
Area-Wide Soil Contamination Task Force Report

June 30, 2003

Submitted to:

**Washington State Department of Agriculture
Washington State Department of Ecology
Washington State Department of Health
Washington State Department of Community, Trade and Economic Development**

Prepared with the assistance of:

**Ross & Associates Environmental Consulting, Ltd.
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Area-Wide Soil Contamination Task Force Report

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June 30, 2003

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Re: Area-Wide Soil Contamination Task Force Final Report

Dear Agency Directors:

We are pleased to present you with the final report of the Area-Wide Soil Contamination Task Force, chartered in January 2002 to offer advice about a statewide strategy to respond to low-to-moderate level arsenic and lead soil contamination (so-called area-wide soil contamination) in Washington State.

Our Task Force has worked diligently over the last 18 months to understand and consider the issues and to develop recommendations that advance a shared set of guiding principles. Task Force deliberations focused on understanding the nature and extent of area-wide soil contamination, making recommendations about effective, practical, and affordable steps individuals

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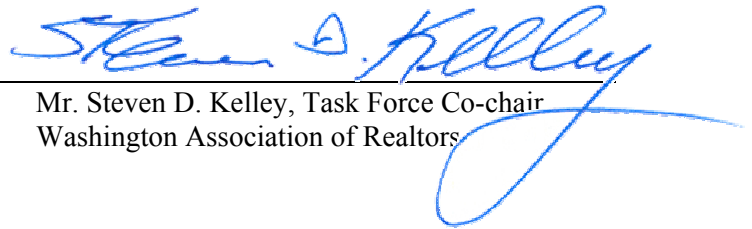
and organizations might choose to take to reduce their potential for exposure to arsenic and lead in soil, and creating an alternative, more streamlined approach under the Model Toxics Control Act for properties affected by area-wide soil contamination. We believe that the recommendations included in the enclosed report offer you the means to respond appropriately to area-wide soil contamination and appreciate you giving the report your fullest consideration.

Thanks to you and to your staffs for providing us with outstanding support throughout our deliberations. It has been an honor to participate on this Task Force and serve the people of Washington State, and we look forward to seeing the benefits that will be brought about as a result of this work.

Respectfully,



Mr. Stephen Gerritson, Task Force Co-chair
Sierra Club



Mr. Steven D. Kelley, Task Force Co-chair
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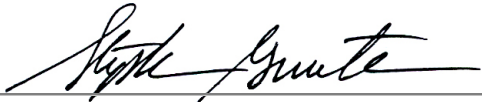
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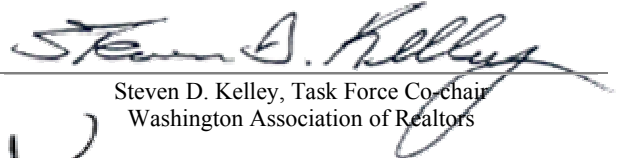
Signature Page

We, the members of the Area-Wide Soil Contamination Task Force, submit this report to the Washington State Departments of Agriculture, Ecology, Health, and Community, Trade and Economic Development. This report contains the Task Force's findings and recommendations on a statewide strategy for addressing area-wide soil contamination.

In developing this report, Task Force members considered and took positions on a large number of complex issues. This report contains many compromises. Under the Task Force's approach to consensus, a member's signature below means that he or she is comfortable with the report as a whole; where there was disagreement on an issue, the report documents the range of views on the Task Force.



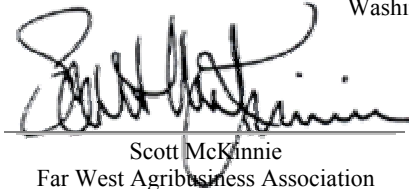
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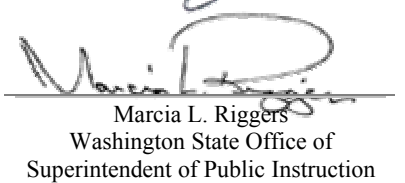
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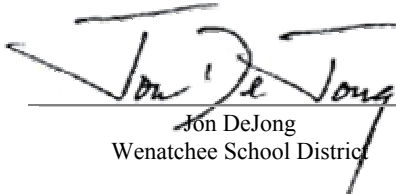
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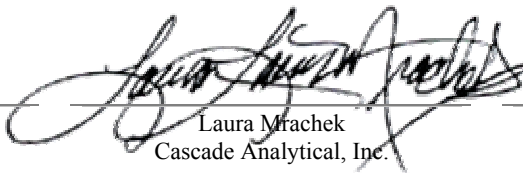
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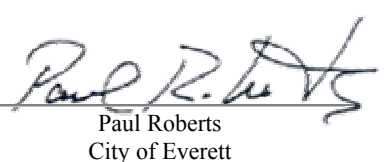
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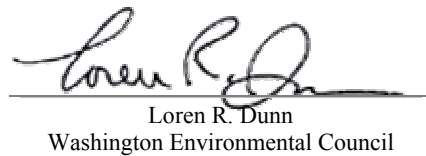
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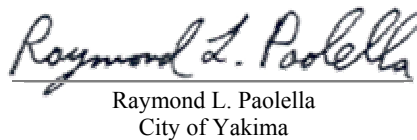
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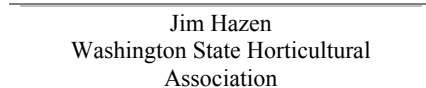


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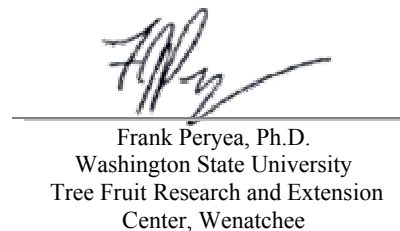


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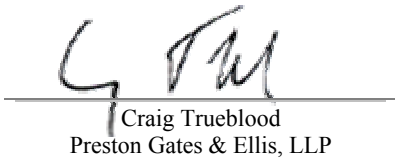
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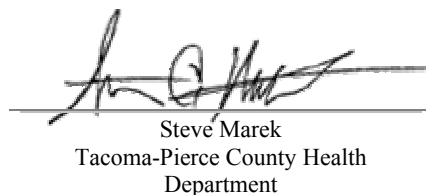
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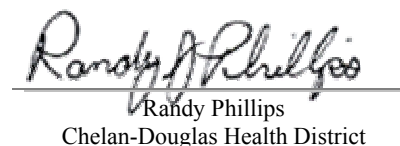
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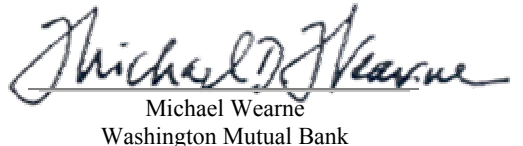
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Area-Wide Soil Contamination Task Force Report

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Executive Summary

This report transmits the findings and recommendations of the Area-Wide Soil Contamination Task Force, a 17-person panel chartered by the Washington State Departments of Agriculture, Ecology, Health, and Community, Trade and Economic Development (the Agencies) to offer advice about a statewide strategy to respond to low- to moderate-level arsenic and lead soil contamination in Washington State. The Model Toxics Control Act (MTCA) Policy Advisory Committee (PAC) recommended that the Department of Ecology (Ecology) take steps to more effectively address area-wide soil contamination, and the Task Force was formed in response to this recommendation and based on the Agencies' belief that effective, long-term solutions to area-wide soil contamination would require looking beyond traditional cleanup processes and agency boundaries.

