropriate sampling and analytical methods for historic orchard land, and implementing other recommendations from the Area Wide task force. Aerial photos from 1947 that indicated the site was formerly occupied by an orchard. Analytical results showed lead and arsenic contamination in excess of MTCA Method A cleanup levels.

The figure on the next page illustrates analytical results from the 2002 pilot project. It shows lead and arsenic concentrations in excess of Ecology MTCA Method A cleanup levels throughout the property.

The site was chosen for a deep soil mixing demonstration in September of 2005. Ecology was interested in seeing if this was a viable remediation technique. Pre- and post- mix soil analysis indicated deep mixing technology both sound and affordable.

Additional soil analysis was conducted in March of 2006 to further delineate soil contamination prior to remediation. Of 41 samples analyzed, only 2 were below MTCA cleanup levels for arsenic. Eleven samples were above 100 parts per million (ppm) arsenic, and two were above 300 ppm.

Lincoln Elementary School was the third of eight schools remediated in 2006. Experience gained at Lincoln and other Wenatchee schools has been used to develop analytical and remedial strategies that have been employed by Ecology throughout central Washington.

Figure 3-1 Pilot Project Samples

4.0 SITE CONTACT INFORMATION

Contractual and planning phases of the project were reviewed by the Wenatchee School District prior to beginning field operations. Requests in addition to the original scope of work were issued by Bryan Visscher, Director of Maintenance and Operations. Ecology maintained contact with Lincoln Elementary staff throughout site work to maintain a positive working relationship and exchange of information as needed.

CBA Environmental was contracted for deep soil mixing and acted as General Contractor for all school sites in the Wenatchee School District. George Williams was the onsite representative for CBA Environmental, managing deep mixing operations and providing interaction between Ecology, Wenatchee School District personnel, sub-contractors, and others as needed. Wenatchee School District Maintenance & Operations staff was often onsite to provide information, suggestions, and requests.

The following table contains contact information for individuals responsible for various roles in the completion of remedial activities.

Name	Organization	Position	Phone Number
Les Vandervort	Wenatchee School District	Chief Financial Officer	(509) 663-8161
Bryan Visscher	Wenatchee School District	Maintenance & Operations Director	(509) 663-0555
Pam Peer	Wenatchee School District	Secretary to Maintenance & Operations	(509) 663-0555
George Williams	CBA Environmental	General Contractor/Deep Mixing	(570) 682-8742
Greg Smith	Smith Excavation	Excavation	(509) 782-0446
Mike Stubblefield	Mountain View Landscaping	Landscaping & Irrigation	(509) 663-3168
Tim Sheppard	Lincoln Elementary School	Principal	(509) 663-5710

5.0 REMEDIAL PROCESS

5.1 RISK

The most common exposure pathways for lead and arsenic in soil include inhalation, ingestion, and dermal absorption. It is important to note that ingestion is not considered as an exposure pathway in the site hazard assessment ranking method. For the purpose of this cleanup, ingestion was determined to be the primary exposure pathway, particularly in the case of young children. Metals in dust or soil can be ingested accidentally by hand-to-mouth activity. Pica behavior in young children, that is, eating of non-food items, will increase this exposure. Ingestion or inhalations of wind-blown soil or dust are additional pathways of exposure to lead and arsenic. Children are considered a sensitive population because they tend to ingest more soil and dust than adults and because they tend to absorb more of the lead they ingest. Metals are not readily absorbed through the skin, so dermal absorption of metals is not a significant concern at the concentrations found at schools in the area-wide cleanup program.

Evidence of groundwater contamination or the threat of groundwater contamination has not been found relative to area wide lead and arsenic contamination. Extensive soil profile sampling in Central Washington has demonstrated that lead and arsenic contamination does not extend below 30 inches below ground surface (bgs) in undisturbed situations. Concentrations of arsenic above 50 parts per million (ppm) and concentrations of lead above 250 ppm were not found below 12 inches bgs. These results may vary in climates with more precipitation, but in this region, the findings were very consistent. Due to the depth of groundwater found in the vicinity of the school, combined with the distribution of the contamination, the risk of lead and arsenic contamination in groundwater is minimal.

5.2 REMEDIAL PROCESS

5.2.1 SAFETY AND HEALTH

Throughout the construction process, the site was restricted from public access by a 6-foot high chain link fence. The contractor was required to provide a site specific Health & Safety Plan (HSP) for the site construction activities. All personnel working at the site were responsible for reading and understanding the HSP.

5.2.2 DUST CONTROL PLAN

The contactor was required to control dust and to prepare a dust control plan. Dust control measures, at a minimum, included a water truck.

5.2.3 REMEDIAL ACTIVITIES

The initial remediation plan for the site was based upon sampling conducted across the property to a depth of approximately eight inches. This data indicated that there were two small areas with lead and arsenic contamination high enough that some excavation would be required prior to applying deep mixing technology.

The deep mixing technology was supplied by CBA Environmental Inc. (CBA) from Hegins, Pennsylvania. The deep mixer is a piece of heavy equipment manufactured by Vermeer Manufacturing and modified by CBA for the purpose of deep soil mixing. The machine is track mounted and weighs between 50 and 120 tons depending on model. A large rotating drum mounted on the front of the machine is lowered to a maximum depth of 4.5 feet bgs where it rotates and mixes the soil. It travels at average speeds between 4 and 8 feet per minute and typically covers between 1/3 and ½ acre per day. Studies conducted by Ecology and CBA have shown a mixing efficiency between 70% and 95% depending on soil types.

Prior to beginning remedial excavation, additional sampling was conducted to create a more detailed delineation of the lead and arsenic concentrations. This additional sampling confirmed two small areas that would require additional excavation. That the majority of the site contained concentrations low enough that deep mixing would be successful without excavation. As a general rule, any contamination above 100 ppm cannot be deep mixed without some excavation to remove some of the contaminant load. Concentrations in the 60-99 ppm range may or may not need to be excavated depending on the depth of contamination and the background concentrations found in the clean soil below.

A bulldozer was used for excavation in the two small hotspot areas. After the bulldozer had excavated an area down to a prescribed depth, the XRF was used to analyze post-excavation surface concentrations and determine whether more excavation was required. When surface concentrations of 70 ppm were reached, excavation was considered complete for that area. A front-end loader was then used to load the stockpiles into trucks for transport to the landfill. Approximately 1000 cubic yards of contaminated soil were excavated from Lincoln Elementary and disposed of at the Greater Wenatchee Landfill, operated by Waste Management, Inc.

While excavation was taking place, deep mixing was started at the north end of the site where lead and arsenic concentrations were low enough that excavation was not required. Soil sampling was conducted continuously throughout the remedial process. As the deep mixer completed each row, that row was sampled and analyzed to ensure the mixing was successful in reducing contaminant levels below MTCA levels. In the event that lead and arsenic levels were not reduced below MTCA cleanup levels, a row could be remixed with deeper soils to reduce concentrations further. One small area was remixed at the north end of Lincoln Elementary. During the mixing process, an old burn pile was discovered. Post-mixing samples collected from this area indicated slightly elevated levels of arsenic. This area was remixed and re-sampled. Confirmation samples indicated that the remixing was successful in reducing concentrations below MTCA cleanup levels. Across the remainder of the site, there were several samples that exceeded MTCA cleanup levels for arsenic, though none were twice the cleanup level. Statistical analysis indicates that less than 10% of samples exceed MTCA standards and no further remedial action is required for the site.

5.3 SAMPLE RESULTS

Remedial activities at Lincoln Elementary School were successful in reducing the majority of lead and arsenic concentrations below MTCA cleanup levels for unrestricted land use. There were several samples that exceeded MTCA cleanup levels for arsenic, though none were twice the cleanup level. Of the 410 samples collected after remediation, 35 exceeded MTCA cleanup levels. Statistical analysis indicates that less than 10% of samples exceed MTCA standards. According to MTCA cleanup guidelines, a site may be considered clean if no more than 10% of samples exceed MTCA cleanup levels and no samples are greater than twice MTCA cleanup levels. Based on these guidelines, no further action is required for the site.

Pre-remediation arsenic samples had an average concentration of 72 ppm and a maximum concentration of 315 ppm. Pre-remediation lead samples had an average concentration of 202 ppm and a maximum concentration of 1496 ppm. Post-remediation arsenic samples had an average concentration of 16 ppm and maximum concentration of 39 ppm. Post-remediation lead samples had an average concentration of 85 ppm and a maximum concentration of 420 ppm. The tables below contain pre and post remediation sample data. Maps containing a general representation of this data are available in figures A-2 and A-3.

