Tacoma Smelter Plume Site
Soil Safety Program
Final Design Document

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Prepared for

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1.0 INTRODUCTION

ASARCO operated a primary copper smelter at Ruston, Washington for almost 100 years. That smelter, referred to as the Tacoma Smelter, specialized in the smelting of complex (e.g., high-arsenic) ores. It closed in 1986. For many years, the Tacoma Smelter was the sole domestic source of arsenic for the U.S. market.

The U.S. Environmental Protection Agency (EPA) is overseeing cleanup of residential properties in Ruston and north Tacoma, within approximately 1 mile of the former smelter, as part of Commencement Bay Superfund Site cleanup activities. The Washington State Department of Ecology (Ecology), in cooperation with local health departments, has been investigating widespread contamination from smelter emissions extending beyond the designated EPA Superfund site. This larger area of contamination has been designated the Tacoma Smelter Plume (TSP) Site under Washington's Model Toxics Control Act (MTCA).

A number of studies of residual soil contamination within the TSP Site have been completed including footprint studies of Thurston, Pierce, Kitsap, and King Counties, and Child Use Area (CUA) studies in King and Pierce Counties. Footprint studies defined the spatial pattern of smelter contamination and its likely maximum magnitudes by location. Child Use Areas - those locations where numbers of children are likely to spend significant time and have opportunities for contact with contaminated soil – have been sampled in King and Pierce Counties, on a limited basis as funding allowed. Young children are considered a population of special concern because of their propensity for soil contact, mouthing behaviors, and greater sensitivity (e.g., greater absorption) for smelter-related contaminants such as arsenic and lead.

1.1 PURPOSE

A new law, Chapter 70.140 RCW, was enacted in 2005 that requires Ecology to assess soil contamination at schools and childcares within the Tacoma Smelter Plume (TSP). The purpose of this document is to describe the activities that will be conducted and identify the roles and responsibilities of Ecology and other state and local agencies in implementing this law.

1.2 RECENT LEGISLATION (RCW 70.140)

A law (Chapter 70.140 RCW) was enacted in 2005 to assist state and local agencies in implementing actions to reduce children's exposure to soil with area-wide arsenic and lead contamination. The law requires Ecology, in cooperation with the Department of Social and Health Services (DSHS), the Department of Health (DOH), the Office of the Superintendent of Public Instruction (OSPI), and local

health districts, to assist schools and childcares in western Washington to reduce the potential for children's exposure to area-wide soil contamination. The law (RCW 70.140.030) requires Ecology to:

(a) Identify schools and childcares that are located within the central Puget Sound smelter plume (Tacoma Smelter Plume) based on available information

(b) Conduct qualitative evaluations to determine the potential for children's exposure to area-wide soil contamination;

(c) Conduct soil samples by December 31, 2009, if the qualitative evaluation determines that children may be routinely exposed to area-wide soil contamination at a property; and

(d) Notify schools and childcares regarding the test results and the steps necessary for implementing best management practices, if soil sample results confirm the presence of area-wide soil contamination.

Ecology must also develop best management practice (BMP) guidelines [RCW 70.140.040(2)] and a grant program to assist schools and owners and operators of childcares with implementing BMPs [RCW 70.140.040(3)] and recognize schools and childcares that successfully implement BMPs [RCW 70.140.030(4)]. The law authorizes Ecology (within available funds) to provide grants to schools and childcares for implementation of BMPs [RCW 70.140.040(4)] and financial assistance to DSHS to implement required activities [RCW 70.140.040(5)]. It also authorizes Ecology to use an interagency agreement to authorize a local health department to implement any activity [RCW 70.140.040(6)].

In addition, the law requires schools and childcares to work with Ecology to provide site access for soil sampling. If schools or childcares with area-wide soil contamination do not implement BMPs within 6 months of receiving written notification of test results, they must notify parents and guardians in writing of the results, using a written notice prepared by Ecology.

Ecology has partnered with Public Health – Seattle & King County (PHSKC) and the Tacoma-Pierce County Health Department (TPCHD) to implement this law. The program has been titled the "Soil Safety Program." Ecology has provided grants to the health departments to conduct activities related to the Tacoma Smelter Plume, including soil sampling at the childcares and schools, and providing education and outreach.

1.3 PREVIOUS STUDIES

Footprint studies have been completed to determine the extent and magnitude of shallow soil contamination from the TSP. As a result of the footprint studies, CUA studies were conducted to determine the potential exposure to children in contaminated areas. The approaches and results of these studies are presented in the following sections.

1.3.1 RELATIONSHIP BETWEEN STATE CLEANUP LEVELS, INTERIM ACTION LEVELS, AND HIGH/MODERATE RANGES

Results from the Tacoma Smelter Plume studies are often compared to various concentration levels. Briefly described here are the relationships between these levels in order to better understand the comparisons.

State Cleanup Levels

State cleanup levels are established under the state cleanup law, the Model Toxics Control Act (MTCA). The state cleanup levels serve two important purposes by:

- Establishing a dividing line between properties that require further investigation and cleanup, and those that do not; and
- Defining a level of performance ("how clean is clean?") that must be achieved when someone decides to clean up a specific property.

The state cleanup levels for arsenic and lead are listed in Table 1-1.

Interim Action Trigger Levels

For the first Child-Use Area studies, Ecology developed interim action trigger levels for arsenic and lead soil contamination to help Ecology prioritize interim cleanup decisions for child-use areas. Because of the vast size of the Tacoma Smelter Plume site, not all child-use areas with arsenic and lead concentrations above state cleanup levels could be cleaned up right away. In order to identify the specific child-use areas which were most important to clean up first, Ecology developed interim action trigger levels – these are contaminant levels that "trigger" an interim action to occur. The Interim Action Trigger Levels are also listed in Table 1-1.

High/Moderate Ranges

Soils in large parts of Washington State contain elevated levels of arsenic and lead caused by past releases from metal smelters and historical application of agricultural pesticides. This low- to moderate-level soil contamination, dispersed over large geographic areas, is referred to as area-wide soil contamination. The Tacoma Smelter Plume is an example of an area-wide contaminated site. Ecology has developed a strategy for addressing area-wide contaminated sites. As part of this strategy, Ecology developed ranges to define low to moderate, and moderate to high. The basis for the interim action trigger levels was used to set the different ranges. The Area-wide Strategy sets out that the MTCA regulatory process may be used at properties found to have high levels of arsenic and lead. An alternative approach will be used at properties found to have moderate levels of arsenic and lead soil contamination, no related groundwater contamination, and no other contaminants. The ranges are also included in Table 1-1.

TABLE 1-1
STATE CLEANUP LEVELS, INTERIM ACTION TRIGGER LEVELS, AND MODERATE/HIGH RANGES

	Arsenic (ppm)				Lead (ppm)			
	MTCA Cleanup Level	Interim Action Trigger Level	Moderate	High	MTCA Cleanup Level	Interim Action Trigger Level	Moderate	High
Schools, childcares, residential properties	20	100	20 - 100	> 100	250	700	250 - 500	> 500
Parks, commercial properties	20	200	20 - 200	> 200	250	1000	250 - 700	> 700

* *Comparison statistics: averages above these levels; or a maximum above 2 times these levels (i.e., avg > 20 ppm, or max > 40 ppm)*

** *Basis for moderate and high concentrations – MTCA cleanup levels and Interim Action Trigger Levels. Moderate and high concentrations reviewed and supported by Science Advisory Board. Based on Science Advisory Board recommendations, the high range for lead was lowered.*

1.3.2 FOOTPRINT STUDIES: APPROACHES AND RESULTS

In 1999, Ecology and the local health departments in King and Pierce counties began a systematic and phased approach to soil investigations of smelter-impacted areas outside of the Ruston/north Tacoma area and ASARCO Superfund sites. A phased approach was used to allocate funding as it became available and to direct sampling efforts as more data became available. Footprint studies were conducted first on Vashon-Maury Island and the King County Mainland, followed by Pierce County, and later included parts of Thurston and Kitsap Counties. Footprint sampling focused on relatively undisturbed forested areas to develop information on the likely highest levels of soil contaminant concentrations. The studies were guided by a conceptual model of aerial deposition from the smelter stack influenced by wind direction and intensity, and topographic features. The conceptual model predicted higher concentrations in the surface soil in predominant downwind directions, higher soil concentrations closer to the smelter, and higher soil concentrations in undisturbed soil. Disturbance during development activities was assumed to dilute the surface soil concentrations. The footprint studies confirmed the conceptual model. Table 1-2 summarizes the results of the footprint studies.

TABLE 1-2
SUMMARY OF FOOTPRINT STUDY RESULTS

Study	Metals	Highest Found	State Standard
King County Mainland Footprint Studies	Arsenic	260 ppm	20 ppm
	Lead	790 ppm	250 ppm
Vashon-Maury Island Footprint Study	Arsenic	460 ppm	20 ppm
	Lead	1,300 ppm	250 ppm
Pierce County Footprint Studies	Arsenic	1,050 ppm	20 ppm
	Lead	6,670 ppm	250 ppm
Kitsap County Footprint Study	Arsenic	36.9 ppm	20 ppm
	Lead	198 ppm	250 ppm
Thurston County Footprint Study	Arsenic	159 ppm	20 ppm
	Lead	1,110 ppm	250 ppm

The results of the King County footprint studies showed arsenic contamination ranging as high as 460 ppm on Vashon-Maury Island and 260 ppm on the King County mainland, while lead ranged as high as 1,300 ppm on Vashon-Maury Island and 790 ppm on the King County mainland (Ecology 2000 and Ecology 2002). The Puget Sound background concentrations of arsenic and lead in soil are 7 ppm and 24 ppm, respectively (Ecology 1994). The Model Toxics Control Act Method A Soil Cleanup Levels for unrestricted land uses for arsenic and lead are 20 ppm and 250 ppm, respectively.