The Task Force carried out its deliberations over a 17-month period beginning in February 2002. Deliberations took place at a series of public meetings and through conference calls and e-mail discussions. Task Force members represented a diverse array of perspectives, including environmental, agricultural, schools, business, financial, insurance, real estate, public health, and local government. Preliminary Task Force recommendations were widely publicized and made available for public review and comment; Task Force members considered these comments in finalizing their recommendations.

Task Force deliberations focused on understanding the nature and extent of area-wide soil contamination, making recommendations about effective, practical, and affordable steps individuals and organizations can take to reduce their potential for exposure to area-wide soil contamination, and on creating an alternate, more streamlined approach under MTCA for properties affected by area-wide soil contamination.

One Task Force member participated in the process but chose not to sign the final report because of concerns over recommendations dealing with funding future mapping projects and the potential economic impact of creating area-wide soil contamination zones.

What is Area-Wide Soil Contamination?

“Area-wide soil contamination” refers to low- to moderate-level soil contamination that is dispersed over a large geographic area, covering several hundred acres to many square miles. For schools, childcare centers, and residential land uses, in general, Ecology considers total arsenic concentrations of up to 100 milligrams per kilogram (mg/kg)¹ and total lead concentrations of up to 500–700 mg/kg to be within the low-to-moderate range. For properties where exposure of children is less likely or less frequent, such as commercial properties, parks, and camps, Ecology considers total arsenic concentrations of up to 200 mg/kg and total lead concentrations of up to 700–1,000 mg/kg to be within the low-to-moderate range.

¹ Milligrams per kilogram (mg/kg) is numerically equivalent to parts per million.

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For comparison, the cleanup levels under MTCA for total arsenic and lead in soil are 20 mg/kg and 250 mg/kg, respectively. Arsenic occurs naturally in Washington State soils at approximately 5–9 mg/kg; lead occurs at 11–24 mg/kg.

The Task Force considered area-wide arsenic and lead soil contamination primarily from two sources: past use of lead arsenate-based pesticides, and historical emissions from metal smelters located in Everett, Northport, Tacoma, and on Harbor Island (in Seattle). Based on current information, it is estimated that 676,550 acres in Washington State may be affected by area-wide arsenic and lead soil contamination from these sources. The Task Force also considered the possibility of area-wide soil contamination from combustion of leaded gasoline, and made recommendations about gathering additional information on the potential for area-wide soil contamination from this source.

Task Force Charter

The Agencies asked the Task Force to provide findings and recommendations on four sets of questions:

- What is currently known about the nature and extent of arsenic and lead soil contamination in Washington State? What steps should be taken to improve our understanding of the location and magnitude of arsenic and lead soil contamination?
- What are technically feasible measures for addressing widespread low-to-moderate soil contamination problems? What is the full range of actions that might be considered to address widespread low-to-moderate levels of soil contamination?
- What changes are needed to eliminate barriers in addressing area-wide soil contamination problems? How can agencies facilitate cleanup of area-wide soil contamination problems under the current legal system?
- What agencies need to play a role in addressing area-wide soil contamination problems and what are possible funding sources?

The Agencies also identified three areas as beyond the scope of the Task Force process: 1) MTCA cleanup standards for arsenic and lead and the policies and technical methods upon which the cleanup standards are based, 2) ongoing site-specific cleanup actions, and 3) current agricultural practices.

Task Force Guiding Principles

In making recommendations, the Task Force was guided by six principles, which it believes should also guide the Agencies. These principles are:

- A balanced approach is needed, centered on effective, practical, and affordable solutions.
- Risks from area-wide soil contamination appear to be relatively low when compared to risks at sites with higher concentrations of contaminants.

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- It is prudent to take effective, practical, and affordable steps to minimize the potential for exposure to area-wide soil contamination.
- Efforts should focus on children, because they are believed to be the human population most sensitive to elevated levels of lead and arsenic in the environment.
- Responses to area-wide soil contamination should be commensurate with the level of risk associated with potential exposures and should increase as potential exposure increases.
- Decisions about area-wide soil contamination should be made locally.

From these principles, the Task Force's deliberations produced agreement on and support for numerous recommendations to the chartering Agencies.

Education is the Foundation of Task Force Recommendations

The foundation of the Task Force recommendations calls for the Agencies to initiate a broad-based health education and awareness-building campaign about low- to moderate-level arsenic and lead soil contamination, and to support and encourage actions individuals can take to reduce the likelihood that they will be exposed to arsenic and lead in soil. The Task Force recommends that the Agencies:

- Work with and through local governments, particularly local health jurisdictions, to establish a broad-based education and awareness-building campaign designed to provide individuals, organizations, and communities with a toolbox of information and materials to make knowledgeable and responsible choices about responding to area-wide soil contamination. This should include information on where area-wide soil contamination is most likely, how people can conduct individual property evaluations of the potential for area-wide soil contamination, and on effective, practical, and affordable steps people can take to reduce the likelihood that they will be exposed to arsenic and lead in soil. Education should focus on people and organizations that care for children—including parents, educators, health care providers, and childcare providers—and gardeners and other adults who frequently work in soil.
- Take a step-wise approach to education and awareness-building with statewide distribution of general information supplemented by specific outreach and support for individuals and organizations located where area-wide soil contamination is likely.
- Encourage residents in area-wide soil contamination zones to implement “individual protection measures,” such as hand washing, removing shoes before entering the house, frequently washing toys and pets that go outdoors, and scrubbing fruits and vegetables before eating them. Also encourage residents in area-wide soil contamination zones to maintain good soil cover.
- Evaluate the effectiveness of these outreach and education efforts.

Land-Use Specific Recommendations to Complement Education

To complement broad-based education and awareness-building, the Task Force also recommends specific approaches in different land-use scenarios.

Child-Use Areas

For child-use areas (including schools, parks, and childcare facilities) potentially affected by area-wide soil contamination, the Task Force recommends that property owners implement individual protection measures, maintain good soil cover in areas where children play, conduct qualitative evaluations to increase their understanding of where exposure could occur, test soils where qualitative evaluations indicate the potential for exposure to contaminated soil, and implement additional protection measures such as installing a geotextile fabric barrier between contaminated soils and surfacing materials in play areas if contamination is found. The Agencies should work with local health jurisdictions, school districts, and other organizations to support, encourage, and assist with implementation of these actions. Task Force recommendations for child-use areas also call for the Agencies to:

- Encourage implementation of Consumer Product Safety Commission guidelines for maintaining children's safety at existing playgrounds in parks, schools, camps, and childcare facilities.
- Require soil testing at new public child-use area construction sites and implementation of additional protection measures if contamination is found.
- Establish, with the Department of Social and Health Services (DSHS), a voluntary certification program for family home childcares and childcare centers to indicate that they have taken steps to minimize children's potential for exposure to lead and arsenic in soil.

Residential Properties

For residential properties potentially affected by area-wide soil contamination, the Task Force recommends that the Agencies offer technical and financial assistance to support and encourage residents to implement individual protection measures, maintain good soil cover, and conduct qualitative evaluations to understand where exposure could occur. Where qualitative evaluations indicate the potential for exposure to contaminated soil, the Task Force recommends that individuals consider soil testing and implementing additional protection measures if contamination is found.

Commercial Properties

For commercial properties potentially affected by area-wide soil contamination, the Task Force recommends that where commercial areas are covered with surfaces such as buildings, parking lots, or other effective soil cover, no further response actions are necessary to address area-wide soil contamination. For mixed-use areas, Task Force recommendations for non-commercial use should also be considered. For example, if a childcare center is located in a shopping center, the Task Force recommendations for child-use areas should be considered for the childcare center.