MTCA Method A Soil Cleanup Levels

As- 20 ppm

Pb- 250 ppm

Pre-remediation samples

Date	As	Pb	Sample ID	School
16-Jun-06	**15.78**	**78.83**	L-pipe 1	Lincoln
16-Jun-06	**26.11**	**118.99**	L-pipe 2	Lincoln
16-Jun-06	**20.23**	**61.19**	L-pipe 3	Lincoln
16-Jun-06	**31.95**	**269.00**	L pipe 4	Lincoln
21-Jun-06	**88.15**	**280.29**	L-PL-1 2-6"	Lincoln
21-Jun-06	**32.85**	**85.84**	L-PL-3 2-6"	Lincoln
21-Jun-06	**22.73**	**62.51**	L-PL-4 2-6"	Lincoln
21-Jun-06	**15.96**	**57.35**	L-PL-5 2-6"	Lincoln
21-Jun-06	**17.79**	**91.20**	L-PL-6 2-6"	Lincoln
15-Jun-06	**47.39**	**285.20**	L-T-1 1-4	Lincoln
15-Jun-06	**100.60**	**430.36**	L-T-1 5-8	Lincoln
15-Jun-06	**42.96**	**21.72**	L-T-1 9-12	Lincoln
15-Jun-06	**62.52**	**194.97**	L-T-2 1-4"	Lincoln
15-Jun-06	**193.84**	**478.22**	L-T-2 6-8"	Lincoln
15-Jun-06	**26.77**	**18.27**	L-T-2 10-12"	Lincoln
15-Jun-06	**13.31**	**17.74**	L-T-2 16-18"	Lincoln
15-Jun-06	**12.87**	**17.62**	L-T-2 22-24"	Lincoln
15-Jun-06	**13.34**	**17.65**	L-T-2 28-30"	Lincoln
19-Jun-06	**20.67**	**10.81**	LT-1	Lincoln
19-Jun-06	**24.86**	**13.65**	LT-2	Lincoln
19-Jun-06	**31.59**	**19.04**	LT-3	Lincoln
19-Jun-06	**50.22**	**10.80**	LT-4	Lincoln
19-Jun-06	**79.84**	**42.75**	LT-5	Lincoln
19-Jun-06	**39.83**	**13.74**	LT-6	Lincoln
19-Jun-06	**40.58**	**19.62**	LT-7	Lincoln
19-Jun-06	**145.51**	**372.78**	LT-8	Lincoln
20-Jun-06	**93.49**	**42.39**	LT-10	Lincoln
20-Jun-06	**52.06**	**30.84**	LT-11	Lincoln
20-Jun-06	**213.11**	**300.61**	LT-12	Lincoln
20-Jun-06	**67.12**	**23.54**	LT-13	Lincoln
20-Jun-06	**39.71**	**14.81**	LT-14	Lincoln
20-Jun-06	**55.73**	**16.47**	LT-15	Lincoln
20-Jun-06	**203.08**	**1009.88**	LT-16	Lincoln
20-Jun-06	**148.36**	**409.12**	LT-17	Lincoln
20-Jun-06	**30.09**	**22.49**	LT-18	Lincoln
20-Jun-06	**16.12**	**16.54**	LT-19	Lincoln
20-Jun-06	**18.71**	**16.69**	LT-20	Lincoln
20-Jun-06	**8.91**	**12.76**	LT-22	Lincoln
20-Jun-06	**8.55**	**10.78**	LT-23	Lincoln
20-Jun-06	**29.65**	**75.71**	LT-24	Lincoln

MTCA Method A
Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
20-Jun-06	**15.24**	**22.30**	LT-25	Lincoln
20-Jun-06	**70.79**	**299.95**	LT-26	Lincoln
20-Jun-06	**14.16**	**20.77**	LT-27	Lincoln
20-Jun-06	**83.99**	**20.57**	LT-28	Lincoln
20-Jun-06	**74.38**	**121.25**	LT-29	Lincoln
20-Jun-06	**40.78**	**19.63**	LT-30	Lincoln
20-Jun-06	**42.84**	**24.98**	LT-31	Lincoln
20-Jun-06	**34.72**	**18.02**	LT-32	Lincoln
27-Jun-06	**86.16**	**567.11**	LT-33	Lincoln
27-Jun-06	**97.33**	**366.01**	LT-34	Lincoln
27-Jun-06	**47.72**	**72.68**	LT-35	Lincoln
27-Jun-06	**314.54**	**1495.63**	LT-36	Lincoln
27-Jun-06	**155.39**	**80.19**	LT-37	Lincoln
27-Jun-06	**194.80**	**408.35**	LT-38	Lincoln
28-Jun-06	**106.80**	**284.90**	LT-36 6-9"	Lincoln
28-Jun-06	**94.16**	**128.44**	LT-36 10-13	Lincoln
28-Jun-06	**157.72**	**25.82**	LT-39 15-18	Lincoln
28-Jun-06	**74.24**	**15.86**	LT-39 11-14	Lincoln
27-Jun-06	**169.15**	**79.40**	LT-39	Lincoln
27-Jun-06	**102.35**	**56.30**	LT-40	Lincoln
27-Jun-06	**71.57**	**19.14**	LT-41	Lincoln
27-Jun-06	**96.59**	**19.86**	LT-42	Lincoln
27-Jun-06	**80.95**	**21.98**	LT-43	Lincoln
27-Jun-06	**22.08**	**98.70**	LT-50	Lincoln
27-Jun-06	**34.17**	**271.15**	LT-51	Lincoln
27-Jun-06	**45.73**	**349.05**	LT-52	Lincoln
27-Jun-06	**66.88**	**616.35**	LT-53	Lincoln
27-Jun-06	**185.09**	**961.69**	LT-54 1-3"	Lincoln
27-Jun-06	**268.70**	**1139.01**	LT-54 3-6"	Lincoln
27-Jun-06	**24.82**	**369.98**	LT-55	Lincoln
27-Jun-06	**28.19**	**143.71**	LT-56 1-3"	Lincoln
27-Jun-06	**27.10**	**18.62**	LT-56 3-6"	Lincoln
28-Jun-06	**74.77**	**416.47**	LT-57 1-4"	Lincoln
28-Jun-06	**173.44**	**557.51**	LT-57 5-8"	Lincoln
28-Jun-06	**50.46**	**312.50**	LT-58 1-4"	Lincoln
28-Jun-06	**138.17**	**1090.21**	LT-59 1-4"	Lincoln
28-Jun-06	**73.93**	**351.67**	LT-60 1-4"	Lincoln
28-Jun-06	**130.54**	**597.95**	LT-61 1-4"	Lincoln
29-Jun-06	**86.08**	**137.17**	LT-57	Lincoln
29-Jun-06	**30.31**	**15.34**	LT-58	Lincoln
29-Jun-06	**38.68**	**20.48**	LT-59 5-8" ex	Lincoln
7-Jul-06	**54.74**	**257.95**	LT-62 1-4"	Lincoln
7-Jul-06	**74.41**	**148.62**	LT-63 1-4"	Lincoln
7-Jul-06	**134.07**	**376.98**	LT-64 1-4"	Lincoln
10-Jul-06	**59.75**	**125.18**	LT-65	Lincoln
10-Jul-06	**57.57**	**135.16**	LT-66	Lincoln
10-Jul-06	**71.40**	**211.56**	LT-67	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
10-Jul-06	**58.19**	**152.87**	LT-68	Lincoln
10-Jul-06	**16.93**	**11.52**	LT-69	Lincoln
10-Jul-06	**24.02**	**40.67**	LT-70	Lincoln
Average	**71.99**	**202.33**		
Maximum	**314.54**	**1495.63**		

Under-Playground Samples

Date	As	Pb	Sample ID	School
22-Jun-06	**9.64**	**11.17**	L-PGE-1	Lincoln
22-Jun-06	**19.46**	**15.31**	L-PGE-2 14-20"	Lincoln
22-Jun-06	**4.21**	**5.94**	L-PGE-3A 2--6"	Lincoln
22-Jun-06	**66.48**	**86.68**	L-PGE-3B 14-20"	Lincoln
22-Jun-06	**9.76**	**12.27**	L-PGE-4 14-20"	Lincoln
22-Jun-06	**62.59**	**28.77**	L-PGE-5 10-16"	Lincoln
22-Jun-06	**39.36**	**176.36**	L-PGE-6 8-12"	Lincoln
22-Jun-06	**75.13**	**582.36**	L-PGE-7 8-12"	Lincoln
22-Jun-06	**292.78**	**1195.31**	L-PGE-8 8-12"	Lincoln