Pierce County Footprint Studies showed arsenic concentrations near the smelter as high as 1,050 ppm and lead concentrations as high as 6,670 ppm. A Final Extended Footprint Study included Kitsap and Thurston counties, as well as King and Pierce counties. Table 1-2 summarizes the results of all Footprint studies, and Figure 1 displays the results. Results in Kitsap and Thurston Counties showed lower levels of arsenic and lead, primarily due to their distance from the smelter; however, some results still exceeded the MTCA Method A Soil Cleanup Levels for unrestricted land uses.

1.3.3 CUA STUDIES: APPROACHES AND RESULTS

CUA studies were conducted in King County (including Vashon-Maury Island) and Pierce County between 2000 and 2005. Data from the footprint studies and statistical methods were used to define a geographic region called the CUA Study Zone. The study zone focused CUA sampling in areas that were most likely to have significant concentrations of arsenic and lead in the soil. Targeted CUAs included elementary schools, childcares, parks, and camps. Based on observing where the children played, the CUA was divided into "play areas." Average sample results for each play area were

compared to interim action trigger levels (for schools and childcares: 100 ppm arsenic, 700 ppm lead; for parks and camps: 200 ppm arsenic, 1,000 ppm lead) to determine if the play area needed immediate action to reduce children's exposure to arsenic and lead.

On Vashon-Maury Island, 34 out of 45 identified CUAs were sampled. Of the CUAs sampled, 13 were elementary schools, 4 were childcares, 11 were parks, 4 were camps, and 2 were beaches. On the King County mainland in 2003, 221 facilities were contacted; of those 97 were sampled. A total of 38 elementary schools, 30 parks, 1 garden and 28 childcares were sampled. And in 2005, 547 facilities were contacted; of those 91 were sampled. A total of 12 elementary schools, 30 parks, and 49 childcares were sampled. Of the facilities sampled in King County, none exceeded the interim action trigger levels. A total of 39 CUAs have play areas exceeding the MTCA cleanup level for arsenic, and 7 CUAs have play areas exceeding the cleanup level for lead.

In Pierce County in 2003, 194 CUAs were identified and 64 were sampled. A total of 18 schools, 16 parks, and 30 childcares were sampled. Of the facilities sampled, one school and one childcare exceeded the interim action trigger levels. At the school with a play area above the interim action trigger level, soil was removed from a dirt baseball field and replaced with clean soil and remaining areas of bare ground were covered with asphalt. At the childcare, the owners were provided with soil safety brochures, but no soil removal or encapsulation was undertaken because the contaminated area was wooded and children did not play in the area on a regular basis. In 2005, 10 Metro Parks facilities were sampled. Of the parks sampled, none exceeded the interim action trigger levels. A total of 30 CUAs have play areas exceeding the MTCA cleanup level for arsenic, and 6 CUAs have play areas exceeding the cleanup level for lead. Table 1-3 summarizes the numbers and types of CUAs studied in each county. Table 1-4 provides a summary of the CUA study results.

1.4 LESSONS LEARNED

This section focuses on evaluating processes and technical methods from past CUA studies to identify things that worked well and things that could or should be done differently. The lessons in this section were compiled through interviews with staff from Public Health-Seattle & King County, Tacoma-Pierce County Health Department, and Ecology. The following subsections describe general observations by agency staff regarding property access, community outreach, and sampling methods. Table 1-5 presents some specific lessons learned and changes that were recommended by agency staff for implementing the Soil Safety Program.

TABLE 1-3
CHILD USE AREA DATA SUMMARY

Study		# facilities identified	# facilities contacted	# access agreements	# sampled	# in moderate range	# in high range
King							
VMI (2001)							
	Public schools	4	4	4	4	2	0
	Private schools	6	6	6	6	3	0
	Childcare centers(1)						
	Home childcares	15	15	7	7	1	0
	Parks	13	13	11	11	3	0
	Camps	4	4	4	4	3	0
	Other	3	3	2	2	0	0
Main KC (2003)							
	Public elementary schools	48	41	38	35	10	0
	Private elementary schools	11	4	4	3	0	0
	Childcare centers (1)						
	Home childcares	432	74	35	28	3	0
	Parks	93	56	47	30	7	0
	Camps	0	0	0	0	0	0
	Other	2	1	1	1	0	0
Main KC (2005)							
	Public elementary schools	16	16		10	0	0
	Private elementary schools	10	10		2	0	0
	Childcare centers	85	85		9	1	0
	Home childcares	387	387		40	5	0
	Parks	41	41		30	7	0
	Camps	2	2		0	0	0
	Other	6	6		0	0	0
Pierce							
PC (2003)							
	Public elementary schools	19	19	19	18	5	**1**
	Private elementary schools	5	5	0	0	0	0
	Childcare centers (1)						
	Home childcares	131	131	33	30	12	**1**
	Parks	41	41	22	16	7	0
	Camps	0	0	0	0	0	0
	Other	0	0	0	0	0	0
PC (2005)							
	Public elementary schools	0	0	0	0	0	0
	Private elementary schools	0	0	0	0	0	0
	Childcare centers	0	0	0	0	0	0
	Home childcares	0	0	0	0	0	0
	Parks	12	12	12	10	6	0
	Camps	0	0	0	0	0	0
	Other	0	0	0	0	0	0

(1) Combined with "Home childcares"

TABLE 1-4
SUMMARY OF PREVIOUS CUA STUDY RESULTS

Study	Metals	Highest Individual Sample	Range of Averages	State Standard
Vashon-Maury Island CUA Study	Arsenic	130 ppm	4-50 ppm	20 ppm
	Lead	900 ppm	8-180 ppm	250 ppm
King County Mainland CUA Study (2003)	Arsenic	189 ppm	3-41 ppm	20 ppm
	Lead	699 ppm	4-134 ppm	250 ppm
King County Mainland CUA Study (2005)	Arsenic	223 ppm	2-173 ppm	20 ppm
	Lead	660 ppm	2-336 ppm	250 ppm
Pierce County CUA Study	Arsenic	691 ppm	1-114 ppm	20 ppm
	Lead	1,040 ppm	2-170 ppm	250 ppm
Pierce County Metro Parks CUA Study	Arsenic	214 ppm	3-85 ppm	20 ppm
	Lead	983 ppm	3-234 ppm	250 ppm

1.4.1 PROPERTY ACCESS

Obtaining property access at childcares was difficult and time consuming. Response rates from only sending letters were generally very poor. Response rates from follow-up telephone calls were much better, but were estimated to be below 50 percent. Several agency staff observed that childcare operators are generally very busy and do not have time to read mailed material, and often it is hard for them to even find time for a telephone call. In several cases, a visit to the childcare was effective in persuading the operator to proceed with sampling, although visits are costly and time consuming.

Several agency staff also found that distributing information to childcare operators through other avenues such as childcare organizations like Childcare Resource and Referral Network, or training programs like STARS, was effective. Agency staff obtained feedback from several childcare operators that receiving the information from trusted sources before they were contacted by the agencies was helpful. Childcare organizations were helpful in portraying a non-regulatory message that soil sampling and taking measures to reduce risk (i.e., BMPs) were a healthy choice rather than simply a government mandate. Once childcare operators understood the importance of soil sampling and BMPs for the health of the children, they were more receptive to the CUA study. Several agency staff suggested that a future approach might include disseminating materials through childcare organizations, followed by information from DSHS and the health departments.

TABLE 1-5
LESSONS LEARNED

Category	Lesson/Comment
Property Access	Success rate of achieving property access was greater when agency staff called the childcare directly than when request was mailed. The database of childcare providers did not include telephone numbers; obtaining telephone numbers required considerable effort. King County encountered a high rate of turnover of childcare facilities. Periodic updates to the list of childcares will be necessary to keep information current. Childcare owners and operators may not be the same person. This sometimes caused problems with access, but could be resolved by contacting and doing outreach to both owners and operators. Mailing requests was sometimes unreliable as letters were sent back because of incorrect addresses. The letters to childcare providers were too technical and not personal enough. Most providers ignored them. Agencies often used proper channels to make connections with childcares but could have used them in different ways to increase the success rate of getting access.. Getting the endorsement of childcare associations such as Child Resource and Referral, and DSHS prior to attempting property access increased the responsiveness of the childcares. Childcare providers that are already familiar with arsenic and lead issues have been very receptive to receiving more information. One approach may be to distribute information through childcare organizations then have health departments follow up with telephone calls to each childcares. Information sent to childcares should be clear and concise. Childcare providers do not have time to go through multiple brochures or read lengthy explanations.
Outreach	Many childcares were already doing BMPs such as hand washing and covering bare soil patches prior to learning about arsenic and lead issues in soil Providing outreach in advance of sending out letters requesting access is necessary to increase the positive response rate. Articles in newsletters, presentations at childcare organization meetings or conferences, and getting endorsement from childcare advocacy groups may be helpful. Agencies received a number of telephone calls after results letters were sent out. Generally, the telephone calls seemed helpful to the property owners in explaining the results. People are more receptive to implementing BMPs or Healthy Actions if they view it as a healthy choice they are making for themselves rather than as a government mandate. The childcare network is very interconnected. Many of the childcare providers became interested in the program through word of mouth. This can be problematic if a provider outside the CUA study area requests sampling, or if one childcare provider inside the CUA is required to implement BMPs while another outside the CUA is not, even though they may have similar levels of arsenic or lead. Call clients directly instead of asking them to call the agency if they have questions. Everyone whose property is sampled should get a follow-up telephone call to discuss their results and what they mean. Headstart and preschools are not under DSHSs jurisdiction unless they have an extended care program. These types of programs should be targeted in addition to licensed childcares. Secondary schools need different types of outreach materials and may have different types of BMPs. Provide outreach materials in several languages Focus groups have provided good qualitative information about the effectiveness of outreach materials, and have helped agencies tailor materials to better suit the target populations Surveys were useful in assessing how many people saw and remembered the outreach materials.
Sampling Methods and Design	Sample analysis results with a field, hand-held XRF unit had good correlation to laboratory splits above about 40 ppm, but not below. Some types of play areas were not sampled even though they may pose a potential exposure hazard; for example, wooded areas where children play or ride bikes. Some definition should be given to what constitutes a play area above and beyond areas with actual play structures.