Open Land

For open land potentially affected by area-wide soil contamination, the Task Force recommends that the Agencies:

- Amend the State Environmental Policy Act (SEPA) checklist to include a question about whether there is the potential for area-wide soil contamination on a property.
- Encourage developers to conduct qualitative evaluations of properties and, where warranted, carry out soil testing prior to construction. Also encourage developers to incorporate appropriate additional protection measures into site development and construction plans.
- Support actions to enact Washington State legislation requiring a real property transfer disclosure statement for open land.

In addition, for open land being developed, the Task Force recommends that the Agencies ensure implementation of existing U.S. Occupational Safety & Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) requirements governing worker protection and safety, and implementation of requirements to control windblown dust and soil erosion due to storm water runoff during construction. For open land not being developed, the Task Force recommends that land owners use practical, cost-effective measures to limit the potential for exposure to contaminated soil and windblown dust.

Application of the Model Toxics Control Act

The Task Force debated MTCA and its application to area-wide soil contamination extensively. From these discussions, the Task Force identified a number of objectives related to use of MTCA and a number of elements of MTCA that Ecology might consider in meeting these objectives. The Task Force makes six recommendations related to MTCA:

- As much as possible, use regulations instead of policies to implement Task Force recommendations related to MTCA.
- Avoid listing individual properties affected by area-wide soil contamination and instead identify and describe area-wide soil contamination zones.
- Establish in regulation a new enforcement forbearance policy available where property owners choose to implement Task Force recommendations at residential and commercial properties within area-wide soil contamination zones. To complement the policy, establish a standard checklist that can be used to document property status. Announce the new policy and checklist when area-wide soil contamination zones are first described.
- Where property owners choose not to implement Task Force recommendations, they remain under the current MTCA system that includes a policy under which, in general, Ecology chooses not to take enforcement actions at residential properties.
- Where properties are sampled and concentrations of arsenic and lead are below cleanup levels, provide a streamlined process to reflect that properties are clean.

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- The traditional MTCA approach remains available to property owners who want to use it to address area-wide soil contamination and to Ecology where a property is affected by contamination other than area-wide soil contamination.

Other Recommendations

Task Force recommendations also address additional information needs and funding strategies.

With respect to additional information gathering, the Task Force recommends that the Agencies:

- Gather additional, scientifically valid information on the health of Washington residents, particularly children, who may be exposed to arsenic and lead.
- Conduct further research to characterize the location and extent of elevated levels of lead in soil from past use of leaded gasoline in Washington. Possibly focus on areas adjacent to older, more heavily used roads.
- Study the effects of area-wide soil contamination on ecological receptors, including plants and animals.

With respect to funding, the Task Force recommends that the Agencies:

- Provide financial assistance for local government efforts to address area-wide soil contamination, particularly the activities of local health jurisdictions.
- Seek funding from a broad array of Federal, State, and private sources, including the State and Local Toxics Accounts, private foundations, Federal grant programs, the Federal government and the State legislature, and any identified potentially liable parties.

1. Introduction

This report is the product of a 17-person Task Force chartered by the Washington State Departments of Agriculture, Ecology, Health, and Community, Trade and Economic Development (the Agencies). The Area-Wide Soil Contamination Task Force (Task Force) was charged with developing findings and recommendations related to large areas of low- to moderate-level arsenic and lead soil contamination (so called “area-wide soil contamination”) in Washington State. The Task Force process was carried out over 18 months, from January 2002 to June 2003.

As used in this report, “area-wide soil contamination” means low- to moderate-level soil contamination that is dispersed over a large geographic area, ranging in size from several hundred acres to many square miles. Area-wide soil contamination is different from most cleanup sites, which are typically smaller and have higher levels of contamination.

Concentrations of arsenic and lead within areas affected by area-wide soil contamination are highly variable. The Task Force relied on the current views of the Department of Ecology (Ecology) about what constitutes “low-to-moderate” levels of arsenic and lead in soil. For schools, childcare centers, and residential land uses, in general, Ecology considers total arsenic concentrations of up to 100 milligrams per kilogram (mg/kg)² and total lead concentrations of up to 500–700 mg/kg to be within the low-to-moderate range. For properties where exposure of children is less likely or less frequent, such as commercial properties, parks, and camps, Ecology considers total arsenic concentrations of up to 200 mg/kg and total lead concentrations of up to 700–1,000 mg/kg to be within the low-to-moderate range. Ecology plans to ask the Science Advisory Board to review these values and their use in implementing the Task Force recommendations. For comparison, the State cleanup levels for total arsenic and lead in soil are 20 mg/kg and 250 mg/kg, respectively. Arsenic occurs naturally in Washington State soils at approximately 5–9 mg/kg; lead at 11–24 mg/kg.

Task Force deliberations focused on understanding and mapping the nature and extent of low- to moderate-level arsenic and lead soil contamination from two historical sources: emissions from metal smelters, and use of pesticides containing lead arsenate. The Task Force also offers recommendations about considering the potential for area-wide soil contamination from combustion of leaded gasoline. Task Force recommendations are focused on effective, practical, and affordable steps that organizations and individuals can take to reduce the potential for exposure to low-to-moderate levels of arsenic and lead soil contamination.

The foundation of the Task Force recommendations calls for the Agencies to initiate a broad-based education and awareness-building campaign about low- to moderate-level arsenic and lead soil contamination, and to support and encourage actions individuals can take to reduce the likelihood that they will be exposed to arsenic and lead in soil. To complement broad-based education and awareness-building, the Task Force also recommends specific activities for a number of land-use situations, with an emphasis on child-use areas. Finally, the Task Force

² Milligrams per kilogram (mg/kg) is numerically equivalent to parts per million.

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recommends creation of a special process under the Model Toxics Control Act (MTCA) tailored for properties affected by area-wide soil contamination.

In making these recommendations, the Task Force was guided by six principles which are listed here and described more fully later in the report:

- A balanced approach is needed, centered on effective, practical, and affordable solutions.
- Risks from area-wide soil contamination appear to be relatively low when compared to risks at sites with higher concentrations of contaminants.
- It is prudent to take effective, practical, and affordable steps to minimize the potential for exposure to area-wide soil contamination.
- Efforts should focus on children, because they are believed to be the human population most sensitive to elevated levels of lead and arsenic in the environment.
- Responses to area-wide soil contamination should be commensurate with the level of risk associated with potential exposures and should increase as potential exposure increases.
- Decisions about area-wide soil contamination should be made locally.

2. Project Background and Task Force Charge

In 1994, the Washington State Legislature established the MTCA Policy Advisory Committee (PAC) to review implementation of MTCA. In their final report, the MTCA PAC recommended that Ecology take steps to more effectively address area-wide soil contamination. In early 2000, the Agencies concluded that effective, long-term solutions to area-wide soil contamination problems would require looking beyond traditional cleanup processes and agency boundaries. The Agencies identified several interconnected challenges posed by widespread low- to moderate-level soil contamination.

- Potential for exposure: Over the past 50 years, Washington's population growth has resulted in many agricultural and forested areas and other open space being converted to residential uses. Population has also increased in areas affected by emissions from metal smelters. This growth can bring more people into contact with area-wide soil contamination.
- Scale: The geographic scale of area-wide soil contamination is significantly greater than contamination typically addressed by State and Federal cleanup programs and encompasses many individual parcels of land.
- Financial Impacts: Citizens and land developers have purchased or built homes in areas with contaminated soils. This creates the potential for financial problems that may include payment for cleanup, reduction in property values, and difficulties in financing or selling homes.
- Lack of Information and Awareness: The Agencies lack key information needed to effectively address area-wide soil contamination; for example, information on the full scope of the problem and on stakeholder views. Similarly, many residents are unaware that soil at their homes, future homes, and/or children's schools may contain low-to-moderate levels of arsenic and lead. Consequently, they fail to take steps to control exposures.