Post-Remediation samples

Date	As	Pb	Sample ID	School
15-Jun-06	**11.88**	**53.04**	L-M-1 1s	Lincoln
15-Jun-06	**18.02**	**70.41**	L-M-1 2c	Lincoln
20-Jun-06	**16.55**	**53.76**	L-M5 5s	Lincoln
20-Jun-06	**17.03**	**45.78**	L-M5 6c	Lincoln
20-Jun-06	**18.35**	**43.16**	LM-6 1s	Lincoln
20-Jun-06	**20.23**	**56.50**	LM-6 2c	Lincoln
20-Jun-06	**10.73**	**31.12**	LM-7 1s	Lincoln
20-Jun-06	**13.40**	**33.53**	LM-7 2c	Lincoln
20-Jun-06	**18.43**	**87.99**	LM-7 3c	Lincoln
20-Jun-06	**14.11**	**33.19**	LM-7 4c	Lincoln
20-Jun-06	**29.65**	**73.76**	LM-6 3c	Lincoln
20-Jun-06	**19.46**	**39.70**	LM-6 4s	Lincoln
20-Jun-06	**16.56**	**45.84**	LM-8 1s	Lincoln
20-Jun-06	**15.37**	**31.69**	LM-8 2c	Lincoln
20-Jun-06	**11.43**	**47.82**	LM-8 3s	Lincoln
20-Jun-06	**13.59**	**41.13**	LM-8 4s	Lincoln
20-Jun-06	**10.89**	**37.19**	LM-8 5c	Lincoln
20-Jun-06	**17.43**	**51.05**	LM-8 6c	Lincoln
20-Jun-06	**14.15**	**69.32**	LM-9 1c	Lincoln
20-Jun-06	**13.93**	**58.63**	LM-9 2c	Lincoln
20-Jun-06	**11.04**	**37.46**	LM-9 3c	Lincoln
20-Jun-06	**12.94**	**54.81**	LM-9 4c	Lincoln
20-Jun-06	**19.99**	**43.89**	LM-10 1c	Lincoln
20-Jun-06	**11.21**	**35.91**	LM-10 2s	Lincoln
20-Jun-06	**14.59**	**42.68**	LM-10 3c	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
20-Jun-06	**16.36**	**46.77**	LM-10 4s	Lincoln
20-Jun-06	**13.84**	**45.46**	LM-11 1s	Lincoln
20-Jun-06	**13.95**	**41.48**	LM-11 2c	Lincoln
20-Jun-06	**12.54**	**36.20**	LM-11 3s	Lincoln
20-Jun-06	**10.41**	**36.85**	LM-11 4c	Lincoln
21-Jun-06	**14.41**	**35.43**	LM-12 1c	Lincoln
21-Jun-06	**13.96**	**18.57**	LM-12 2s	Lincoln
21-Jun-06	**13.51**	**22.65**	LM-12 3c	Lincoln
21-Jun-06	**24.65**	**18.57**	LM-12 4s	Lincoln
21-Jun-06	**14.72**	**38.66**	LM-12 5c	Lincoln
21-Jun-06	**15.32**	**125.53**	LM-12 6s	Lincoln
21-Jun-06	**13.07**	**17.77**	LM-12 7c	Lincoln
21-Jun-06	**14.75**	**43.34**	LM-12 8s	Lincoln
21-Jun-06	**14.69**	**190.48**	LM-12 9c	Lincoln
21-Jun-06	**18.07**	**42.46**	LM-13 1c	Lincoln
21-Jun-06	**17.37**	**49.54**	LM-13 5c	Lincoln
21-Jun-06	**18.34**	**234.41**	LM-13 re-test	Lincoln
21-Jun-06	**19.05**	**95.69**	LM-13 re-mix	Lincoln
21-Jun-06	**17.30**	**111.12**	LM-13 re-mix	Lincoln
21-Jun-06	**14.01**	**25.85**	LM-14 1c	Lincoln
21-Jun-06	**13.05**	**17.86**	LM-14 2s	Lincoln
21-Jun-06	**17.11**	**181.30**	LM-14 3c	Lincoln
21-Jun-06	**19.45**	**129.78**	LM-14 4s	Lincoln
21-Jun-06	**15.03**	**42.79**	LM-14 5c	Lincoln
21-Jun-06	**29.18**	**235.15**	LM-14 6s	Lincoln
21-Jun-06	**25.93**	**207.66**	LM-14 7c	Lincoln
21-Jun-06	**19.77**	**330.57**	LM-14 re-mix c	Lincoln
21-Jun-06	**17.24**	**198.04**	LM-14 re-mix s	Lincoln
21-Jun-06	**14.02**	**23.02**	LM-15 1s	Lincoln
21-Jun-06	**14.79**	**28.04**	LM-15 2c	Lincoln
21-Jun-06	**14.06**	**26.19**	LM-15 3s	Lincoln
21-Jun-06	**14.47**	**30.62**	LM-15 4c	Lincoln
26-Jun-06	**13.20**	**28.39**	LM-20 1c	Lincoln
26-Jun-06	**19.03**	**38.59**	LM-20 2c	Lincoln
26-Jun-06	**10.66**	**14.98**	LM-20 3c	Lincoln
26-Jun-06	**9.74**	**25.87**	LM-20 4c	Lincoln
26-Jun-06	**10.88**	**28.34**	LM-20 5c	Lincoln
26-Jun-06	**11.80**	**54.26**	LM-21 1c	Lincoln
26-Jun-06	**18.20**	**69.20**	LM-21 2c	Lincoln
26-Jun-06	**18.69**	**45.38**	LM-21 3c	Lincoln
26-Jun-06	**11.16**	**41.94**	LM-21 4c	Lincoln
26-Jun-06	**10.85**	**41.28**	LM-21 5c	Lincoln
26-Jun-06	**17.40**	**34.13**	LM-22 1c	Lincoln
26-Jun-06	**24.05**	**76.27**	LM-22 2c	Lincoln
26-Jun-06	**15.25**	**47.89**	LM-22 3c	Lincoln
26-Jun-06	**10.63**	**53.71**	LM-22 4c	Lincoln
26-Jun-06	**16.66**	**58.68**	LM-22 5c	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
26-Jun-06	**12.99**	**18.05**	LM-23 1s	Lincoln
26-Jun-06	**25.32**	**51.66**	LM-23 2c	Lincoln
26-Jun-06	**19.13**	**53.60**	LM-23 3s	Lincoln
26-Jun-06	**16.38**	**39.21**	LM-24 1c	Lincoln
26-Jun-06	**21.65**	**62.98**	LM-24 2c	Lincoln
26-Jun-06	**13.39**	**36.36**	LM-24 3s	Lincoln
26-Jun-06	**15.51**	**45.09**	LM-24 4c	Lincoln
26-Jun-06	**12.01**	**46.63**	LM-24 5s	Lincoln
26-Jun-06	**37.54**	**70.87**	LM-25 2c	Lincoln
26-Jun-06	**19.24**	**50.57**	LM-25 3c	Lincoln
26-Jun-06	**23.93**	**85.32**	LM-25 4c	Lincoln
26-Jun-06	**18.37**	**54.05**	LM-25 5c	Lincoln
26-Jun-06	**16.65**	**57.23**	LM-26 1c	Lincoln
26-Jun-06	**13.49**	**94.58**	LM-26 2c	Lincoln
26-Jun-06	**16.93**	**69.59**	LM-26 3c	Lincoln
26-Jun-06	**15.10**	**71.44**	LM-26 4c	Lincoln
26-Jun-06	**13.04**	**87.47**	LM-28 1c	Lincoln
26-Jun-06	**16.66**	**31.94**	LM-28 2c	Lincoln
26-Jun-06	**13.29**	**69.89**	LM-28 3c	Lincoln
26-Jun-06	**10.64**	**43.61**	LM-29 1c	Lincoln
26-Jun-06	**10.70**	**46.39**	LM-29 2c	Lincoln
26-Jun-06	**10.22**	**49.94**	LM-29 3c	Lincoln
26-Jun-06	**16.26**	**54.24**	LM-30 1c	Lincoln
26-Jun-06	**13.40**	**49.76**	LM-30 2c	Lincoln
26-Jun-06	**14.95**	**54.20**	LM-30 3c	Lincoln
27-Jun-06	**15.35**	**52.49**	LM-31 1s	Lincoln
27-Jun-06	**14.71**	**34.90**	LM-31 2c	Lincoln
27-Jun-06	**17.24**	**39.21**	LM-31 3s	Lincoln
27-Jun-06	**16.02**	**66.98**	LM-32 1s	Lincoln
27-Jun-06	**16.00**	**64.11**	LM-32 2c	Lincoln
27-Jun-06	**18.73**	**66.96**	LM-33 1s	Lincoln
27-Jun-06	**17.09**	**57.60**	LM-33 2c	Lincoln
27-Jun-06	**15.78**	**51.96**	LM-34 1s	Lincoln
27-Jun-06	**16.05**	**56.76**	LM-34 2c	Lincoln
27-Jun-06	**12.09**	**43.39**	LM-35 1s	Lincoln
27-Jun-06	**14.64**	**34.26**	LM-35 2c	Lincoln
27-Jun-06	**14.30**	**27.14**	LM-36 1s	Lincoln
27-Jun-06	**14.84**	**30.87**	LM-36 2c	Lincoln
27-Jun-06	**13.25**	**96.65**	LM-37 1c	Lincoln
27-Jun-06	**17.63**	**93.04**	LM-37 2s	Lincoln
27-Jun-06	**14.83**	**136.51**	LM-37 3c	Lincoln
27-Jun-06	**23.75**	**122.32**	LM-37 4s	Lincoln
28-Jun-06	**19.48**	**79.19**	LM-38 1c	Lincoln
28-Jun-06	**13.54**	**119.02**	LM-38 2c	Lincoln
28-Jun-06	**14.38**	**121.94**	LM-38 3c	Lincoln
28-Jun-06	**10.33**	**147.98**	LM-39 1c	Lincoln
28-Jun-06	**18.40**	**145.81**	LM-39 2c	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
28-Jun-06	**10.33**	**94.06**	LM-39 3c	Lincoln
28-Jun-06	**16.61**	**93.42**	LM-40 1c	Lincoln
28-Jun-06	**13.02**	**98.56**	LM-40 2c	Lincoln
28-Jun-06	**19.33**	**180.52**	LM-40 3c	Lincoln
28-Jun-06	**27.77**	**121.15**	LM-41 1c	Lincoln
28-Jun-06	**13.91**	**169.15**	LM-42 1c	Lincoln
28-Jun-06	**14.88**	**120.37**	LM-42 2c	Lincoln
28-Jun-06	**19.22**	**147.29**	LM-43 1c	Lincoln
28-Jun-06	**18.84**	**202.04**	LM-43 2c	Lincoln
28-Jun-06	**25.24**	**113.49**	LM-44 1c	Lincoln
28-Jun-06	**17.91**	**142.69**	LM-44 2c	Lincoln
28-Jun-06	**10.32**	**33.36**	LM-49 2c	Lincoln
28-Jun-06	**11.09**	**35.86**	LM-45 2c	Lincoln
28-Jun-06	**11.18**	**40.85**	LM-45 3c	Lincoln
28-Jun-06	**13.42**	**24.40**	LM-45 4c	Lincoln
28-Jun-06	**13.84**	**73.03**	LM-45 5c	Lincoln
29-Jun-06	**10.20**	**25.06**	LM-48 1c	Lincoln
29-Jun-06	**9.28**	**15.71**	LM-48 2c	Lincoln
29-Jun-06	**18.02**	**30.60**	LM-48 3c	Lincoln
29-Jun-06	**29.70**	**72.51**	LM-48 4c	Lincoln
29-Jun-06	**15.08**	**63.03**	LM-48 5c	Lincoln
29-Jun-06	**18.84**	**66.58**	LM-47 1c	Lincoln
29-Jun-06	**14.16**	**62.20**	LM-47 2c	Lincoln
29-Jun-06	**11.07**	**62.19**	LM-47 3c	Lincoln
29-Jun-06	**23.95**	**38.89**	LM-47 4c	Lincoln
29-Jun-06	**18.94**	**45.91**	LM-47 5c	Lincoln
29-Jun-06	**9.15**	**17.94**	LM-49 1s	Lincoln
29-Jun-06	**11.07**	**35.53**	LM-49 2c	Lincoln
29-Jun-06	**29.34**	**69.82**	LM-49 3s	Lincoln
29-Jun-06	**13.69**	**60.99**	LM-49 4c	Lincoln
29-Jun-06	**12.65**	**52.26**	LM-49 5s	Lincoln
5-Jul-06	**15.39**	**18.07**	LM-50 1c	Lincoln
5-Jul-06	**16.59**	**27.17**	LM-50 2c	Lincoln
5-Jul-06	**11.34**	**43.87**	LM-50 3c	Lincoln
5-Jul-06	**16.30**	**77.43**	LM-50 4c	Lincoln
5-Jul-06	**13.97**	**48.97**	LM-50 5c	Lincoln
5-Jul-06	**12.78**	**42.02**	LM-51 1c	Lincoln
5-Jul-06	**11.99**	**38.65**	LM-51 2c	Lincoln
5-Jul-06	**26.09**	**55.09**	LM-51 3c	Lincoln
5-Jul-06	**13.41**	**54.09**	LM-51 4c	Lincoln
5-Jul-06	**16.33**	**64.24**	LM-51 5c	Lincoln
5-Jul-06	**12.80**	**38.05**	LM-52 1c	Lincoln
5-Jul-06	**10.13**	**21.35**	LM-52 2c	Lincoln
5-Jul-06	**14.75**	**47.06**	LM-52 3c	Lincoln
5-Jul-06	**17.78**	**42.28**	LM-52 4c	Lincoln
5-Jul-06	**11.41**	**61.00**	LM-52 5c	Lincoln
5-Jul-06	**16.41**	**96.92**	LM-53	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
6-Jul-06	**11.97**	**43.19**	LM-54	Lincoln
6-Jul-06	**19.27**	**44.35**	LM-55	Lincoln
6-Jul-06	**16.23**	**48.04**	LM-56	Lincoln
6-Jul-06	**11.39**	**39.45**	LM-57 1c	Lincoln
6-Jul-06	**11.29**	**65.58**	LM-57 2c	Lincoln
6-Jul-06	**16.42**	**46.07**	LM-58 1c	Lincoln
6-Jul-06	**13.38**	**57.53**	LM-58 2c	Lincoln
6-Jul-06	**25.56**	**46.34**	LM-59 1c	Lincoln
6-Jul-06	**18.63**	**51.40**	LM-59 2c	Lincoln
6-Jul-06	**17.13**	**74.64**	LM-60 1c	Lincoln