TABLE 1-5
LESSONS LEARNED

Category	Lesson/Comment
	Some repetitive motion injuries were sustained by sample collection personnel from working with heavy coring devices and hammers. A section describing proper lifting and handling techniques should be added to the health and safety plan. Results indicate that collecting samples from the 0 to 6 inch interval rather than 0 to 2 inch and 2 to 6 inch intervals is adequate.
Providing Results	Some glitches were experienced in terms of the timing of data releases. A better approach may be to send results immediately so that owners/operators can implement BMPs as soon as possible. Withholding results letters until after press releases did not always work because some people were upset that they did not get it immediately, other people heard/read the press release before they received their letter and were alarmed.
Data Tracking	Data tracking worked reasonably well in previous footprint and CUA studies. However, better and more extensive data tracking will be needed for the next phase of the project because data tracking will become increasingly important for reporting to the legislature. Data tracking system should include some way to track if a facility changes hands or goes out of business. Also tracking should include whether a facility was sampled and if not provide a reason. Data needs to be associated with a property not just a facility.
BMP Implementation and cleanup	Using the term BMP when talking to childcares may not be effective because it sounds too regulatory. Note term that will be used is Soil Safety Actions. BMPs need to be defined. Will BMPs include behavior changes or only physical changes to the site? Time and frequency should be included in BMP definitions. For example, if a facility implements handwashing and taking off shoes, how often do children/adults have to do it to make it count as implementation? Or, if a facility puts down wood chips, how often do the chips have to be replaced or replenished? Long-term remedies such as paving play areas or putting in field turf are best incorporated when a facility is being redeveloped. Public Health – Seattle & King County staff have conducted follow-ups with STARS training participants to confirm whether providers implement soil safety measures. Staff often found that childcares didn't have a system of tracking things that had been done, and that some things were forgotten because of high staff turnover. Agencies should consider asking facilities to implement a simple tracking system when they implement BMPs. It could be tied into the certificate program. Follow-up is very important especially with BMPs that are behavior-oriented or require continued maintenance such as wood chips. Physical behavior prompts have been helpful in institutionalizing the messages about BMPs. Coordination with the DSHS licensers can help determine where specific activities take place (e.g., play areas).

Schools were generally receptive to having sampling conducted. Using existing contacts to get information to the schools was effective in sending a non-regulatory message.

1.4.2 OUTREACH

Outreach materials have been developed by Ecology, Public Health-Seattle & King County and Tacoma-Pierce County Health Department. The materials have the same basic messages about BMPs, although they use various names (BMPs, soil safety guidelines or healthy actions). Several staff

suggested that calling them BMPs sends a regulatory message that may not be well received by childcares.

Providing the outreach materials in several languages was helpful in reaching a larger audience. Childcare operators tended to be more receptive to materials disseminated through childcare organizations or existing contacts that they knew and trusted than local health departments, or a state agency such as Ecology. Staff noted that childcare operators are often extremely busy and do not have time to read a large packet of material with multiple brochures or lengthy explanations.

Health departments have assessed the effectiveness of outreach materials through focus groups, written surveys, and telephone surveys. Focus groups have been helpful in obtaining a qualitative assessment of how effectively the materials communicated the desired messages. Surveys were helpful in obtaining quantitative information about how many people and the types of people who had seen or received information. There has been positive feedback to fun, easy to use materials and the Dirt Alert characters created by Pierce County.

1.4.3 SAMPLING METHODS AND DESIGN

Generally agency health department staff thought that field sampling methods worked well. For play areas, agency staff said sampling a single depth (e.g., 0 to 6 inch depth) made more sense than doing a depth profile with 0 to 2 inch and 2 to 6 inch samples. Agency staff also thought that the coring devices were efficient and effective in most soil types, although backup techniques were needed at a few difficult sites. There were also some concerns about repetitive motion injuries from handling of the heavy coring devices and hammers. A suggestion was made that a section be added to the health and safety plans on proper handling techniques and stretching exercises to reduce repetitive motion injuries.

Ecology conducted a study comparing results from a hand-held XRF instrument to laboratory analysis results. The XRF data had good correlation to the laboratory data above about 40 ppm. However, the XRF was not accurate enough to determine if soil was above or below 20 ppm. This study indicates that use of a hand-held XRF instrument is probably not an acceptable analysis method for soil sampling at child use areas.

Some concerns were raised that certain types of informal play areas, such as wooded areas or dirt bike trails, were excluded from the sampling design although they may present an exposure hazard to children. Some agency staff wanted clearer definition of what qualifies as a play area, so that potential hazards are not missed.

1.4.4 PROVIDING RESULTS

In past studies results were collected and provided to property owners in groups periodically

throughout the study. Feedback from Health Department and Ecology staff indicated that sending results to facility owner/operators upon receiving results from the lab may be a good approach for this program. Several reasons were cited including glitches in previous data releases, unhappy or alarmed clients, and the need to provide results in a manner that would facilitate timely implementation of BMPs.

1.4.5 DATA TRACKING

Data tracking worked reasonably well in previous studies. However, the types of data being collected during the Soil Safety Program are more complex and the new databases will likely require a higher level of sophistication. For example, the implementation of BMPs, follow up visits, certification of BMP implementation, etc. will need to be recorded and tracked for reporting to the legislature. Ecology and the health departments will be conducting different parts of the program, so it will be necessary to coordinate data gathering and tracking efforts. Additionally, some concerns have been raised about having multiple database formats that are not easily compatible.

1.4.6 BMP IMPLEMENTATION AND CLEANUP

The CUA studies conducted to date did not include concerted efforts for implementing BMPs and cleanup. However, overall observations indicate that follow-up would be very important in ensuring BMPs are implemented and maintained. A simple tracking system could be combined with a certificate program to help schools and childcares track and maintain BMPs. This can be especially important at childcares where staff turnover is generally high.

2.0 SOIL SAFETY PROGRAM DESIGN

2.1 BACKGROUND

The goal of the Soil Safety Program is to identify play areas at schools and childcares (including Head Start programs and preschools) in the Tacoma Smelter Plume with elevated arsenic and lead in soils, and to assist schools and childcares to reduce the potential for child exposure to area-wide arsenic and lead contamination. The program is designed to encourage participation in the required sampling program by providing clear and concise information on why sampling is needed, and to encourage voluntary implementation of a Soil Safety Action Plan (i.e., BMPs) by providing useful information on what can be done, available funding assistance, and incentives for implementing a Soil Safety Action Plan.

Under the Soil Safety Program, Ecology, through the local health departments, will seek to analyze soil samples from all schools and childcares where children are at risk of exposure to area-wide arsenic and lead in soil and, for facilities with moderate or high levels of arsenic and lead, encourage schools and childcare operators to implement a Soil Safety Action Plan or notify the parents of children who attend the facility.

All agencies involved in the creation of the Soil Safety Program have expressed the view that the best way to accomplish the above goal is to create a positive incentive-based program. The new law does not provide reprimands if a school or childcare does not comply. The new law does require a school or childcare to notify parents and guardians about the soil testing results, if the facility chooses to not implement Best Management Practices (i.e. Soil Safety Actions). The conceptual design includes steps and practices to accomplish the objectives while conveying an overall positive message. The implementation steps are based on lessons learned by various agency staff from previous CUA sampling events and through meetings with representatives of childcares and schools.

Note: the design looks at schools and childcares. In most instances, schools include both public and private schools, and childcares include: licensed home childcares, childcare centers, corporate centers, preschools, Headstart programs, and ECEAP (Early Childhood Education and Assistance Program) programs. Each type of facility can require unique approaches for implementing the program. Some of the unique approaches are detailed in this design; some will be detailed in the health department's implementation plans.