In June 2001, the Washington Legislature appropriated \$1.2 million to form and support a stakeholder Task Force to consider these issues, and the Agencies initiated the process of hiring a project support contractor and identifying potential Task Force members. The Agencies chartered the Area-Wide Soil Contamination Task Force in January 2002 to consider the special challenges posed by area-wide soil contamination and recommend a statewide strategy for meeting these challenges. In particular, the Agencies asked the Task Force to provide findings and recommendations on four sets of questions:

- What is currently known about the nature and extent of arsenic and lead soil contamination in Washington State? What steps should be taken to improve our understanding of the location and magnitude of arsenic and lead soil contamination?

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- What are technically feasible measures for addressing widespread low-to-moderate soil contamination problems? What is the full range of actions that might be considered to address widespread low-to-moderate levels of soil contamination?
- What changes are needed to eliminate barriers in addressing area-wide soil contamination problems? How can agencies facilitate cleanup of area-wide soil contamination problems under the current legal system?
- What agencies need to play a role in addressing area-wide soil contamination problems and what are possible funding sources?

Even though other contaminants may pose area-wide soil contamination problems, the Agencies asked the Task Force to focus on problems associated with arsenic and lead because of the potential widespread distribution of these contaminants and their persistence in the environment. The Agencies also identified three areas as beyond the scope of the Task Force process: 1) MTCA cleanup standards for arsenic and lead and the policies and technical methods upon which the cleanup standards are based, 2) ongoing site-specific cleanup actions, and 3) current agricultural practices. In this context, the Task Force began deliberations at its first meeting in February 2002.

3. Task Force Composition, Process, and Information Gathering

The Task Force was made up of 17 individuals who represent diverse interests including business, environment, agriculture, local government, and schools. The Agencies identified Task Force members based on areas of expertise, ability to represent potentially affected stakeholder groups, and a desire to ensure geographic representation across the state. Task Force members served the project as volunteers—they were not compensated for their time or expertise. Most Task Force members served for the entire process. Two Task Force members left the process relatively early because of changes in their professional circumstances. They were replaced by other representatives in their area of expertise. The Task Force met 12 times from February 2002 to June 2003. All meetings were advertised and were open to the public, and opportunities for public comment were provided at each meeting.

The Task Force began by reviewing and accepting the Task Force charter, which includes the questions posed by the Agencies and the areas identified as outside the scope of the Task Force deliberations discussed in the section above. It also accepted two co-chairs recommended by the Agencies—a representative of environmental interests from Western Washington and a representative of business interests from Eastern Washington. The Task Force co-chairs served as liaisons to the facilitation team and helped to guide and manage the Task Force process. A list of Task Force members and meeting locations and dates, as well as a copy of the Task Force charter and ground rules are included in Appendix B.

There was a wide range of views on the Task Force, and at their first meetings Task Force members worked to develop a common language and information base from which to discuss area-wide soil contamination and to understand one another's concerns and interests. At their fourth meeting, the Task Force developed a Project Map (see Figure 1 below) to organize their deliberations. The Project Map organizes Task Force deliberations into four issue areas: 1) identifying the nature and extent of area-wide soil contamination, 2) identifying actions to address area-wide soil contamination, 3) implementing actions to address area-wide soil contamination, and 4) funding sources and financing mechanisms. It lists questions that the Task Force considered under each issue area and shows the issue areas as interrelated and affected by three overarching factors: cost, health exposure data, and MTCA. Between full Task Force meetings, small groups of Task Force members met to evaluate specific issues identified on the Project Map and develop options and recommendations for the full Task Force to consider. These discussions formed the basis for the recommendations described in this report.

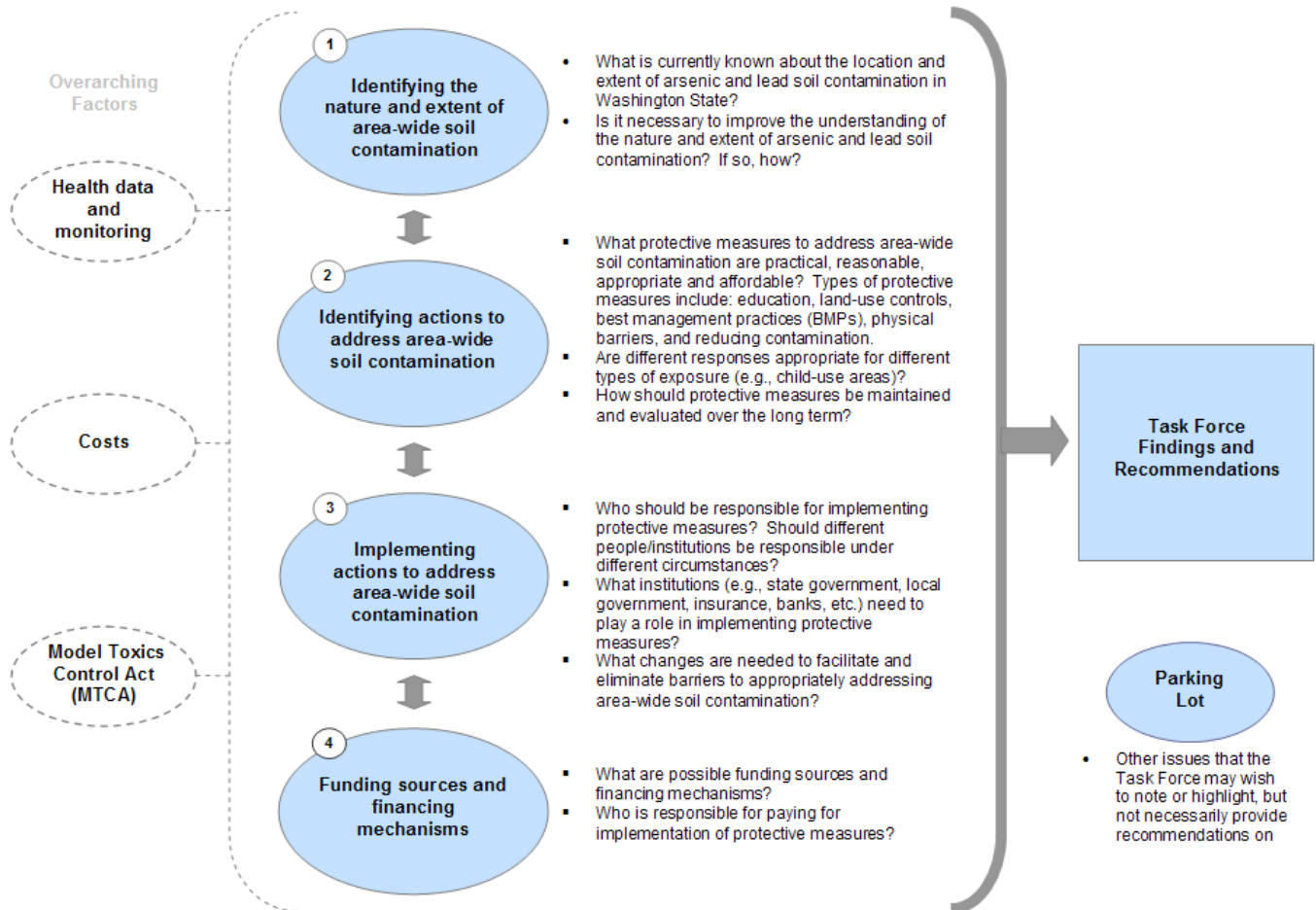
The Task Force completed preliminary findings and recommendations for the majority of the questions on the Project Map in April 2003. Preliminary Task Force findings and recommendations were widely publicized and made available for public review and comment in May 2003. In addition, five focus group meetings were organized. Task Force members attended the focus group meetings to hear first-hand the reactions to the preliminary findings and recommendations. The public review and comment process is summarized in Appendix C. The

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Task Force then met twice in June 2003 to evaluate public comments and refine their findings and recommendations, and issued their final report at the end of June 2003.