6-Jul-06	**17.79**	**60.28**	LM-60 2c	Lincoln
6-Jul-06	**12.37**	**38.77**	LM-61 1c	Lincoln
6-Jul-06	**16.82**	**57.86**	LM-61 2c	Lincoln
6-Jul-06	**14.86**	**43.38**	LM-61 3c	Lincoln
6-Jul-06	**10.99**	**29.41**	LM-62 1c	Lincoln
6-Jul-06	**15.71**	**52.82**	LM-62 2c	Lincoln
6-Jul-06	**13.37**	**34.11**	LM-62 3c	Lincoln
6-Jul-06	**10.87**	**21.63**	LM-63 1c	Lincoln
6-Jul-06	**10.37**	**21.47**	LM-63 2c	Lincoln
6-Jul-06	**23.82**	**43.03**	LM-63 3c	Lincoln
6-Jul-06	**11.36**	**51.41**	LM-64 1c	Lincoln
6-Jul-06	**10.35**	**62.79**	LM-64 2c	Lincoln
6-Jul-06	**10.31**	**34.39**	LM-65 1c	Lincoln
6-Jul-06	**17.11**	**43.95**	LM-65 2c	Lincoln
6-Jul-06	**12.36**	**19.84**	LM-66 1c	Lincoln
6-Jul-06	**18.32**	**49.42**	LM-66 2c	Lincoln
6-Jul-06	**17.58**	**60.94**	LM-66 3c	Lincoln
6-Jul-06	**10.77**	**26.13**	LM-67 1c	Lincoln
6-Jul-06	**28.29**	**61.77**	LM-67 2c	Lincoln
6-Jul-06	**19.26**	**48.34**	LM-67 3c	Lincoln
6-Jul-06	**11.35**	**31.85**	LM-68 1c	Lincoln
6-Jul-06	**10.70**	**49.76**	LM-68 2d	Lincoln
6-Jul-06	**11.64**	**55.13**	LM-68 3c	Lincoln
6-Jul-06	**13.91**	**78.98**	LM-68 4c	Lincoln
6-Jul-06	**10.57**	**34.75**	LM-69 1c	Lincoln
6-Jul-06	**11.53**	**16.21**	LM-69 2c	Lincoln
6-Jul-06	**14.86**	**59.97**	LM-69 3c	Lincoln
6-Jul-06	**14.15**	**62.99**	LM-69 4c	Lincoln
6-Jul-06	**11.59**	**36.91**	LM-70 1s	Lincoln
6-Jul-06	**10.99**	**32.39**	LM-70 2c	Lincoln
6-Jul-06	**14.03**	**42.11**	LM-70 3s	Lincoln
6-Jul-06	**11.60**	**38.87**	LM-70 4c	Lincoln
6-Jul-06	**14.90**	**36.52**	LM-71 1c	Lincoln
6-Jul-06	**15.81**	**64.73**	LM-71 2c	Lincoln
6-Jul-06	**14.23**	**169.45**	LM-72 1s	Lincoln
6-Jul-06	**23.69**	**78.10**	LM-72 2c	Lincoln
6-Jul-06	**14.51**	**123.74**	LM-73 1s	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
6-Jul-06	**10.55**	**77.55**	LM-73 2c	Lincoln
6-Jul-06	**10.08**	**100.91**	LM-73 3s	Lincoln
6-Jul-06	**14.84**	**94.61**	LM-74 1c	Lincoln
6-Jul-06	**18.67**	**77.86**	LM-74 2c	Lincoln
6-Jul-06	**13.99**	**65.50**	LM-74 3c	Lincoln
6-Jul-06	**15.37**	**87.95**	LM-75 1s	Lincoln
6-Jul-06	**18.84**	**122.54**	LM-75 2c	Lincoln
6-Jul-06	**17.88**	**48.55**	LM-75 3s	Lincoln
7-Jul-06	**11.15**	**157.13**	LM-76 1s	Lincoln
7-Jul-06	**33.24**	**116.34**	LM-76 2c	Lincoln
7-Jul-06	**10.37**	**84.79**	LM-76 3s	Lincoln
7-Jul-06	**10.81**	**172.18**	LM-78 1c	Lincoln
7-Jul-06	**18.70**	**84.19**	LM-78 2s	Lincoln
7-Jul-06	**17.94**	**79.33**	LM-78 3s	Lincoln
7-Jul-06	**19.83**	**40.45**	LM-78 4s	Lincoln
10-Jul-06	**19.29**	**95.27**	LM-79 1s	Lincoln
10-Jul-06	**12.06**	**75.30**	LM-79 2c	Lincoln
10-Jul-06	**14.63**	**71.07**	LM-79 3s	Lincoln
10-Jul-06	**17.33**	**90.75**	LM-80 1s	Lincoln
10-Jul-06	**16.58**	**64.39**	LM-80 2c	Lincoln
10-Jul-06	**12.34**	**56.94**	LM-81 1s	Lincoln
10-Jul-06	**15.51**	**101.60**	LM-81 2c	Lincoln
10-Jul-06	**17.00**	**67.13**	LM-81 3s	Lincoln
10-Jul-06	**13.00**	**85.99**	LM-81 4c	Lincoln
10-Jul-06	**15.66**	**125.89**	LM-81 5s	Lincoln
10-Jul-06	**12.53**	**214.04**	LM-81 6c	Lincoln
10-Jul-06	**13.00**	**75.52**	LM-82 1c	Lincoln
10-Jul-06	**14.95**	**99.81**	LM-82 2c	Lincoln
10-Jul-06	**12.80**	**214.79**	LM-82 3c	Lincoln
10-Jul-06	**14.16**	**228.97**	LM-82 4c	Lincoln
10-Jul-06	**19.18**	**164.78**	LM-82 5c	Lincoln
12-Jul-06	**15.95**	**39.24**	LM-83 1c	Lincoln
12-Jul-06	**14.99**	**106.23**	LM-83 2c	Lincoln
12-Jul-06	**10.23**	**125.30**	LM-83 3c	Lincoln
12-Jul-06	**11.11**	**242.73**	LM-83 4c	Lincoln
12-Jul-06	**27.89**	**240.01**	LM-83 5s	Lincoln
12-Jul-06	**13.82**	**103.37**	LM-84 1c	Lincoln
12-Jul-06	**15.95**	**130.07**	LM-84 2c	Lincoln
13-Jul-06	**19.43**	**112.18**	LM-85 1c	Lincoln
13-Jul-06	**17.07**	**126.46**	LM-85 2c	Lincoln
13-Jul-06	**12.77**	**192.66**	LM-85 3c	Lincoln
13-Jul-06	**15.09**	**183.07**	LM-85 4c	Lincoln
13-Jul-06	**13.14**	**281.74**	LM-85 5c	Lincoln
13-Jul-06	**11.98**	**144.33**	LM-86 1c	Lincoln
13-Jul-06	**16.92**	**125.78**	LM-86 2c	Lincoln
13-Jul-06	**19.27**	**210.81**	LM-86 3c	Lincoln
13-Jul-06	**16.96**	**157.67**	LM-86 4c	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
13-Jul-06	**12.96**	**221.89**	LM-86 5c	Lincoln
13-Jul-06	**19.72**	**112.29**	LM-87 1c	Lincoln
13-Jul-06	**13.34**	**207.94**	LM-87 2c	Lincoln
13-Jul-06	**17.91**	**170.53**	LM-87 3c	Lincoln
13-Jul-06	**17.83**	**221.40**	LM-87 4c	Lincoln
13-Jul-06	**11.93**	**139.86**	LM-88 1c	Lincoln
13-Jul-06	**16.75**	**288.39**	LM-88 2c	Lincoln
13-Jul-06	**19.73**	**420.04**	LM-88 3c	Lincoln
13-Jul-06	**12.73**	**288.42**	LM-89 1c	Lincoln
13-Jul-06	**17.01**	**254.43**	LM-89 2c	Lincoln
13-Jul-06	**13.14**	**156.30**	LM-89 3c	Lincoln
13-Jul-06	**14.08**	**306.78**	LM-89 4c	Lincoln
13-Jul-06	**16.15**	**308.85**	LM-90 1c	Lincoln
13-Jul-06	**14.43**	**331.77**	LM-90 2c	Lincoln
13-Jul-06	**10.10**	**310.64**	LM-90 3c	Lincoln
13-Jul-06	**18.05**	**222.12**	LM-90 4c	Lincoln
13-Jul-06	**16.68**	**255.89**	LM-91 1c	Lincoln
13-Jul-06	**13.33**	**301.89**	LM-91 2c	Lincoln
13-Jul-06	**15.73**	**313.05**	LM-91 2c	Lincoln
13-Jul-06	**12.48**	**307.77**	LM-91 3c	Lincoln
13-Jul-06	**20.78**	**307.83**	LM-91 4c	Lincoln
13-Jul-06	**19.43**	**307.08**	LM-92 1c	Lincoln
13-Jul-06	**13.45**	**382.89**	LM-92 2c	Lincoln
14-Jul-06	**12.25**	**153.34**	LM-93 1c	Lincoln
14-Jul-06	**15.81**	**178.10**	LM-93 2c	Lincoln
14-Jul-06	**13.81**	**237.70**	LM-94 1c	Lincoln
14-Jul-06	**18.67**	**291.48**	LM-94 2c	Lincoln
14-Jul-06	**16.42**	**211.17**	LM-95 1c	Lincoln
14-Jul-06	**16.83**	**100.36**	LM-95 2c	Lincoln
14-Jul-06	**13.60**	**209.29**	LM-96 1c	Lincoln
14-Jul-06	**16.16**	**200.31**	LM-96 2c	Lincoln
14-Jul-06	**12.79**	**218.57**	LM-97 1c	Lincoln
14-Jul-06	**16.90**	**200.75**	LM-97 2c	Lincoln
14-Jul-06	**15.65**	**204.44**	LM-98 1c	Lincoln
14-Jul-06	**19.55**	**257.68**	LM-98 2c	Lincoln
14-Jul-06	**11.69**	**27.19**	LMS-1	Lincoln
14-Jul-06	**17.28**	**19.70**	LMS-2	Lincoln
14-Jul-06	**11.70**	**140.19**	LMS-3	Lincoln
14-Jul-06	**13.90**	**61.48**	LMS-4	Lincoln
14-Jul-06	**16.57**	**44.05**	LMS-5	Lincoln
14-Jul-06	**28.42**	**91.08**	LMS-6	Lincoln
14-Jul-06	**8.33**	**10.38**	LMS-7	Lincoln
14-Jul-06	**15.27**	**10.14**	LMS-8	Lincoln
14-Jul-06	**10.27**	**18.66**	LMS-9	Lincoln
14-Jul-06	**13.88**	**20.65**	LMS-10 1c	Lincoln
14-Jul-06	**13.00**	**9.96**	LMS-10 2c	Lincoln
14-Jul-06	**11.29**	**9.43**	LMS-11 1c	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
14-Jul-06	**9.98**	**10.83**	LMS-11 2c	Lincoln
14-Jul-06	**16.91**	**54.74**	LMS-12 1c	Lincoln
14-Jul-06	**17.56**	**40.94**	LMS-12 2c	Lincoln
14-Jul-06	**19.75**	**67.05**	LMS-12 3s	Lincoln
14-Jul-06	**13.32**	**127.30**	LMS-12 4c	Lincoln
14-Jul-06	**14.21**	**124.72**	LMS-12 6c	Lincoln
14-Jul-06	**19.04**	**203.13**	LMS-12 7s	Lincoln
14-Jul-06	**10.75**	**144.94**	LMS-12 8c	Lincoln
17-Jul-06	**10.70**	**63.96**	LMS-13 1c	Lincoln
17-Jul-06	**15.56**	**71.28**	LMS-13 2c	Lincoln
17-Jul-06	**15.92**	**86.37**	LMS-13 3c	Lincoln
17-Jul-06	**15.14**	**52.35**	LMS-13 4c	Lincoln
17-Jul-06	**16.29**	**122.30**	LMS-13 5c	Lincoln
17-Jul-06	**17.02**	**73.63**	LMS-14 1c	Lincoln
17-Jul-06	**17.14**	**33.49**	LMS-14 2c	Lincoln
17-Jul-06	**18.55**	**68.64**	LMS-14 3c	Lincoln
17-Jul-06	**12.64**	**52.80**	LMS-14 4c	Lincoln
17-Jul-06	**12.71**	**31.83**	LMS-15 1c	Lincoln
17-Jul-06	**17.22**	**17.32**	LMS-15 2c	Lincoln
17-Jul-06	**15.10**	**20.79**	LMS-15 3s	Lincoln
17-Jul-06	**20.16**	**57.02**	LMS-15 4c	Lincoln
17-Jul-06	**17.64**	**60.41**	LMS-15 5c	Lincoln
17-Jul-06	**10.34**	**28.17**	LMS-16 1c	Lincoln
17-Jul-06	**17.41**	**19.78**	LMS-16 2c	Lincoln
17-Jul-06	**11.77**	**32.39**	LMS-16 3c	Lincoln
17-Jul-06	**12.68**	**23.21**	LMS-17 1c	Lincoln
17-Jul-06	**16.95**	**51.09**	LMS-17 2c	Lincoln
17-Jul-06	**15.80**	**10.20**	LMS-17 3c	Lincoln
17-Jul-06	**12.06**	**85.10**	LMS-17 4c	Lincoln
17-Jul-06	**10.23**	**69.59**	LMS-17 5c	Lincoln
17-Jul-06	**10.80**	**19.84**	LMS-18 1c	Lincoln
17-Jul-06	**18.99**	**15.61**	LMS-18 2c	Lincoln
17-Jul-06	**14.46**	**45.24**	LMS-18 3c	Lincoln
17-Jul-06	**16.21**	**17.44**	LMS-18 4c	Lincoln
17-Jul-06	**11.73**	**45.62**	LMS-18 5s	Lincoln
17-Jul-06	**12.26**	**16.25**	LMS-19 3c	Lincoln
17-Jul-06	**18.39**	**14.26**	LMS-19 1c	Lincoln
17-Jul-06	**10.86**	**17.66**	LMS-19 2c	Lincoln
17-Jul-06	**17.58**	**29.84**	LMS-19 4c	Lincoln
17-Jul-06	**17.88**	**27.27**	LMS-19 5c	Lincoln
18-Jul-06	**19.32**	**10.06**	LM-20 1c	Lincoln
18-Jul-06	**10.19**	**26.81**	LM-20 2c	Lincoln
18-Jul-06	**15.75**	**24.26**	LM-20 3c	Lincoln
18-Jul-06	**10.58**	**19.11**	LM-20 4c	Lincoln
18-Jul-06	**18.32**	**46.24**	LM-22 1c	Lincoln
18-Jul-06	**13.21**	**59.20**	LM-22 2c	Lincoln
18-Jul-06	**18.24**	**86.89**	LM-22 3c	Lincoln