2.2 IMPLEMENTATION

As described in Section 1.2, recent legislation (Chapter 70.140 RCW) states that all schools and childcares within the central Puget Sound smelter plume should be identified, and a qualitative assessment

conducted to determine if there is a potential for children's exposure to area-wide soil contamination. If the qualitative assessment determines that children may be routinely exposed to area-wide soil contamination, then soil sampling should be conducted. If the results of the soil sampling confirm the presence of area-wide contamination (see Section 2.2.8 for Evaluation of Results), then the facility must be notified and encouraged to implement a Soil Safety Action Plan. If the facility does not implement a Soil Safety Action Plan within 6 months, they are required to notify the parents and guardians of the children in their care of the results of the soil sampling.

Ecology and the local health departments are partnering to implement the Soil Safety Program. Specific responsibilities of the local health departments and Ecology are described in this document and will be further detailed in the individual agency implementation plans for the Soil Safety Program (appendices F and G).

The number of schools and childcares within the TSP is very large; to make effective use of available resources, prioritization and sequencing is necessary. The following sections provide a 12-step process for implementing the law. Table 2-1 below provides a summary of the 12-step process.

Note: many schools and childcares within the higher concentration area of the Tacoma Smelter Plume have already been sampled during previous CUA studies. The play areas at these facilities will not be re-sampled. The results from the previous sampling have been reevaluated against the criteria set for the Soil Safety Program, and those exceeding the criteria will be incorporated into the Soil Safety Action Plan implementation program. We have identified 44 schools and childcares from the earlier sampling program that will require Soil Safety Action Plans.

TABLE 2-1
SOIL SAFETY PROGRAM IMPLEMENTATION STEPS

	Task	Description	Responsible Agency(s)
1	Soil Safety Program Service Area	Define the geographic boundaries of the Soil Safety Program service area (SSP service area).	Ecology with input from Health Departments
2	Identification of Schools and Childcares	Identify schools and childcares within the SSP service area that need to be assessed, may include working with other agencies to obtain lists.	Health Departments with assistance from Ecology, DSHS and School Districts
3	Sequencing of Outreach, Assessment, and Sampling	Focus first on schools and childcares within the SSP service area with highest predicted levels of arsenic and lead based on the footprint studies, combined with administrative or geographical considerations.	Health Departments
4	Outreach/Messages	Work with school districts, private school associations and local childcare organizations to establish open communication with childcares, pre-schools, and schools. (detailed in Soil Safety Program Communication Strategy, Appendix C)	Health Departments and Ecology
5	Property Access	Request access to schools and childcares for qualitative assessment and soil sampling after appropriate outreach	. Ecology and Health Departments meet with public school districts. At the meeting, access forms will be ready for signature. Ecology contacts childcare corporations/centers. The corporate offices will define how to contact individual centers. Ecology contacts headquarter offices for Headstart, Early Headstart, and ECEAP. The headquarter offices will define how to contact the Headstarts and ECEAPs. Health Departments mail access information packets to family/home childcares, childcare centers and private schools.
6	Qualitative Assessment	Assess each school and childcare during a site visit to determine if there is a potential for children to be exposed to soil, if so, schedule soil sampling	Health Departments
7	Soil Sampling	Sample and analyze surface soil at schools and childcare facilities to determine the concentration of arsenic and lead.	Health Departments, TPCHD arrange for laboratory contracts for analysis of all samples
8	Evaluation of Results	Compare laboratory sample results to moderate and high concentration categories.	Health Departments evaluate results, calculate averages and identify maximum. Ecology makes the final determination if play areas are above or below criteria.
9	Property Owner/ Operator Notification	Notify the school districts and childcare or private school owner/ operator of the soil sample results; provide certificate of participation, and appropriate outreach materials. Explain Soil Safety Action Plan implementation, property access needs, and inspection process for those with levels above criteria.	Health Departments, via letter, provide results and certificate of participation to property owners with results below criteria. Ecology and Health Departments, in person and in writing, provide results and certificate of participation to property owners with levels above criteria.

TABLE 2-1
SOIL SAFETY PROGRAM IMPLEMENTATION STEPS

	Task	Description	Responsible Agency(s)
10	Soil Safety Action Plan	Provide school districts and childcare or private school owners/operators with technical and financial assistance as necessary to implement appropriate Soil Safety Actions (detailed in Funding Strategy, Appendix E). Provide a certificate of Soil Safety Action Plan completion upon completion of Soil Safety Action Plan. For those facilities not participating with the agencies in a Soil Safety Action Plan, contact owners 5 months after results are provided to them to determine if they have implemented Soil Safety Actions. If not, request they send notification to parents of the sampling results. Report those facilities that do not implement Soil Safety Actions and do not notify parents in legislative report. For those childcares participating with the agencies in a Soil Safety Action Plan, provide information on Soil Safety Actions conducted to local DSHS licensure for their records. Request local licensures to include follow-up on Soil Safety Actions in their routine inspections (centers every 12 months, home childcares every 18 months). For those schools participating with the agencies in a Soil Safety Action Plan, request they include follow-up inspections in their operation and maintenance.	Ecology, in coordination with the Health Departments, work with each facility to determine Soil Safety Action Plan and implementation schedule. Ecology documents recommended Soil Safety Action Plan; sends to facility for their agreement and access if necessary. Ecology provides funding or contracts to do soil actions (e.g., soil covers under playground equipment). Health Departments provide assistance with behavior actions (e.g., handwashing programs). Ecology provides a certificate upon completion of Soil Safety Action Plan. Ecology contact property owners not participating in Soil Safety Action Plan, ask if they have implemented Soil Safety Actions. Request they send notification letter to parents, if they have not implemented Soil Safety Actions. Ecology provide model notification letter. Ecology track those facilities that do not implement Soil Safety Actions and do not notify parents in database used for reporting to legislature. Ecology work with DSHS and local licensures to include Soil Safety Action Plan follow-up in routine inspections. DSHS licensure provide updated certificates.
11	Data Tracking	Use database to track information related to each step of the Soil Safety Program implementation process in order to provide information to Ecology and the Legislature.	Health Departments will track qualitative assessment, sample results, certificates of participation, outreach, and behavior actions. Ecology will track Soil Safety Action Plan recommendations, soil actions, certificates of Soil Safety Action Plan completion, facilities not participating in Soil Safety Action Plan.
12	Reports to the Legislature	Prepare progress reports to the legislature regarding the status of the Soil Safety Program.	Ecology using information provided by Health Departments (through the Soil Safety tracking database) and others.

2.2.1 SOIL SAFETY PROGRAM SERVICE AREA

The TSP is more than 1,000 square miles and funding is not currently available to identify and assess every school and childcare within the plume. For this reason, a focused service area for the Soil Safety Program of about 315 square miles was identified based on data compiled from the footprint studies (Figure 3). This service area approach allows limited resources to be focused initially in areas most likely to have significant impacts from the smelter plume. Assessment within the service area is the first step in the qualitative assessment of potential for exposure. At the end of 2008, the progress of the Soil Safety Program will be evaluated, and the program activities may be expanded to include areas with lower predicted levels of contamination outside of the initial focused service area.

The Soil Safety Program service area (SSP service area) was established in a two step process. First, reevaluation of previous CUA study zone boundaries incorporating new data; second, modifying the boundary based on local health department recommendations.

Initially, the SSP service area boundary was statistically defined, and covered geographic areas where there is potential for moderate or high levels of area-wide contamination. Table 2-2 defines moderate and high arsenic and lead soil concentrations. The study zone boundary for the original CUA studies was based on information from the first footprint studies in King and Pierce counties, including: distance and direction from smelter, and maximum predicted arsenic concentration (100 ppm).[1] In developing the SSP service area, the original boundary of predicted 100 ppm maximum arsenic was modified by including data from the final Extended Footprint Study, which covered King, Pierce, Kitsap, and Thurston counties. The addition of the extended footprint study results expanded the boundary in nearly all directions, including south into Thurston County. The 2002 and 2006 predicted maximum 100 ppm arsenic boundaries are shown on Figure 2.

TABLE 2-2
MODERATE AND HIGH SOIL CONCENTRATIONS
OF ARSENIC AND LEAD

	Arsenic (ppm)		Lead (ppm)	
	moderate	high	moderate	high
Schools and childcares	20 - 100	> 100	250 - 500	> 500

- MTCA Method A soil cleanup levels for unrestricted land uses: Arsenic = 20 ppm; lead = 250 ppm.
- Moderate and high concentration ranges will be used for comparison with play area concentrations:
  - Play area average concentration[2] compared to the ranges identified above (e.g., average arsenic compared to 20 ppm).
  - Play area maximum concentration[3] compared to two times the ranges identified above (e.g., maximum arsenic compared to 40 ppm).
- Moderate and high concentrations are based on MTCA Method A soil cleanup levels (moderate) and Interim Action Trigger Levels (high) previously used in TSP. The moderate and high concentrations have been reviewed by and are supported by the MTCA Science Advisory Board.

The initial SSP service area boundary was modified based on local health department recommendations. The initial SSP service area boundary in King County nearly doubled the area of the original CUA study zone. Due to the density of childcares and schools in King County and limited resources, Public Health-Seattle & King County recommends focusing sampling efforts on the area

1 The extended footprint sampling targeted undisturbed areas where concentrations of area-wide contaminants are likely to be highest. Concentrations at disturbed areas such as schools and childcares are likely to be significantly less as indicated by previous sampling results at schools and childcares. Therefore, use of a criterion value of 100 ppm soil arsenic (based on undisturbed soil, footprint data) is likely to produce a service area boundary that includes all schools and childcares with moderate or high concentrations.