One Task Force member participated in the process but chose not to sign the final report because of concerns over recommendations dealing with funding future mapping projects and the potential economic impact of creating area-wide soil contamination zones.

Figure 1: Area-Wide Soil Contamination Project Map



The Agencies served as *ex officio* members of the Task Force, attending both Task Force and small group meetings. They provided background information and support for Task Force deliberations and offered agency perspectives during the Task Force's development of findings and recommendations, but did not participate in final decision-making with respect to the Task Force report. In addition, the Task Force was supported by a contractor project team hired by Ecology and, early in their process, by two workgroups made up of technical experts and advisors. The workgroups carried out research and analysis to support Task Force deliberations and reviewed technical documents prepared for the project. The contractor project team carried

out research and analysis to support Task Force deliberations and facilitated the Task Force and small group meetings.

Task Force deliberations were supported by an information-gathering effort that had four primary components:

- Interviews with Task Force members and stakeholders to identify key issues and concerns.
- Survey of research to identify and learn from other approaches to area-wide soil contamination and similar challenges.
- Case studies of several relevant cleanup or land-use development projects to evaluate their legal, funding, and institutional arrangements for addressing soil contamination and responding to public concerns.
- Research on institutional systems in Washington relevant to recommendations the Task Force considered.

These information-gathering efforts are described in Appendices D–G of this report.

4. Consideration of Health Risks and Guiding Principles for Making Recommendations

As described earlier in this report, the Task Force charter specifically excluded evaluation of the MTCA soil cleanup standards for arsenic and lead, the risk policies underlying the cleanup standards, and the technical methods used to establish the standards. Nonetheless, to develop appropriate recommendations, the Task Force discussed the potential risks posed by arsenic and lead, reviewed some of the available information on potential health effects from exposure to low-to-moderate levels of arsenic and lead in soil, and heard presentations from experts.

Information provided to the Task Force on the potential health effects of arsenic and lead is summarized in Appendix H. From this evaluation, the Task Force reached a number of conclusions:

What is Low-to-Moderate?

The Task Force relied on Ecology's current views about what constitutes "low-to-moderate" levels of arsenic and lead in soil. For schools, childcare centers, and residential land uses, in general, Ecology considers arsenic concentrations of up to 100 total mg/kg and lead concentrations of up to 500–700 total mg/kg to be within the low-to-moderate range. For properties where exposure of children is less likely or less frequent, such as commercial properties, parks, and camps, Ecology considers arsenic concentrations of up to 200 total mg/kg and lead concentrations of up to 700–1,000 total mg/kg to be within the low-to-moderate range.

- As described later in this report, concentrations of arsenic and lead in soil are above State soil cleanup levels in some areas of Washington State.
- The risk of developing health problems from arsenic or lead depends on the amount of exposure and the concentrations to which a person is exposed. The greater the exposure and/or the greater the concentrations, the greater the risk. Most information about the health effects of arsenic and lead comes from studies where exposures were greater than those expected from living and working in places with low-to-moderate levels of arsenic and lead in soil.
- Scientific studies to date have not found conclusive evidence that exposure to low-to-moderate levels of arsenic and lead contamination in soil has caused or is causing deleterious health effects in Washington residents. The number of pertinent studies is small, and their designs lack sufficient power to detect the presence of increased incidences of adverse health effects, if any do exist. Health monitoring and research studies have not been carried out to the extent necessary to understand and document whether exposure to low- to moderate-level soil contamination is causing or contributing to long-term health problems.
- Evaluating health effects at lower levels of exposure is difficult and expensive. It is unlikely that conclusive scientific information to determine the health risks, if any, from exposure to area-wide soil contamination will be available in the foreseeable future. In light of this uncertainty, there is disagreement among scientists about how the information that is available should be interpreted and used to assess the risks of exposure to low- to moderate-level soil contamination. Some members of the scientific

community argue that Federal and State efforts to address low- to moderate-level soil contamination are not scientifically justified because there is no information demonstrating that health problems are being caused by exposure to such contamination. Other members of the scientific community argue that arsenic and lead in soil have the potential to cause health problems at low levels of exposure—especially for people, such as young children, who are particularly sensitive to the effects of these contaminants. Task Force members mirrored this diversity of views. In recent years, the majority of scientific review committees formed to evaluate the available scientific information on arsenic and lead have concluded that there is a sufficient scientific basis to justify efforts to reduce exposure to all sources of arsenic and lead, including arsenic and lead occurring in soil.

- Arsenic and lead are both considered persistent contaminants. This means that they bind strongly to soil and usually remain in the environment without breaking down or losing their toxicity, and thus can be a source of exposure for many decades.

In light of these conclusions, the Task Force developed six guiding principles. These principles guided the Task Force's deliberations and recommendations and should guide the Agencies and other organizations' implementation of Task Force recommendations:

- A balanced approach is needed: The Task Force believes that responses to area-wide soil contamination should be effective, practical and affordable.
- Lower adverse health risk: Despite the fact that concentrations of arsenic and lead in soil may be above State soil cleanup levels, the Task Force believes that the level of risk associated with exposures to low-to-moderate arsenic and lead soil contamination appears to be relatively low when compared to risks at sites where smelters operated or where lead arsenate pesticides were mixed (i.e., sites with higher concentrations of contaminants). Resources to address contaminated sites in Washington State are limited, and addressing area-wide soil contamination sites will compete for resources with addressing more traditional cleanup sites. Beyond the broad-based education and awareness-building described below, the Task Force does not recommend that additional remediation responses are needed at every individual property with low-to-moderate arsenic and lead soil contamination, unless exposure potential exists for children or the likelihood for enhanced exposure potential exists for adults through activities such as gardening.
- Focus on controlling exposure: Given the potential for exposure to arsenic and lead to cause adverse health effects in people, it is prudent to take effective, practical, and affordable steps to minimize the potential for exposure to arsenic and lead in soil.

What Home Remedies Contain Lead?

Some home remedies or medicines contain lead and can make people, particularly young children, very sick, even though symptoms of lead poisoning might not be immediately evident. Home remedies containing lead include:

- Azarcon and Greta are bright powders used in the Hispanic community to treat intestinal illness or "empacho." They are almost 100% lead.
- Pay-loo-ah is a red powder used in the Hmong community to treat rash or fever.
- Ghasard, Bala Goli, and Kandu are Asian Indian remedies for stomachaches.
- Kohl and Surma are used in Arab communities for cosmetic and medicinal purposes.

- Focus on children: While adults are also vulnerable to adverse health effects from arsenic and lead and should not be ignored, the Task Force felt a special responsibility to address protection of children. Resources devoted to assessing and responding to area-wide soil contamination should be focused on locations where there is the highest risk of exposure and should be targeted at protecting children. The vulnerability of the population, likelihood of exposure, and the duration or frequency of exposures are the most important factors in deciding whether response actions are necessary and, where actions are needed, in selecting the specific actions selected.
- Responses increase as exposure increases: Responses to area-wide soil contamination should be commensurate with the level of risk associated with potential exposure. In general, the intensity and effectiveness of responses to area-wide soil contamination should increase as exposures become more likely (because of likelihood of extent of contact), more prevalent (because of more individuals exposed), or more intense (because of longer duration or more frequent exposures). In some situations, higher concentrations of arsenic or lead may be found in areas affected by area-wide soil contamination; in these cases, more aggressive response actions may be warranted.
- Decisions should be made locally: The Task Force recommends what it believes are effective, practical, and low-cost methods to respond to area-wide soil contamination. However, the Task Force recommendations are only guidelines. Each person or community affected by area-wide soil contamination should implement a response that meets their priorities, objectives, and tolerance for risk, even if those responses differ from those recommended by the Task Force. For example, some individuals or communities might choose not to implement Task Force recommendations. Other individuals or communities might choose to remove contaminated soil because they do not want the added complication of maintaining protection measures over time, even though less costly actions focused on individual protection measures and maintaining soil cover would also be effective.