MTCA Method A Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
18-Jul-06	**14.28**	**171.15**	LM-22 4c	Lincoln
18-Jul-06	**16.92**	**189.49**	LM-23 1c	Lincoln
18-Jul-06	**14.33**	**254.00**	LM-23 2c	Lincoln
18-Jul-06	**12.81**	**228.03**	LM-25 1c	Lincoln
18-Jul-06	**18.97**	**22.23**	LM-25 2c	Lincoln
18-Jul-06	**14.78**	**10.37**	LM-26 1c	Lincoln
18-Jul-06	**10.96**	**128.29**	LM-27 1c	Lincoln
18-Jul-06	**14.97**	**154.87**	LM-27 2c	Lincoln
18-Jul-06	**15.64**	**219.72**	LM-27 3c	Lincoln
18-Jul-06	**10.96**	**154.35**	LM-28 1c	Lincoln
18-Jul-06	**39.48**	**116.28**	LM-29 1s	Lincoln
18-Jul-06	**18.37**	**103.81**	LM-30 1c	Lincoln
18-Jul-06	**19.20**	**52.39**	LM-30 2c	Lincoln
18-Jul-06	**19.97**	**59.03**	LM-30 3c	Lincoln
18-Jul-06	**13.40**	**157.33**	LM-30 4c	Lincoln
19-Jul-06	**15.23**	**41.87**	LM-30 5c	Lincoln
19-Jul-06	**15.09**	**18.45**	LM-31 1c	Lincoln
19-Jul-06	**12.78**	**37.41**	LMS-32 1c	Lincoln
19-Jul-06	**12.20**	**156.38**	LMS-33 1c	Lincoln
19-Jul-06	**12.18**	**60.97**	LMS-34 2c	Lincoln
19-Jul-06	**15.02**	**66.33**	LMS-34 1c	Lincoln
19-Jul-06	**9.35**	**21.40**	LMS-34 3c	Lincoln
19-Jul-06	**19.35**	**51.57**	LMS-34 4c	Lincoln
19-Jul-06	**19.37**	**27.50**	LMS-34 5c	Lincoln
19-Jul-06	**18.49**	**33.48**	LMS-35 1c	Lincoln
19-Jul-06	**15.68**	**21.02**	LMS-35 2c	Lincoln
19-Jul-06	**15.03**	**56.83**	LMS-35 3c	Lincoln
19-Jul-06	**10.88**	**11.76**	LMS-36 1c	Lincoln
19-Jul-06	**14.68**	**18.98**	LMS-36 2c	Lincoln
19-Jul-06	**12.55**	**10.45**	LMS-36 3c	Lincoln
20-Jul-06	**15.21**	**138.62**	LMS-37 1c	Lincoln
20-Jul-06	**16.40**	**28.13**	LMS-37 2c	Lincoln
20-Jul-06	**13.36**	**18.09**	LMS-37 3c	Lincoln
20-Jul-06	**14.48**	**18.14**	LMS-37 4c	Lincoln
20-Jul-06	**19.82**	**194.80**	LMS-38 1c	Lincoln
20-Jul-06	**14.36**	**203.23**	LMS-38 2c	Lincoln
20-Jul-06	**14.46**	**19.42**	LMS-38 3c	Lincoln
20-Jul-06	**19.47**	**158.47**	LMS-39 1c	Lincoln
20-Jul-06	**17.10**	**99.66**	LMS-39 2c	Lincoln
20-Jul-06	**16.41**	**18.70**	LMS-39 3c	Lincoln
20-Jul-06	**18.90**	**139.22**	LMS-40 1c	Lincoln
20-Jul-06	**10.54**	**30.38**	LMS-40 2c	Lincoln
20-Jul-06	**16.55**	**115.01**	LMS-40 3c	Lincoln
20-Jul-06	**17.97**	**58.79**	LMS-40 4c	Lincoln
20-Jul-06	**13.51**	**81.32**	LMS-41 1c	Lincoln
20-Jul-06	**13.96**	**28.82**	LMS-41 2c	Lincoln
20-Jul-06	**18.75**	**27.63**	LMS-41 3c	Lincoln