2 Play area average concentration is determined by adding the concentrations in samples from a given play area together and dividing the sum by the number of samples.

3 Play area maximum concentration is the greatest concentration measured in samples from a given play area.

roughly inside the original CUA study boundary with minor variations based on geographic and political boundaries. The final SSP service area boundary reflects this recommendation in King County, and uses the expanded boundary in Pierce and Thurston counties. Sampling activities in King County may eventually extend further as time and funding allow. The SSP service area is shown on Figure 3. A more detailed description of how the service area was defined can be found in the Sampling Design in Appendix A.

As outlined in the overall Project Plan for the TSP (currently being finalized by Ecology, TPCHD, and PHSKC), geographic areas with high concentrations of arsenic and lead are a higher priority than areas with moderate concentrations of arsenic and lead. In King County, areas considered to have the potential for high levels of area-wide soil contamination generally include: Vashon-Maury Island, Normandy Park, Burien, Des Moines, SeaTac, Federal Way, and parts of West Seattle, Kent, and Tukwila. In Pierce County, areas considered to have the potential for high levels of area-wide soil contamination generally include: Tacoma, Fircrest, University Place, Lakewood, and Steilacoom. The final SSP service area includes these communities.

If childcares or schools outside the SSP service area request sampling, health departments will inform them that resources are not currently available to sample outside the service area and refer them to Ecology's website where posted materials describe how one can sample and reduce risk from arsenic and lead in soil. The health departments will refer them to Ecology for additional assistance if appropriate. Ecology and the health departments will keep a list of entities they provide materials to or assist. In instances where a facility is very close to the service area boundary, health departments may, at their discretion, sample the facility.

2.2.2 IDENTIFICATION OF SCHOOLS AND CHILDCARES

Schools and childcares requiring assessment will be identified in the SSP service area at the beginning of the program. As the childcare industry is dynamic, a re-identification of childcares (and schools) will take place every 6 months.

For past CUA studies, multiple sources were used to identify schools and childcares. Those sources often varied in their completeness and currency. Obtaining the lists of childcares was sometimes difficult. The following sections identify sources for information about schools and childcares and describe how agencies can work together to develop complete lists.

2.2.2.1 Schools (public and private)

Most public elementary schools within the SSP service area have already been sampled; therefore, school sampling will primarily focus on public middle and high schools, new elementary schools, elementary schools not previously sampled for various reasons, as well as private schools. The health departments will be responsible for identifying the schools within the service area in their jurisdiction. To determine the names and locations of specific schools within the SSP service area, health departments will contact the appropriate school districts, use geographic information system (GIS) data with the locations of schools, communicate with OSPI and Educational Service Districts, or use other means as needed to identify public and private schools. All identified schools will then be listed on the Soil Safety tracking database, including the schools which have already been sampled. Ecology is developing the Soil Safety tracking database which will be a web application – Ecology and the health departments will be able to access at any time, and it will always be up to date.

2.2.2.2 Childcares

Lists of childcares from various organizations vary in their completeness and currency. Because the local DSHS licensing branches maintain the childcare licenses for their regional area, DSHS is likely to have the most complete and up-to-date list of licensed facilities. Due to limited funding, unlicensed facilities will not be targeted during this program. Ecology will obtain from DSHS a download from their database of licensed childcares. The data will be entered into the Soil Safety tracking database. Using address matching software, a latitude and longitude will be defined for each facility, and the facility mapped (a GIS layer will be created). The GIS layer is expected to contain information including the name, address, and number and age of children. Ecology will request updates of the DSHS database and create a new GIS layer approximately every 6 months to identify new licensees and those who are no longer providing childcare services.

2.2.2.3 Pre-schools and Headstart/ECEAP programs

Educational service districts, the Washington Association of Young Children, school districts, US Administration for Children and families – Region 10, and local municipality websites can be resources for locating pre-schools and Headstart/ECEAP programs. These facilities may be in DSHS databases if they include an extended care program. The health departments will identify and add to the Soil Safety tracking database.

2.2.3 SEQUENCING OF OUTREACH, ASSESSMENT, AND SAMPLING

The sequencing of outreach, assessment and sampling considers the timing between these activities, the levels of contamination (higher concentration areas first), and mobilization that reflects the most efficient use of resources. Ecology has estimated that approximately 573 schools and childcares in King County and approximately 183 schools and childcares in Pierce County are within the SSP service area and will need assessment by December 31, 2009. This estimate includes an estimate of new childcares that come into business prior to December 31, 2009.

As this is a new program, the first activity is outreach to schools and childcares, followed by assessment and sampling. Most of the public school districts in the SSP service area participated in the CUA studies, are aware of the TSP contamination, and may be aware of the law. This level of awareness should facilitate a quick outreach to public schools. Childcares and private schools are less likely to be aware of the law, let alone the TSP contamination. A larger and more time-consuming outreach will be needed for the childcares. Outreach to private schools may also take more time, but there are a limited number of private schools. (See section 2.2.4 for more details on Outreach).

In addition to the timing of activities, and to make the most efficient use of limited resources, areas within the SSP service area with the highest reported levels of arsenic from the footprint studies will be targeted first for outreach, qualitative assessments, and sampling. Those areas have been identified using a Theissen polygon analysis which statistically assigns a concentration to a geographic area based on nearby sampling results. Figure 3 shows concentration ranges assigned to areas using this method.

As there are a limited number of schools (public and private) remaining to be assessed (approximately 20 in each county) and the public school districts have participated in the previous CUA studies, Ecology and the local health departments will conduct soil safety program activities at public and private schools first. The sequencing will be based on the school district boundaries as overlaid on the concentration polygons (Figure 4). The school districts in the higher concentration areas of King County are Highline and Federal Way; and for Pierce County, the Tacoma School District. The sequencing of activities will then move to school districts in the lower concentrations areas (e.g., Seattle SD, Tukwila, Kent in King County; University Place in Pierce County).

Outreach to childcares, preschools, and Headstart/ECEAP programs regarding the Soil Safety Program will take some time (see Section 2.2.4). This outreach by Ecology and the local health departments will run concurrent with the outreach, assessment, and sampling of schools. As sampling at schools winds down, assessment and sampling at childcares, preschools, and Headstart/ECEAP programs will begin. Sequencing of childcare assessment and sampling is challenged by the dynamic nature of the industry. Thus the sequencing will need to be flexible – reflecting a preference to sample childcares in higher concentration areas first while maximizing use of staff resources. The health departments' Soil

Safety Program Implementation Plans are attached as appendices, and contain a more detailed explanation of the sequencing for each county.

2.2.4 OUTREACH/MESSAGES

During the previous CUA studies it was determined that outreach was a key component in successfully obtaining property access and helping schools and childcares understand sampling results. The Soil Safety Program Communication Strategy contains a detailed approach to be used when communicating with childcares and schools (Appendix C).

Ecology created the Communication Strategy with input from the health departments and stakeholders. The strategy reflects lessons learned (Section 1.4) from prior sampling and education and outreach efforts, and input from stakeholders who attended the Communications Strategy meeting in early March 2006, and stakeholder meetings in November and December 2005 and late March 2006.

The strategy contains a purpose and objectives, a proposal for modifying and updating the strategy, an audience and stakeholder profile with notes about communication, key messages, some tools for marketing the messages, a table of communication tools, a timeline for the first nine months of the program, and examples of materials created for the program.

The tools table includes both existing tools and new tools that Ecology and the health departments will use or have created specific for the Soil Safety Program.

The communication strategy objectives are:

- Create a cohesive, engaging and positive image of the Soil Safety Program and program partners, resulting in a high level of voluntary participation among target audiences.

- Coordinate messages and marketing among the program partners, especially among Ecology and the health departments, so that schools and childcares understand the program and can easily participate.

- Keep stakeholders well informed and involved throughout the life of the program, relying on their expertise and experience in the development and use of communication tools and in program evaluation.

An important part of the strategy is conducting intense outreach to childcares April – August 2006, prior to the health departments requesting access for soil testing. To provide intense outreach in such a short amount of time, Ecology is providing a $10,000 public participation grant to the Washington Child Care Resource and Referral Network (the Network). The grant will be for April 2006 through June 2007. The grant is for outreach to childcares and an independent survey of childcares in fall 2006. Outreach may include presentations, postcard mailings, articles in newsletters and other activities. Ecology will use the survey to modify and update the communication strategy and program design in

January 2007. The Network will be eligible to compete for additional funding for the July 2007-June 2009 biennium.

Major tools that Ecology and the health departments will use to communicate program content and messages are described below. For more details, please see Appendix C.

- Frequently Asked Questions – Soil Safety Program Overview

  This handout will be in a question and answer format, and will contain most of the key program messages and a simple service area map. Ecology will put this piece on a letterhead template that lists all the program partners and highlights the Dirt Alert logo. Schools and childcares will be the audiences for this piece.

- Property access cover letter and soil testing permission form

  The health departments will mail these to childcares and private schools not previously sampled. They will attach the Frequently Asked Questions piece. An important consideration with these tools is first impressions. For some childcares and private schools, the cover letter will be the first information they receive about the program.

- Service area map

  An important tool will be a simple service area map that shows the service area boundary, cities, county lines, major roads, and the smelter site. Listed on the back of the map will be zip codes, school districts and private schools that are located within the service area. Adding these elements to the map itself would make it too complicated, and a list will make it easy for schools and childcares to know if they are within the service area boundary.