Lead-Based Paint

Nationwide, the most common source of lead poisoning in children is lead-based paint. Lead was used extensively in interior and exterior paint before 1950 and may be present in any home built before 1978. Lead-based paint is most dangerous when it is peeling, chipping, chalking, or cracking. Children can be exposed to lead by eating paint chips, chewing painted surfaces, or ingesting soil or dust contaminated from lead-based paint.

Using these guiding principles, the Task Force considered a wide range of protection measures and developed the recommendations in the remainder of this report.

One Task Force member expressed strong and persistent concerns about the wisdom of the Task Force process, believing that it was inappropriate to exclude consideration of the MTCA cleanup standards from the Task Force charter and that the process failed to demonstrate any link between human health risk to lead and arsenic in the soil. This Task Force member asserts that a full evaluation of these issues would show that the MTCA cleanup levels for arsenic and lead in soil are set too low given current and historical human health-related data regarding this complex issue and should be revised. Although this Task Force member supports efforts to reduce

potential exposure through education and awareness building efforts, he chose not to sign the final report because of concerns over recommendations dealing with funding future mapping projects and the potential economic impact of creating area-wide soil contamination zones. He remains very concerned about possible overreaction to area-wide soil contamination that could lead to unwarranted fears by the public and media, potential damage to local and state economies, and overregulation by government in response to this issue.

5. Nature and Extent of Area-Wide Soil Contamination

The Task Force considered what is known and not known about the location and magnitude of elevated levels of arsenic and lead in soil from historical smelter emissions, use of pesticides containing arsenic and lead, and combustion of leaded gasoline. Much of the Task Force's deliberations focused on how to communicate this information in a way that would present information accurately without causing undue alarm. As discussed below, the Task Force decided that a tiered series of maps, along with accompanying information and tools, should be used to communicate information on area-wide soil contamination in a balanced and useful way. The Task Force also recommends updating the maps regularly to improve their precision and developing local maps of area-wide soil contamination where such maps do not exist (primarily for areas affected by lead arsenate pesticides). Recommendations for additional research on contamination from combustion of leaded gasoline are discussed in Section 11.

The Task Force's findings and recommendations in this section are organized according to three questions the Task Force considered:

- What is currently known about the nature and extent of arsenic and lead soil contamination in Washington State?
- How should information on the nature and extent of area-wide soil contamination be communicated?
- What steps should be taken to improve our understanding of the nature and extent of arsenic and lead soil contamination?

What is Known About the Nature and Extent of Area-Wide Arsenic and Lead Soil Contamination

Elevated levels of arsenic and lead are present in soil in some areas of Washington State from three historical sources: air emissions from metal smelters, lead arsenate pesticides, and combustion of leaded gasoline. In areas affected by off-site deposition of smelter emissions and areas where lead arsenate pesticides were applied to crops, concentrations of arsenic and lead in soil

generally are higher than concentrations that occur naturally in Washington soils and higher than State soil cleanup levels established under MTCA. However, concentrations generally are lower than those found at smelter operation sites and at sites where lead arsenate pesticides were mixed in preparation for application. Low-to-moderate arsenic and lead soil contamination associated with areas affected by off-site deposition of smelter emissions, lead arsenate pesticide application, and combustion of leaded gasoline is referred to as "area-wide soil contamination" to distinguish it from the higher concentrations and smaller geographic extent of contamination at more traditional cleanup sites.

What is Area-Wide Soil Contamination?

Area-wide soil contamination is low- to moderate-level contamination that is dispersed over a large geographic area, ranging in size from several hundred acres to many square miles.

The precise boundaries of land affected by area-wide soil contamination are not known; however, certain places have a higher likelihood of arsenic and lead soil contamination based on the locations of metal smelters or the probable use of lead arsenate pesticides from approximately 1905 to 1947. To support Task Force deliberations, the contractor project team conducted a detailed study of available data on the nature and extent of area-wide soil contamination. Based on this study, areas affected by smelter emissions in King, Pierce, Snohomish, and Stevens counties have a higher likelihood of arsenic and lead soil contamination than other areas of the state due to historical emissions from metal smelters located in Tacoma, Everett, Northport, and Trail, BC, and on Harbor Island (in Seattle). Areas where apples and pears were historically grown have a higher

likelihood of arsenic and lead soil contamination than other areas of the state because of past use of lead arsenate pesticides. Chelan, Spokane, Yakima, and Okanogan counties have a higher likelihood than other counties for elevated levels of lead and arsenic in soil based on the greater numbers of apple and pear trees in production there between 1905 and 1947. Combustion of leaded gasoline produces lead-enriched particulates and aerosols that are emitted from exhaust pipes and deposited onto nearby soils. The full extent of area-wide soil contamination from past use of leaded gasoline in Washington is not known; however, in general, land adjacent to any road constructed prior to 1995 and land in the center of highly populated urban areas has some likelihood of elevated levels of lead in soil from leaded gasoline. Table 1, later in this section, describes the number of acres potentially affected by area-wide arsenic and lead soil contamination based on information currently available.

What Are Other Sources of Arsenic and Lead Contamination?

Other sources of arsenic contamination include wood treated with chromated copper arsenate (often called “pressure-treated” wood), emissions from coal-fired power plants and incinerators, and other industrial processes. Other sources of lead contamination include lead-based paint, lead-soldered water pipes, home remedies or health-care products that contain lead, hobbies that use lead (e.g., stained glass or sculpturing), foods and beverages, combustion of coal or oil, waste incinerators, and mining and industrial processes (such as battery and ammunitions manufacturing). Both arsenic and lead also occur naturally in the environment at varying concentrations.

According to the study prepared to support Task Force deliberations, the range of concentrations of arsenic and lead in soil associated with area-wide soil contamination is quite broad. Total arsenic concentrations range from natural background levels (7–9 mg/kg statewide) to over 3,000 mg/kg in smelter areas. Average concentrations of total arsenic in soil at developed properties with area-wide soil contamination generally are less than 100 mg/kg. Total lead concentrations range from natural background levels (11–24 mg/kg statewide) to over 4,000 mg/kg in orchard top soils (higher concentrations are likely areas where pesticides were mixed prior to application). Average concentrations of total lead in soil at developed properties with area-wide soil contamination generally are less than 700 mg/kg. By comparison, the MTCA soil cleanup levels for unrestricted land use for total arsenic and total lead are 20 mg/kg and 250 mg/kg, respectively. Soil concentrations tend to be greater around the Tacoma smelter than in the other smelter areas, because the Tacoma smelter operated for a longer period and specialized in the processing of high-arsenic ore.

Where found, arsenic and lead soil contamination tends to be relatively shallow. In undisturbed soils, most of the arsenic and essentially all of the lead from historical smelter emissions and

historical use of lead-arsenate pesticides typically are concentrated in the upper 6 to 18 inches of soil.³ While some downward movement of arsenic occurs in most soils, substantial downward movement has been detected on occasion and appears to be restricted to heavily leached sandy-to medium-textured soils with very uniform soil profile characteristics.⁴ Currently there does not appear to be evidence of ground water contamination associated with area-wide soil contamination. The long-term consequences of the very slow downward movement of arsenic in soil require further evaluation.