MTCA Method A
Soil Cleanup Levels

As-20 ppm

Pb- 250 ppm

Date	As	Pb	Sample ID	School
20-Jul-06	**12.25**	**44.85**	LMS-41 4c	Lincoln
20-Jul-06	**14.46**	**28.27**	LMS-42 1c	Lincoln
20-Jul-06	**14.33**	**27.11**	LMS-42 2c	Lincoln
20-Jul-06	**15.40**	**95.00**	LMS-42 3c	Lincoln
20-Jul-06	**13.65**	**56.97**	LMS-42 4c	Lincoln
20-Jul-06	**14.25**	**37.17**	LMS-43 1c	Lincoln
20-Jul-06	**13.49**	**18.62**	LMS-43 2c	Lincoln
20-Jul-06	**15.87**	**35.31**	LMS-43 3c	Lincoln
20-Jul-06	**15.22**	**44.14**	LMS-43 4c	Lincoln
20-Jul-06	**20.80**	**19.13**	LMS-43 5c	Lincoln
average	**15.54**	**85.07**		
maximum	**39.48**	**420.04**		

6.0 PROJECT SUMMARY

Soil samples collected at Lincoln Elementary School during sampling events in 2002 and 2006 indicated lead and arsenic contamination existed in surface soils at concentrations above MTCA cleanup levels. Deep mixing technology was used to blend the contaminated surface soil with deeper clean soils. As a result, lead and arsenic concentrations at the site were spread throughout a four foot soil profile and the majority of soil on site no longer contains concentrations above MTCA cleanup levels. Though some samples still slightly exceed MTCA cleanup levels, statistical analysis was used to show that fewer than 10% of samples exceeded MTCA cleanup levels and none were twice the MTCA cleanup level. MTCA cleanup guidelines require no further action at a site when these conditions are met. Following remediation, the site was restored to its original condition.