- Certificates and Decal

  Ecology has contracted with Kick Spark Creative, LLC to create two certificates and a window decal. Ecology and the health departments will use the certificates and decal to acknowledge schools and childcares who participate in the program. Ecology will give the second certificate to schools and childcares that complete a Soil Safety Action Plan. This second certificate will list the actions the school or childcare has agreed to undertake and sustain. This will enable DSHS licensors, parents, and others who visit the school or childcare to know actions that should be in place, and support those actions.

- Language Translations

  Ecology will use in-house and contract services to provide Spanish, Russian and other translations as needed to serve non-English speaking schools and childcares. If necessary, Ecology and the health departments will use interpreters to communicate with schools and childcares.

An important part of the Communication Strategy is ongoing involvement of stakeholders who represent schools and childcares. To this end, several stakeholders who have already participated in design meetings have agreed to participate in an advisory capacity as needed. Ecology has already committed to reconvene stakeholders in November 2006 to review interim results and provide feedback

on program implementation. Their involvement has been invaluable throughout the design phase, and Ecology will seek their involvement throughout program implementation.

2.2.5 PROPERTY ACCESS

The law requires property owners to grant access for assessment and sampling. Ecology and the health departments will work with the property owners to gain access.

During past CUA studies, public schools were generally willing to allow access for soil sampling. There are a limited number of school districts within the SSP service area. Ecology will contact each school district to set up a meeting with Ecology and the health department. The school districts will determine if representatives of the schools requiring assessment (or Soil Safety Action Plans) should be involved in the meeting. The agencies will present information about the Soil Safety Program, request access to assess and sample schools, and begin discussions on implementing a Soil Safety Action Plan at those schools previously sampled that have arsenic and or lead above criteria. Each school district (and/or school) will be provided with an information packet that explains the program and includes a formal property access agreement form (Appendix D).

The approach for gaining access at private schools will be similar to childcares (as described below). Ecology will first provide outreach to private school associations – to get the word out. Then the health departments will mail letters with the information packet to the individual private schools. The information packet will include an access form to ensure there is a record of property access granted.

Outreach and education through childcare groups and DSHS licensors will be conducted prior to attempting access at childcares (see Section 2.2.4). Several methods of obtaining childcare access were used during the previous CUA studies. In general, calling each childcare to set up a sampling appointment achieved the best response rate, however was very time consuming. For the Soil Safety Program, the health departments will mail letters with the access form to family/home childcares and childcare centers. As with schools, an information packet will be included and a written access form will be used to ensure there is a record of property access granted. For those childcares that do not respond, the health departments will follow-up with a phone call within 1-2 months after mailing the letter. For those childcares that do not respond after a phone call, the health departments will consider a "knock & talk" to achieve access. If after 3 attempts (e.g., letter, phone call, knock & talk) there is still no response, the childcare will be listed in the Soil Safety tracking database as no response. In following up to get access, the health departments should work closely with their public health nurses and the DSHS licensure for the childcare that is not responding.

Corporate centers with multiple facilities will be treated like private schools in that Ecology will make personal contact with the corporate offices to explain the program and gain access for qualitative

assessments and sampling (if needed). Corporate offices will define how their individual childcare centers will be contacted to schedule the assessments and sampling.

Ecology will contact headquarter offices for Headstart, Early Headstart, and ECEAP to explain the Soil Safety Program. The health departments will then contact the individual Headstart facilities. An information packet will be provided and a written access form will be used to ensure there is a record of property access granted.

As some childcares routinely use play areas at nearby parks, Ecology and the health department will contact the park for access.

An example access agreement form is included in Appendix D. As noted in the example form, the form must make it clear that sample results are public information. The property access forms may be modified by the Counties as needed. Ecology will approve the language of access agreement forms before they are sent out.

The health departments will track access granted by schools and childcares, as well as access denied, and those that just don't respond in the Soil Safety tracking database.

Those schools and childcares that deny access will be tracked in the Soil Safety tracking database and included in the report to the legislature. Ecology may also include a list on their website. If the rate of denial is significant (e.g., >40%), then Ecology will report to the legislature (at any appropriate time) with recommendations for improving access approval rates.

2.2.6 QUALITATIVE ASSESSMENT

A qualitative assessment will be conducted at each childcare or school to determine if there is a potential for children to be exposed to contaminated soil. The results of the assessment will be recorded by the local health department field staff in field notebooks. Information collected, used and recorded by the local health department will be outlined in the Quality Assurance Project Plan (QAPP) and may include where children play, the condition of ground cover, the number and age of children at the facility, the type of play in different areas, and the facility and site history.

To provide some measure as to the effectiveness of the outreach in raising awareness of the program, field staff will ask the property owner/operator if they have heard of the Soil Safety Program. And if so, how did they hear of the program. This information will be recorded in the field notebook, and then tracked in the Soil Safety tracking database.

Based on the results of the assessment, the local health department will decide if soil sampling is necessary. Information about the results of qualitative assessments, whether sampling was needed, why or why not, and a record of the names and locations of the facilities that were evaluated will be

maintained in the Soil Safety tracking database. Since the qualitative assessments are a legislative requirement, the information will eventually be used to compile a report to the legislature.

2.2.7 SOIL SAMPLING

Once a school or childcare has been qualitatively assessed and it is determined that sampling is necessary, the local health department will schedule sampling in cooperation with the schools and childcares. The sampler may also schedule soil sampling at the same time as the qualitative assessment. In this case, the sampler can simply forgo sampling if it is determined to be unnecessary. Past sampling events have shown that most childcares will require some soil sampling.

Soil samples will be collected from all play areas within each property. Samples will be collected from surface soil between 0 and 6 inches below ground surface, the layer of soil that children are most likely to be exposed to. Samples will be collected by the local health departments, and analyzed by a contracted laboratory.

The sampling design is presented in Appendix A, and provides specific information on defining play areas, the number and locations of samples to be collected, sample depths, sample analysis, and data evaluation. The quality assurance project plan (QAPP) is presented in Appendix B. The QAPP establishes the quality assurance objectives and quality control procedures for the soil sampling and analysis for the Soil Safety Program. The county implementation plans are attached as appendices F and G. The implementation plans include basic field sampling activities such as procedures for identifying schools and childcares, prioritizing and scheduling assessment and sampling, collection of samples, record keeping, and other details of the sampling program.

2.2.8 EVALUATION OF RESULTS

Sample results will be reported by the laboratories directly to the health departments. As with past TSP studies, the health departments will be responsible for tracking analytical results in a database that is compatible with Ecology's EIM system.

The health departments will evaluate the results for each play area, calculating an average and identifying the maximum concentration for each play area. This may be an automated feature of the databases. The play area average and maximum will be compared to the concentration ranges in Table 2-2.

The screening statistics are an adaptation of the MTCA compliance statistics. MTCA compliance statistics include 3 tests to show compliance with MTCA cleanup standards: 1) the 95%UCL of site data should be below the cleanup level, 2) the maximum should be less than 2 times the cleanup level; and 3)

no more than 10% of results can exceed the cleanup level. The screening statistics include 2 of these 3 tests and are modified as follows: 1) the average of the play area data compared to the cleanup level or the moderate/high level; and 2) the maximum compared to 2 times the cleanup level or the moderate/high level.

Thus, play areas will be categorized as:

- **Below criteria** (average arsenic below 20 ppm and maximum arsenic below 40 ppm; average lead below 250 ppm and maximum lead below 500 ppm)

- **Moderate** (average arsenic between 20 ppm to 100 ppm; and/or maximum arsenic between 40 ppm to 200 ppm; and/or average lead between 250 ppm to 500 ppm); and/or maximum lead between 500 ppm to 100 ppm

- **High** (average arsenic above 100 ppm; and/or maximum arsenic above 200 ppm; and/or average lead above 500 ppm; and/or maximum lead above 1000 ppm).

As examples: a play area with average arsenic = 25 ppm is categorized moderate. A play area with average arsenic = 18 ppm and maximum arsenic = 45 ppm is categorized moderate. A play area with average arsenic = 105 ppm is categorized high.

The evaluation methods are described further in Appendix A.

Results of data evaluations will be provided to Ecology with data submittals for EIM every month. Ecology will then make a final determination of those facilities with results above criteria (moderate or high). Facilities with high levels will be considered to be a higher priority for personalized follow-up and for funding improvements than facilities with moderate levels. Follow-up with all facilities is described in the sections below.

Schools and childcares sampled during the previous CUA study have been evaluated according to the above criteria. Of 192 schools and childcares sampled, 21 schools and 23 childcares are in the moderate/high categories. These facilities will be included in the notification and Soil Safety Action Plan implementation described in the sections below.

2.2.9 PROPERTY OWNER/OPERATOR NOTIFICATION

Previously sampled schools and childcares with moderate or high results must be informed of the new law and any requirements for Soil Safety Actions based on previous sampling results. Ecology and the health departments will notify schools districts during the meeting about the Soil Safety Program and sampling of other schools in their district (Section 2.2.5). The 23 childcares will be notified in person by Ecology and the health departments. For the previously sampled properties with levels that are below the criteria, no action is necessary.

For newly sampled properties, the property owner will be notified within 1 month after results are reported to the health department. If arsenic and lead concentrations on the property are below criteria, notification will be in the form of a letter from the health department that conducted the sampling. A certificate of participation in the sampling program, which can be posted at the facility, will be mailed along with the notification letter.