Concentrations of arsenic and lead at properties affected by area-wide soil contamination are highly variable and depend on the historical use and development of the property. For example, during development of a property, surface soils are often mixed with underlying soils and redistributed; this disturbance tends to dilute the concentrations of arsenic and lead in soil and distribute them in unpredictable patterns. Contaminant concentrations on one property cannot reliably be used to predict concentrations on neighboring properties.

Information on the nature and extent of arsenic and lead soil contamination provided the basis for Task Force deliberations on what actions should be taken to respond to area-wide soil contamination in important ways. For example, the knowledge that most added arsenic and almost all added lead remains in surface and near-surface soils, coupled with lack of evidence for ground water contamination, suggests that ground water contamination is not likely an issue for properties with area-wide soil contamination. Similarly, the understanding that arsenic and lead contamination tends to be highest in undisturbed soils, with other considerations, led to the Task Force's recommendations on additional steps that should be taken when converting open land into developed properties.

Recommendations on How Information on the Nature and Extent of Area-Wide Soil Contamination Should be Communicated

The Task Force recommends that information on the nature and extent of area-wide soil contamination be communicated using a combination of maps and accompanying narrative information that emphasize the need for individual property evaluations to determine with certainty whether area-wide soil contamination is present.

Maps can be a highly effective way to communicate available information about potential locations of area-wide soil contamination to the public. In addition to communicating information about potential locations of area-wide soil contamination to the public, the maps recommended by the Task Force serve a variety of purposes, including helping the Agencies to identify areas where an alternate approach under MTCA might apply (see Section 10 below) and helping the Agencies and local jurisdictions prioritize and focus efforts where area-wide soil contamination is more likely. For the Tacoma and Everett smelters, Ecology, several local jurisdictions, and other organizations have collected and continue to collect data on where

³ Landau Associates, *Preliminary Estimates Report, Area-Wide Soil Contamination Strategy*, Washington State, prepared for the Washington State Department of Ecology, Olympia, WA, 2003 (pending).

⁴ Peryea, F.J., and T.L. Creger, "Vertical Distribution of Lead and Arsenic in Lead Arsenate-Contaminated Soils." *Water, Air and Soil Pollution* 78 (1994): 297-306.

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arsenic and lead soil contamination is likely to be present based on emissions, wind deposition, and results of a number of soil sampling events, and have developed maps to communicate this information. These maps were an important factor in the Task Force deliberations. Task Force recommendations related to maps are discussed later in this section.

Maps also have significant limitations. As discussed earlier in this report, the precise boundaries of area-wide soil contamination are not, and likely will not be, identified and therefore cannot be mapped. Even where area-wide soil contamination is likely, the actual distribution and concentrations of arsenic and lead in soil vary greatly over short distances. Because of this limitation, the Task Force emphasizes that maps can be used only to communicate where elevated levels of arsenic and lead in soil are more likely to be

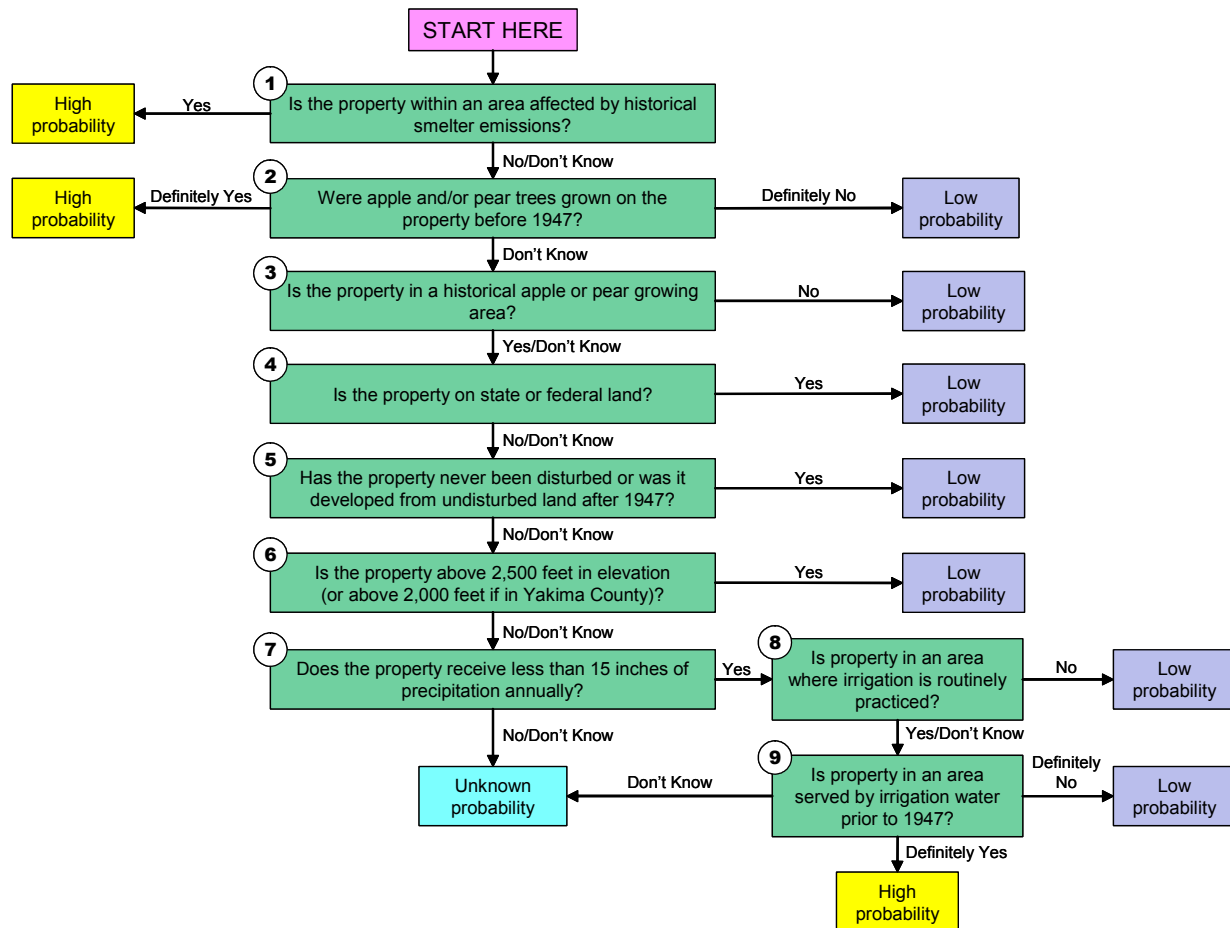
present relative to other areas in Washington State. Maps do not show where elevated levels of arsenic and lead have actually been found, and many properties within identified area-wide soil contamination locations may, if sampled, be shown to have concentrations of arsenic and lead that are below MTCA cleanup levels.

Table 1: Preliminary Estimates of Area-Wide Soil Contamination in Washington	
Area-Wide Contamination Source	Estimated Land Area Affected ⁽³⁾
Smelters	
<i>Tacoma</i>	329,600 acres ⁽¹⁾
<i>Everett</i>	8,320 acres ^{(1) (2)}
<i>Harbor Island</i>	640 acres ⁽¹⁾
<i>Northport and Trail</i>	150,400 acres ^{(1) (2)}
Orchard Land	187,590 acres ⁽¹⁾
Leaded Gasoline	Unknown at present
All Area-Wide Sources	676,550 acres
⁽¹⁾ Extent of affected area has not been fully characterized. ⁽²⁾ Based on air modeling for the Everett smelter and maps of sulfur dioxide injury to vegetation for the Northport and Trail smelters. ⁽³⁾ The total area of land in Washington is 66,544 square miles, or about 42.6 million acres.	