7.0 APPENDICES

Appendix A: FIGURES

Figure A-1: Vicinity Map

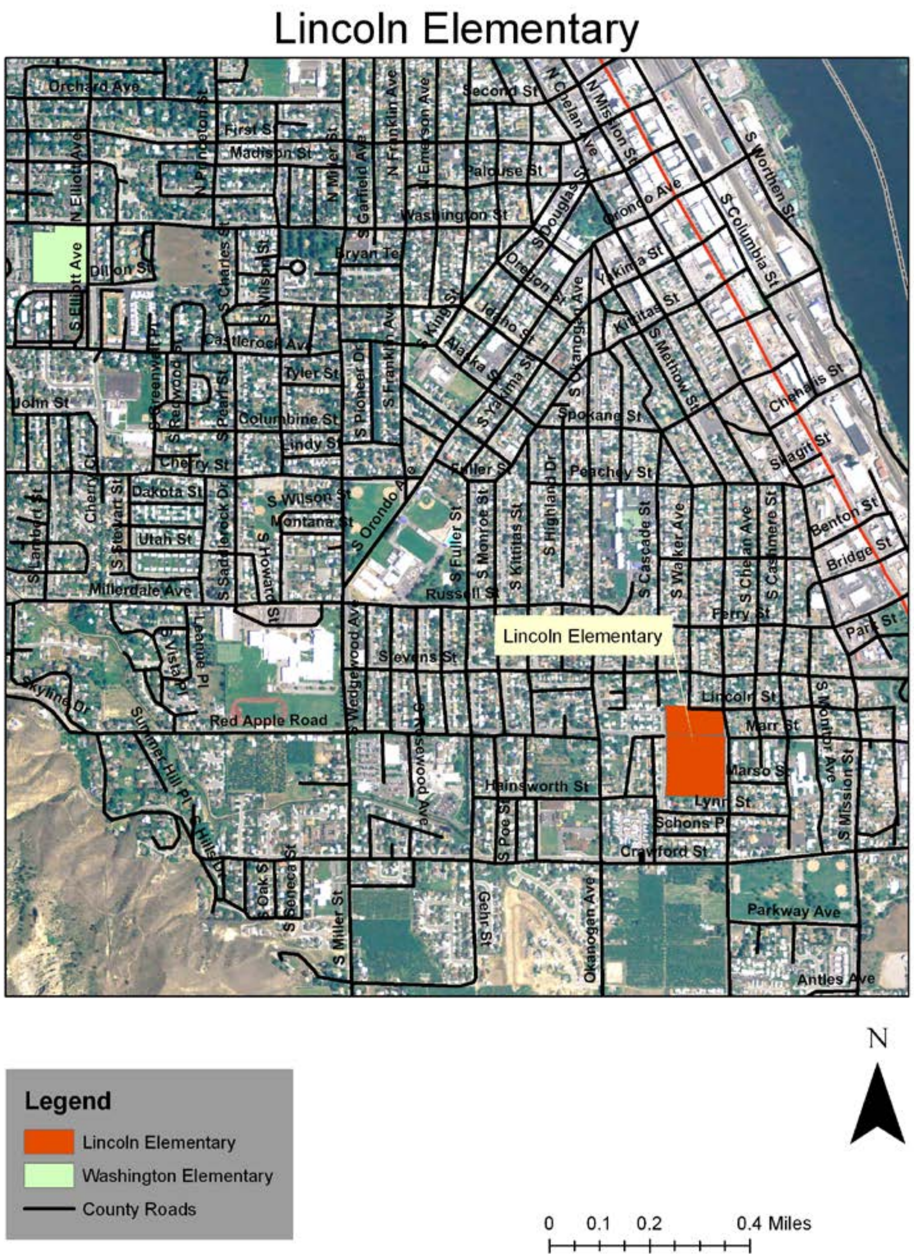


Figure A-2: Pre-Remediation Samples

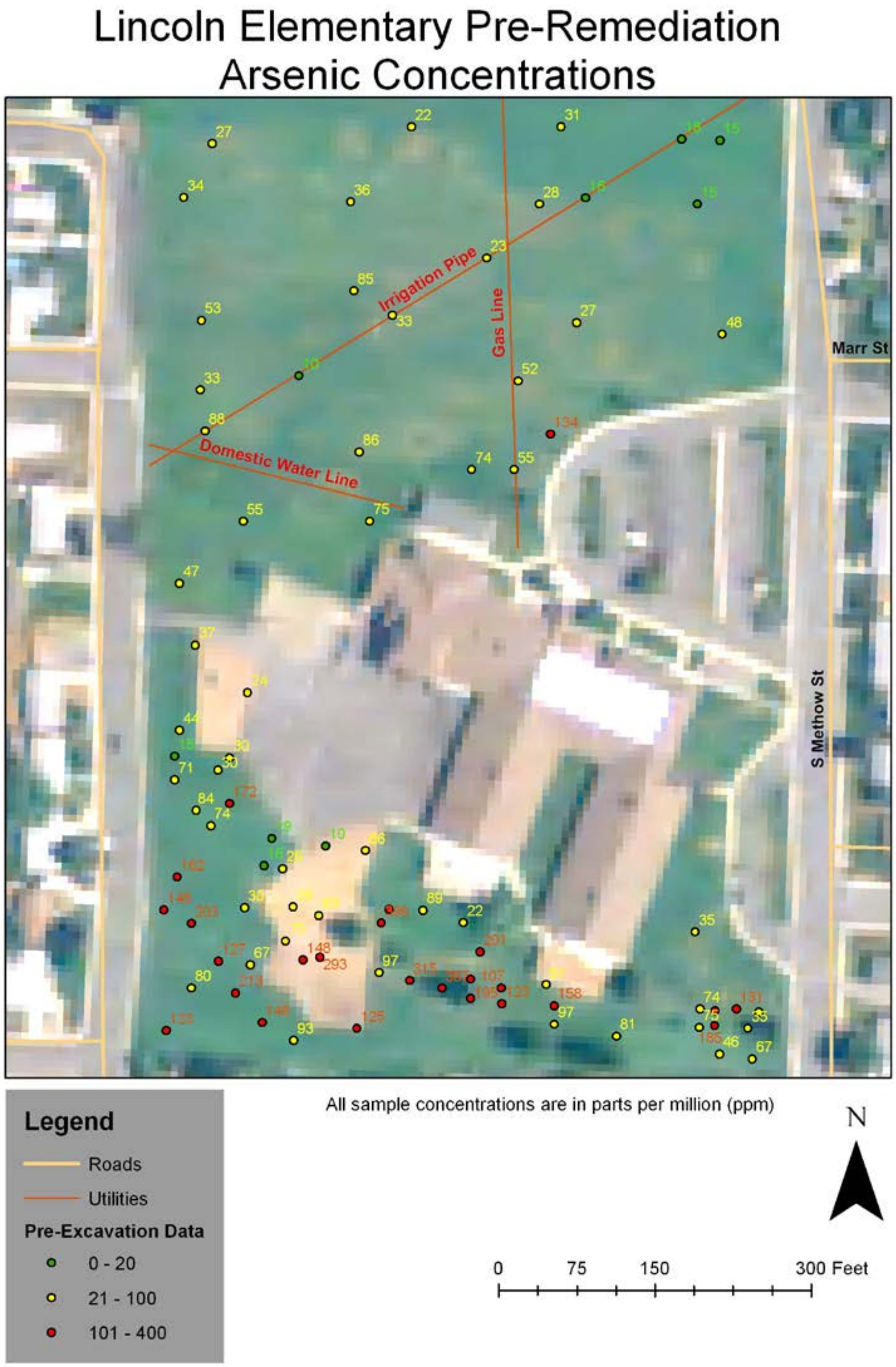
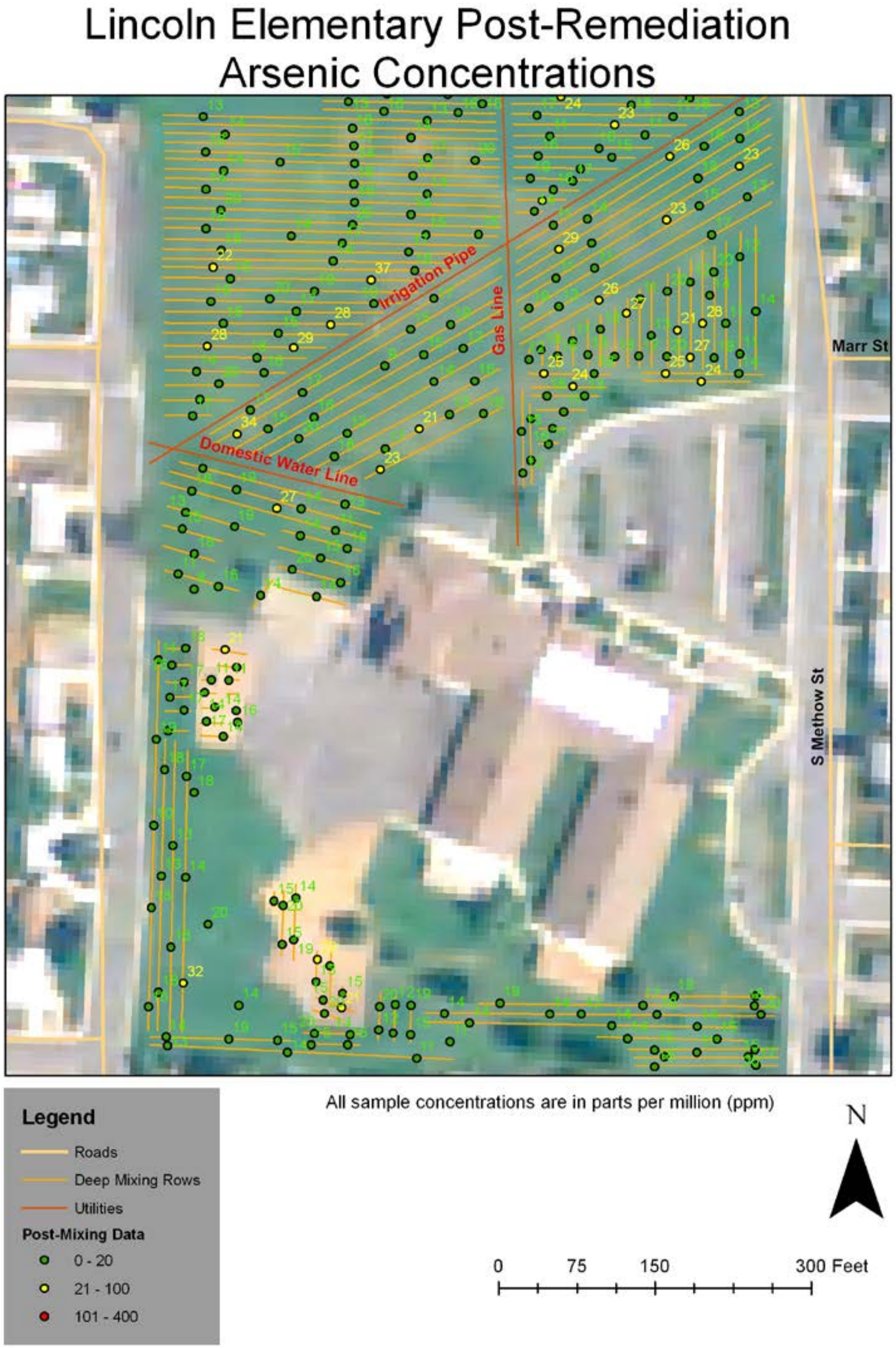


Figure A-3: Post-Remediation Samples



Appendix B: XRF USE

The summer 2006 area-wide contamination clean-up projects involved the collection and analysis of a vast number of soil samples. Concentrations of lead and arsenic in these soil samples provided information as to whether or not an area was contaminated, and this information was used to determine how the remedial activities would proceed. Therefore project staff needed a way to quickly and reliably evaluate soil arsenic and lead concentrations. This was achieved through the use of two portable X-Ray Fluorescence (XRF) Analyzers manufactured by Innov-x Systems.

The instruments use x-ray technology to excite elemental electrons in a soil sample and cause these elements to emit characteristic x-rays. The intensity of these elemental x-rays is then measured to determine the amount of a particular element present in the sample. The entire analysis is performed in approximately one minute and the data is stored in a removable Hewlett-Packard (HP) iPAQ personal data assistant which can transmit the information to a laptop.

The use of portable XRF units for the determination of soil elemental concentrations has been described by EPA Method 6200 and has been found to provide, "a rapid field screening procedure" for site characterization [1]. Results from the study conducted by Ecology in 2002 (as shown in the graphs below) found that a portable Niton XRF had a correlation coefficient (r2 value) between field and Inductively-Coupled Plasma (ICP) laboratory analyses of 0.8057 for lead and 0.933 for arsenic. In addition, a verification study conducted by the EPA Superfund Innovative Technology Evaluation (SITE) Monitoring and Measurement Technology (MMT) Program provides additional support for the use of this technology. The investigation compared an Innov-x XRF model, similar to the one used by Ecology, with reference laboratory data and showed a correlation coefficient of 0.8762 for arsenic and 0.91 for lead [2]. All of this data shows that an XRF can be an effective tool for characterizing large contamination sites.