If the property has moderate or high concentrations of soil contaminants, the owner/operator will be notified as follows:

- Ecology will contact the owner and operator by telephone to arrange a site visit to discuss sampling results and Soil Safety Action Plan options. This visit will be coordinated with the health departments.
- Ecology will provide a letter (results letter)[4] with the results, explanation of sample results, and summarizing the requirements of the law for parental notification, to the owner/operator in person at the time of the site visit, with copies provided to other appropriate parties (such as the property owner, corporate office, or school district office). All letters will encourage facilities to notify the parents regardless of the results or recommendations for a Soil Safety Action Plan. The letters will include a certificate of participation in the sampling program.
- Ecology will provide an information packet at the time of the visit. The packet will include information on the requirements of the law, information on Soil Safety Actions, a sample parental notification letter, information on Ecology funding of Soil Safety Actions, and information on how they may receive a certificate of successful participation in the Soil Safety Action Plan.
- The health departments will provide educational materials at the time of the visit.
- Ecology and the health department will then work with the owner and operator to develop a site specific Soil Safety Action Plan, as described in the sections below.

Appendix D includes model results letters to schools and childcares and a model letter to notify parents of results.

2.2.10 SOIL SAFETY ACTION PLAN

Schools and childcares with sampling results above criteria (moderate or high) will be encouraged to implement a Soil Safety Action Plan. Ecology and the health departments will work with the facility to identify a Soil Safety Action Plan appropriate for the facility. Ecology will assist with the implementation of the Soil Safety Action Plan, including financial assistance. Those facilities that successfully complete a Soil Safety Action Plan will receive a Certificate to post in their facility. Follow-

4 For schools, the results letter will be provided to both the school principal and the district superintendent, with copies to the facilities managers and/or public relations staff. For childcares, the results letter will be provided to the property owner, business owner, facility manager or operator, and DSHS licensure office covering that childcare.

up of Soil Safety Actions will be incorporated into routine maintenance activities (e.g., school maintenance programs) and licensure inspections (e.g., DSHS licensure inspections of childcares).

2.2.10.1 Soil Safety Action Plan Development

Ecology and the health department will meet with each school and childcare where sample results indicate arsenic and/or lead levels above criteria (Section 2.2.8) in the play areas, including the 44 facilities previously tested. The Department of Ecology and the facility will jointly develop a Soil Safety Action Plan.

A recommended Soil Safety Action Plan may vary depending on the level and location of contamination, the type of facility, and the age of the children. For example, a Soil Safety Action Plan appropriate for pre-schoolers at a childcare may not be appropriate for children at a public middle or high school. The Soil Safety Action Plan at a facility will likely include a range of actions. For example, the first step actions may be educational such as hand-washing and use of door mats; the second step actions may be structural such as building a containment structure under and around the play area.

Ecology has a preference for low-maintenance or permanent Soil Safety Actions. As an example, heavy-duty covers and a berm under and around playground equipment with wood chips for fall protection can reduce exposure to contaminated soil. This type of containment will require addition of wood chips overtime, but the liner continues to reduce exposure even if the wood chips have been kicked out. An example of a permanent Soil Safety Action might be removal of contaminated soils and replacement with clean soils.

Soil Safety Action information is being developed by Ecology with input from other participating agencies and stakeholders (Appendix E). The information will be provided to childcares and schools during the notification process after sampling results are known.

2.2.10.2 Soil Safety Action Plan Implementation

Ecology and the facility will determine the appropriate Soil Safety Action Plan for the facility and develop a timeline for implementing the program. For Soil Safety Actions requiring construction or structural changes, Ecology will work with the facility until the construction is complete, using Ecology funds as described below. For Soil Safety Actions that are educational (e.g., hand-washing, wiping feet at door), the health department will work with the facility.

2.2.10.3 Funding Strategy

Ecology is developing a strategy for funding Soil Safety Action Plans requiring construction or structural changes (see Appendix E). This may include direct funding through interagency agreements with school districts; public works contracts for implementing structural Soil Safety Actions at childcares or private schools; and utilizing Washington Conservation Corps (WCC) crews for smaller scale remediation projects. Funding for construction will be the Safe Soil Account which is a capital account (can be spent over several biennia). At the time of this design, it is anticipated that there will be adequate funds in the capital account to cover the costs of Soil Safety Actions at all facilities requiring Soil Safety Actions. If there is insufficient funds, Ecology will request additional funds from the Legislature.

The health departments are addressing Soil Safety Actions that are educational, and their funding is in the Site Hazard Assessment grants from Ecology to the health departments. Site Hazard Assessment grants are funded by the Local Toxics Control Account.

2.2.10.4 Sequencing

Ecology and the health departments will first approach the 18 schools (and their respective school districts) previously sampled that had results above criteria. The contact will be made at the same time as the outreach to the school districts for sampling of untested schools. The agencies will then approach the 26 childcares previously sampled that had results above criteria. These 44 facilities will serve as a pilot for implementing Soil Safety Action Plans, and provide an initial feedback on the effectiveness of the program. The agencies will learn about: the usefulness of the informational materials; common elements of a Soil Safety Action Plan (i.e., are there Soil Safety Actions we routinely recommend); typical costs; and ease of implementation (e.g., construction).

As new sampling results become available, the agencies will approach the newly identified schools and childcares. At the time of this design, we anticipate adequate funds to implement Soil Safety Action Plans, so prioritization of funding is not strictly necessary. Sequencing will be based on maximizing use of resources. To maximize use of resources, appointments and construction activities will be scheduled in geographic groups.

2.2.10.5 Parent Notification

Five months after notifying the school or childcare of their results, Ecology will determine whether a Soil Safety Action Plan has been successfully implemented (either by Ecology or the property owner). If not, Ecology will remind the facility of the legislative requirement to notify parents of the soil sampling results in writing within 6 months of receiving the results. Ecology can provide another copy of

the sample parental notification letter (Appendix D). At 6 months, Ecology will request a copy of the letter sent to parents and a list of parents that received the letter. Ecology can spot check by contacting some of the parents on the list to verify if they received a letter. Ecology will track in the Soil Safety tracking database those facilities that send letters, and those that do not. Ecology will include the information in their biennial report to the legislature.

For those facilities participating with Ecology in implementing a Soil Safety Action Plan, and where structural changes or construction are not yet complete, Ecology will work with the facility owner to draft language to provide to parents describing actions being taken to protect children from exposure to contaminated soils.

2.2.10.6 Soil Safety Action Plan Certification

A soil safety certification program is planned as a way to encourage implementation of Soil Safety Actions. Ecology will develop a Certificate of Soil Safety Action Plan implementation, describing what Soil Safety Actions were implemented and commending the facility for carrying them out. This will be in addition to the certificate of participation in the sampling program. Upon completion of the Soil Safety Action Plan, the facility will receive the Certificate of Soil Safety Action Plan Implementation to post in the facility. If new or additional Soil Safety Actions are implemented, the facilities may notify Ecology and have their certification updated. Renewal of certifications may eventually be part of the licensing program through DSHS.

2.2.10.7 Soil Safety Action Plan Follow-up

Ecology has a preference for permanent or low-maintenance Soil Safety Actions. However, some elements of a Soil Safety Action Plan will require on-going maintenance. For example, hand-washing programs must continue as long as there is a potential for exposure to contaminated soil. And, some containment remedies will require routine replacement of cover material that is kicked out of the play area.

For schools, Ecology will explore with the school and school district means of incorporating such elements into their day-to-day business and maintenance programs. For childcares, Ecology will work with DSHS licensures to incorporate inspection of Soil Safety Action Plan elements in their routine inspections (every 12 months for childcare centers, and 18 months for home childcares). To facilitate this, a copy of the Soil Safety Action Plan will be provided to the DSHS licensure.

Ecology will explore with the school districts and DSHS licensures how best to follow-up on Soil Safety Action Plan inspections, and how to track the results of inspections.

2.2.11 DATA TRACKING

Two types of data will be tracked by Ecology and the health departments: 1) environmental data (sample results), 2) additional information needed for reports to the legislature.

Results Database:

Ecology currently has a database for environmental results, the Environmental Information Management (EIM) database. Each health department will be responsible for maintaining a results database that is capable of extracting environmental data for EIM. The health departments will upload results data to EIM every month, and notify Ecology's Soil Safety coordinator via email that results have been uploaded to EIM. The following information, at a minimum, will be tracked for each childcare or school in the results database:

- Identification and contact information: facility name, type of facility, address, telephone number, contact name and position, and unique identifier (generated by Soil Safety tracking database).
- Location information – latitude and longitude of each play area
- Date of sampling. Number of play areas sampled. Number of samples. Field notes should include a sketch of play area(s) with sample locations.
- Date results were received by the health department from the lab.
- Sample results

Soil Safety Tracking Database:

Ecology will develop and maintain a second database (the Soil Safety tracking database) to manage the additional information needed for reports to the legislature. This database is a web application so will always be up to date – no need for uploading data. Each health department will be responsible for entering data into the Soil Safety tracking database on an on-going basis. The following information, at a minimum, will be tracked for each childcare or school in the Soil Safety tracking database:

- Identification and contact information: facility name, type of facility, address, telephone number, contact name and position, and a unique identifier.
- Was the facility sampled during a previous CUA event?
- Date(s) for attempts at access for assessment/sampling. Method(s) used to gain access (letter, phone call, knock & talk). Was access granted? (yes, no, no response). If not, why not?
- Date of qualitative assessment.