Figure B-1: 2002 Arsenic Comparison

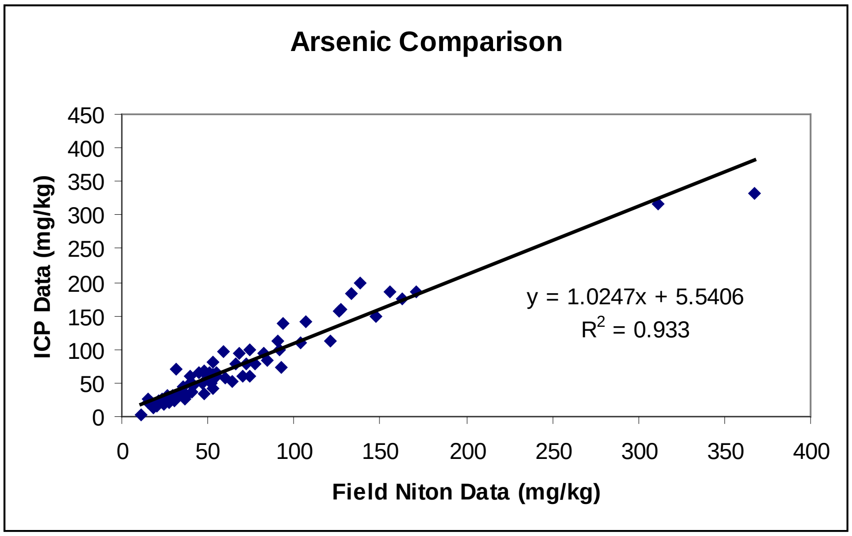
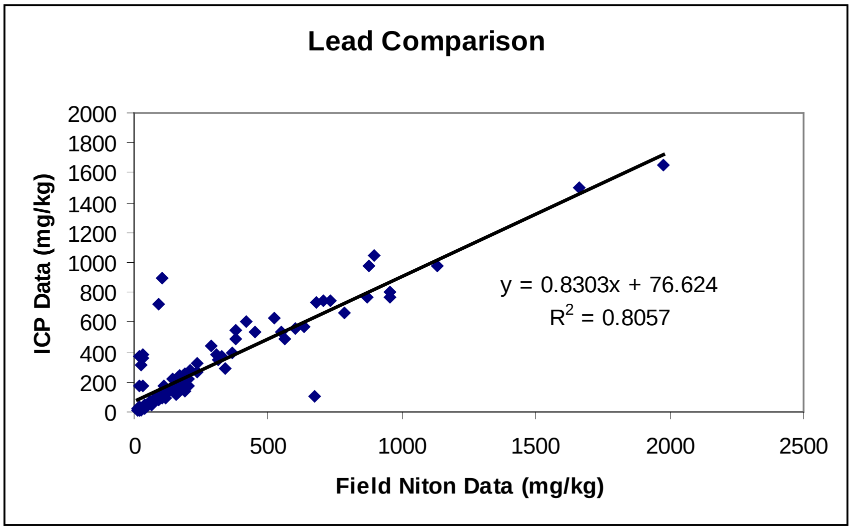


Figure B-2: 2002 Lead Comparision



During the summer 2006 projects, soil samples were collected and analyzed with the XRF instruments from a variety of locations. These locations included: undisturbed portions of the school playfields, sections of the playfields where initial soil excavations had occurred, and areas that had been processed by the deep mixer. As timely decision making was often required to keep the projects on schedule, the ability to assess the effectiveness of remediation activities with on-site soil analysis was invaluable to the overall success of the project. The XRF could determine concentrations of lead and arsenic in minutes. Sending samples for laboratory analysis at standard rates takes 2-3 weeks and would have drastically reduced the efficiency of remedial activities. Real-time results from these field analyses enabled project staff to make decisions such as whether the removal of additional soil was necessary or whether the barrel of the deep mixer should be raised to mix less soil or lowered to mix more.

Following the completion of the remediation projects conducted in 2006, additional samples were collected for comparison between XRF and laboratory ICP methods. A total of 95 additional samples were collected and analyzed by both methods. These samples were analyzed by XRF prior to packaging in clean sealed jar. The analysis (as shown in the graphs below) found that the Innov-X XRF had a correlation coefficient (r2 value) between field and Inductively-Coupled Plasma (ICP) laboratory analyses of 0.779 for arsenic and 0.893 for lead. It should be noted that many of the data points were actually detection limits of both analysis methods for samples where lead or arsenic was not detected. When those non-detect data points are removed, the analysis found that the Innov-X XRF had a correlation coefficient (r2 value) between field and Inductively-Coupled Plasma (ICP) laboratory analyses of 0.838 for arsenic and 0.879 for lead.

Figure B-3: 2006 Arsenic Comparison

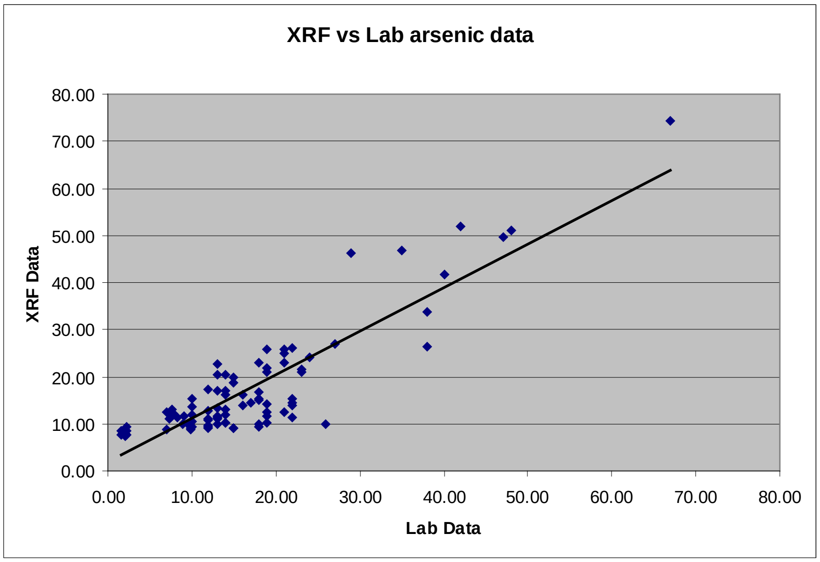
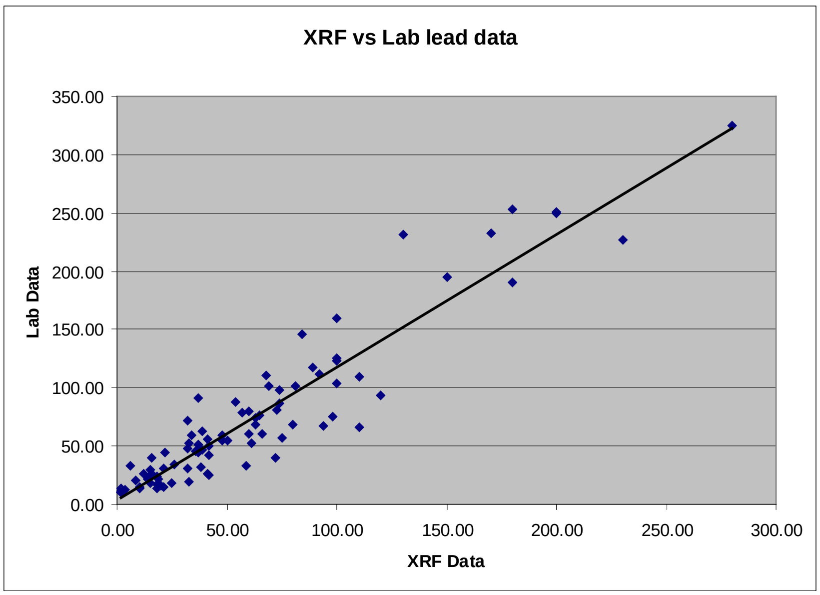


Figure B-4: 2006 Lead Comparison



Project staff followed all safety protocols for use of the XRF instruments including completion of mandatory information and safety trainings before sampling analysis began. In order to reduce health risks associated with radiation exposure, the instruments were operated while in a docking station and careful attention was paid to eliminate direct x-ray exposure. Actual amounts of radiation exposure as regulated by OSHA were monitored with the use of dosimeters which were carried by all sampling personnel.

Finally, in addition to the time saving benefits of the XRF instruments, their use proved to be a cost effective option for sample analysis. Due to the area (total acreage) covered during the school remediation projects, a large number of samples were required to characterize site progress. Use of the instruments resulted in a significant reduction in the number of soil samples sent off for laboratory analysis at a cost of $62-$66 per sample. Therefore, instead of project money being spent on one time analyses, it was invested in a second XRF instrument which enabled remediation work to occur simultaneously in several locations. Not only has the instrument paid for itself over the course of a single summer, but it will now be available for use in many future projects.

Appendix C: COSTS

Remediation costs for Lincoln Elementary School were higher than anticipated for two primary reasons:

- Areas of extremely high arsenic concentrations had to be excavated and disposed of at a certified landfill.
- A major irrigation pipeline crossed the property. Unfortunately, this was not known prior to remediation, causing delays to avoid damage.

Lincoln Elementary School Remediation Costs

Mobilization	
Soil Disposal	$53,065
Soil Transport	$21,677
Final Grading	$6514
Import Clean Fill	$5,227
Deep Mixing Costs	
Vertical Mixing	$128,760
Excavation Costs	
Shallow Excavation	$44,880
Landscaping	
Sod Installation	$20,680
Irrigation	
Install Irrigation Panel	$2,205
Irrigation/Pump Controllers	$2,492
Installation of Irrigation System	$194,304
Miscellaneous	
Locate Main Irrigation Line	$223
Road Plate Rental	$955
Piping/ Debris Disposal	$3,822
Reclamation District	$2,061
Playground Equipment	$3,464
Playground Area Maintenance	$900
Additional Fence & Rental	$2,205
Temporary Fencing	$1,112
Total	$494,546
Acres remediated	7.85
Cost per acre	$62,999
Square feet remediated	341,946
Cost per square foot	$1

Appendix D: PHOTO LOG

Photo D-1: Excavated areas at Lincoln Elementary

Photo D-2: Excavation at Lincoln Elementary

Photo D-3: Deep Mixer in operation at Lincoln Elementary

Photo D-4: Lincoln Elementary after germination

Appendix E: BIBLIOGRAPHY

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