- Results of qualitative assessment. Does the property require sampling? If not, why not? Include in database if property owner/operator had heard of Soil Safety Program, and if so, how?
- Evaluation of concentration ranges for each play area (moderate or high).
- Outreach conducted specific to that facility.
- Date notification letter and certificate of participation sent to the facility owner or operator for sites with levels below the criteria.
- Date of visit by Ecology and the health department - when notification letter and certificate of participation was handed to the facility owner or operator for sites with levels above the criteria.
- Date Soil Safety Action Plan form sent to facility. Track basics of the recommended Soil Safety Action Plan.
- Date Soil Safety Action Plan form signed and returned to Ecology.
- Date when Soil Safety Action Plan initiated (e.g., Ecology contractor constructing remedy).
- Date Soil Safety Action Plan completed. Which Soil Safety Actions were implemented? Include amount of funds provided/spent.
- Date Certificate of Soil Safety Action Plan implementation mailed.
- Date contact made with follow-up agencies (e.g., DSHS licensures)
- Follow-up by Ecology with those facilities not working with Ecology in Soil Safety Action Plan. Did they implement Soil Safety Actions? Which Soil Safety Actions were implemented? If not, did they notify parents?

Consistency between Databases:

To ensure consistency between the health departments' results database, Ecology's EIM results database, and the Soil Safety tracking database, the agencies will follow the below naming/numbering convention.

1. User Study ID *{must be 8 or less characters}:*
   TSPPCSSP (Pierce County)
   TSPKCSSP (King County)
   TSPTCSSP (Thurston County)

2. User Location ID:
   This represents the study, facility and play area: *{must be 15 or less characters}*

   TSPPCSSPXXXX-1
   TSPKCSSPXXXX-2
   TSPTCSSPXXXX-1

XXXX = Sequential unique facility code assigned by Ecology's Soil Safety tracking database, numeric. To track facility type, the following range of numbers will be used for the specified facility type:

0001 to 1000 = schools
1001 to 8000 = childcares
8001 to 9999 = parks or camps (for those childcares with offsite play areas at nearby park or camp)

Example: TSPPCSSP0001-1 = play area 1 at school 0001 in Pierce County.
Example: TSPKCSSP1201-2 = play area 2 at childcare 1201 in King County.

Each play area within the facility will have its own GPS coordinates (latitude and longitude).

For schools and childcares, Ecology will use address matching software to identify a latitude/longitude for the facility – and enter this into the Soil Safety tracking database (not EIM). (If a school or childcare does not respond to access requests, or denies access, we will still be able to plot the facility.) For those facilities that grant access, the counties will use GPS during the qualitative assessment to verify the latitude/longitude of the facility. If the qualitative assessment determines that soil sampling is not necessary, then the GPS coordinates will be taken from the front door of the facility. If the qualitative assessment determines that soil sampling is necessary, then the GPS coordinates will be taken at each play area (for EIM). For the Soil Safety tracking database, the coordinates for the first play area will be used.

3. Location Name:

Name of facility
Examples: North Thurston High School PA2
KinderCare PA1

PA = play area

4. Study Location Name:

Name of facility
Examples: North Thurston High School PA2
KinderCare PA1

PA = play area

5. Location Description

Property address

6. Sample ID

1) County (Pierce = 27; King = 17; Thurston= 34) (numbers are standard county codes);
2) Facility Code: the sequential number assigned to each facility through Ecology's Soil Safety tracking database (format to be determined – numeric);
3) Play area number: 1,2, 3, 4, etc..
4) Boring number: 1, 2, 3, 4, etc.
5) Depth interval (required for KC database structure) 1 = 0-6"
6) Sample type 4= regular
5= duplicate

Example: 27-0001-1-1-1-4 = Pierce County, facility 0001, play area 1, boring 1, depth 1, regular sample.

Example: 17-0005-2-8-1-5 = King County, facility 0005, play area 2, boring 8, depth 1, duplicate sample.

2.2.12 REPORTS TO THE LEGISLATURE

Health departments will submit progress reports to Ecology by October 31, 2006 and October 31, 2008. Ecology will compile the submitted information and submit progress reports to the governor and legislature by December 31, 2006 and December 31, 2008. Reports will include information about the following items:

- The number of childcares and schools identified within the service area zone
- The number that were previously sampled
- The number of qualitative assessments conducted
- The number of facilities that did not need sampling and why
- The number of facilities where sampling was conducted
- The number of facilities that needed implementation of Soil Safety Actions
- Which Soil Safety Actions were implemented at what frequency
- The number of facilities that did not implement Soil Safety Actions when it was recommended
- Any instances where it was necessary to notify a regulatory agency because Soil Safety Actions were not implemented and parents were not notified by the facility.

2.3 EVALUATION OF SOIL SAFETY PROGRAM

The goal of the Soil Safety Program is to reduce exposure of children to soil with area-wide arsenic and lead at schools and childcares within the TSP. The steps to achieving this goal are:

- Identify the service area and schools and childcares within the zone
- Get access to identified schools and childcares
- Collect and analyze soil from child play areas if a qualitative evaluation indicates that children may be routinely exposed to area-wide soil contamination
- Notify schools and childcares of sample results and if results are in the moderate or high categories, encourage them to implement Soil Safety Actions by providing information on Soil Safety Actions, recommending implementation of specific Soil Safety Actions, and providing funding for implementation.

Ecology and the health departments will evaluate the effectiveness of the Soil Safety Program, by determining the effectiveness of the above steps, using the information included in the reports to the legislature described in Section 2.2.12.

2.3.1 IDENTIFY SOIL SAFETY PROGRAM SERVICE AREA AND SCHOOLS AND CHILDCARES WITHIN THE SERVICE AREA

In order to focus the efforts of Ecology and the county health departments on the area where soil is most likely to contain area-wide contamination, a Soil Safety Program service area was defined based on previous footprint sampling data and recommendation of the local health departments. Ecology, with the county health departments, will reevaluate the Soil Safety Program service area boundary at the end of 2008.

The re-evaluation will be qualitative. All schools and childcares sampled will be mapped – those below criteria will be colored blue, and those above criteria will be colored red. The locations of the facilities above criteria will be compared to the SSP service area boundary. If there are facilities above criteria that are close to the boundary, then the agencies will consider if the boundary should be expanded – as there may be facilities outside the boundary that are above criteria.

2.3.2 GET ACCESS TO IDENTIFIED SCHOOLS AND CHILDCARES

Ecology and the health departments will evaluate the effectiveness in getting access to identified schools and childcares in October of each year of the program. Performance is measured by the percentage of facilities granting access (i.e., number schools granting access/number schools contacted). The performance measures are:

	Schools	Childcares
October 2006	95%	60%
October 2007	100%	70%
October 2008	100%	80%
October 2009	100%	90%

If the rate for achieving property access is less than the performance measure, the outreach materials used and approach for gaining access will be reevaluated and may be revised. Additional evaluation of outreach materials will be performed as described in the Soil Safety Program Communications Strategy. If, based on this evaluation, Ecology concludes that voluntary participation in the program is not producing adequate results, Ecology will notify the Legislature in the progress reports (and at other times if appropriate) and suggest changes that would make the program more successful.

2.3.3 COLLECT AND ANALYZE SOIL

Ecology and the health departments will evaluate the effectiveness of the assessment and sampling elements of the program in October of each year of the program. Performance is measured by two percentages: 1) percentage of facilities assessed (i.e., number schools assessed/number schools granting access for assessment); 2) percentage of facilities sampled (i.e., number schools sampled/number schools requiring sampling based on qualitative assessment). The performance measures for both are:

	Schools	Childcares
October 2006	95%	75%
October 2007	100%	90%
October 2008	100%	90%
October 2009	100%	90%

If the rate of assessment or sampling is less than the performance measures, Ecology and the health departments will discuss how to increase the rates at which facilities are assessed and sampled. In addition, Ecology and the health departments will consider whether the health department is likely to complete sampling of schools and childcares within the SSP Service Area by the end of 2009.

2.3.4 ENCOURAGE SOIL SAFETY ACTION PLAN IMPLEMENTATION WHERE APPROPRIATE

Ecology and the health departments will evaluate the effectiveness of encouraging the implementation of Soil Safety Action Plans in October of each year of the program. Performance is measured by two percentages: 1) percentage of facilities initiating Soil Safety Actions (i.e. number schools initiating Soil Safety Actions/number schools above criteria); 2) percentage of facilities receiving Certificate of Soil Safety Action completion (i.e., number schools receiving certificate/number schools above criteria). The performance measures are:

	Schools		Childcares	
	Soil Safety Action Plan initiated	Soil Safety Action Plan complete	Soil Safety Action Plan initiated	Soil Safety Action Plan complete
October 2006	50%	25%	25%	10%
October 2007	100%	75%	50%	25%
October 2008	100%	100%	75%	50%
October 2009	100%	100%	75%	75%

If the rate of Soil Safety Action Plan implementation is less than the performance measures, Ecology and the health departments will discuss how to increase the rate. If, based on this evaluation, Ecology concludes that voluntary participation in the program is not producing adequate results, Ecology will notify the Legislature in the progress reports (and at other times if appropriate) and suggest changes that would make the program more successful.

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