Individual Property Evaluations

Because of the limitations of maps, an individual property assessment is the only way to know with certainty whether a property is affected by area-wide soil contamination. The Task Force believes that individual property evaluations are an important step for people to understand the potential for area-wide soil contamination where they live or work. These assessments are more important than locating a property on one of the maps discussed later in this report, because of the variability in the distribution of arsenic and lead and other limitations of mapping. To support individual property evaluations, the Task Force has created the following flowchart. Individuals who follow the flowchart and determine that there is a high probability of area-wide soil contamination at their property should implement individual protection measures and maintain good soil cover, and may want to consider soil testing, particularly if there is a high potential for exposure.

Figure 2: Individual Property Evaluation Flowchart



Maps of Potential Area-Wide Soil Contamination

To supplement individual property evaluations, the Task Force recommends use of maps. The Task Force discussed maps at length and considered many different individual maps and mapping options. From these deliberations a number of themes emerged:

- The locations of area-wide soil contamination cannot be precisely mapped. Individual property evaluations are the only way to know with certainty whether a property is affected by area-wide soil contamination.
- Maps are a useful communication device, and are an effective way to show where area-wide soil contamination is more or less probable so that individuals can make knowledgeable choices about whether to carry out individual property evaluations. However, care should be taken to avoid misinterpretation of maps.
- Because of the limitations of maps, the Task Force believes strongly that maps should always be accompanied by information that describes what the maps show and the limitations of data on which the maps were based.

The Task Force recommends two tiers of maps and accompanying information for smelter emissions and historical uses of lead arsenate pesticides:

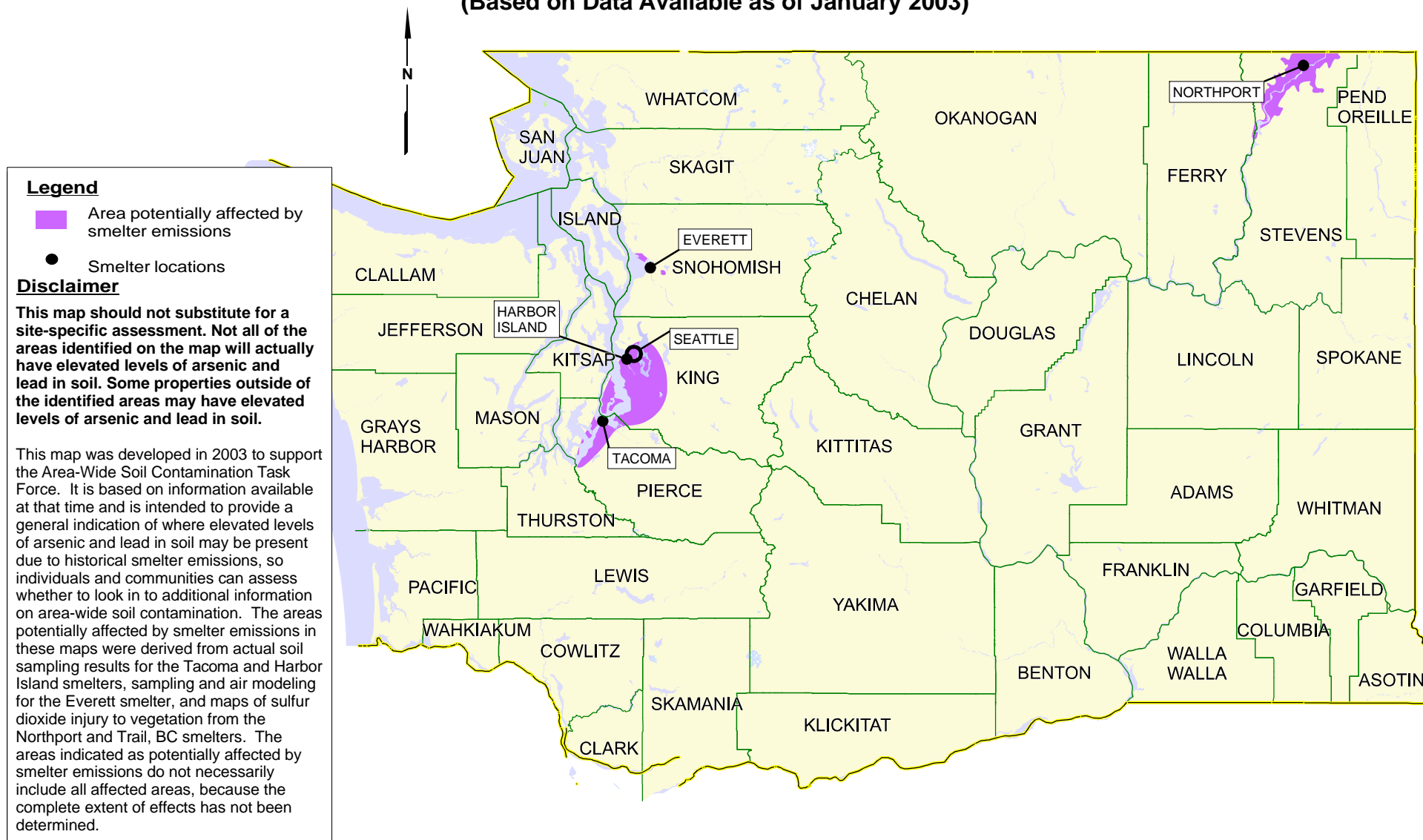
- Tier 1: The first tier of maps and accompanying information should identify the general areas in the state where elevated levels of arsenic and lead soil contamination are more likely to be present based on historical smelter emissions and historical use of lead arsenate pesticides. Information accompanying Tier 1 maps should emphasize that maps do not show areas that have been found to be contaminated, but simply show where contamination is more likely relative to other places. Tier 1 information should be designed to raise general awareness about area-wide soil contamination in the widest possible audience and to help users decide whether to look at the second tier of more detailed maps and informational tools for more information.
- Tier 2: The second tier of maps and accompanying information should identify where area-wide soil contamination is likely to be present on more detailed, smaller scale maps of smelter plumes and historical orchard areas, where these areas are known. Information accompanying Tier 2 maps should include flowcharts and/or other informational tools to help individuals determine whether arsenic and lead soil contamination is likely to be present based on the location and land-use history of individual properties and whether to implement individual protection measures or other responses, including soil sampling.

Examples of Tier 1 maps are included below (see Figures 3 and 4); examples of smaller scale Tier 2 maps are included in Appendix I. The Task Force emphasizes that the maps included in this report are only examples prepared to support Task Force deliberations. The example smelter emission maps are based largely upon ongoing mapping and sampling efforts associated with the Tacoma, Everett, and Harbor Island smelter cleanup actions. The smelter emission map for the Northport and Trail, BC smelters is based upon a historical study of the observed effects of sulfur dioxide emissions (another smelter emission contaminant released along with arsenic and lead) on vegetation. The example lead arsenate pesticide maps show estimates of the areas potentially affected by the use of lead arsenate pesticides based upon three different types of data sources: 1) the peak historical acreage in apple and pear tree production by county during 1905-47 (Figure 4), 2) a county-wide application of the land-use information in the individual property evaluation flowchart, and 3) locations of historical orchards identified based on aerial photographs from 1947.

It is important to reiterate that while maps show a greater or lesser probability of encountering elevated levels of arsenic and lead soil contamination based on proximity to historical sources, individual property evaluations are needed to confirm if elevated levels of arsenic and lead are actually present. Due to the variability of the nature and distribution of area-wide soil contamination, properties outside of areas identified on maps may contain elevated levels of arsenic and lead, while properties inside areas identified on maps may not, in fact, have elevated levels of arsenic and lead. The maps in this report include disclaimers to explain these limitations so that individuals are not given a false sense of assurance or concern about whether their property likely is affected by area-wide soil contamination.

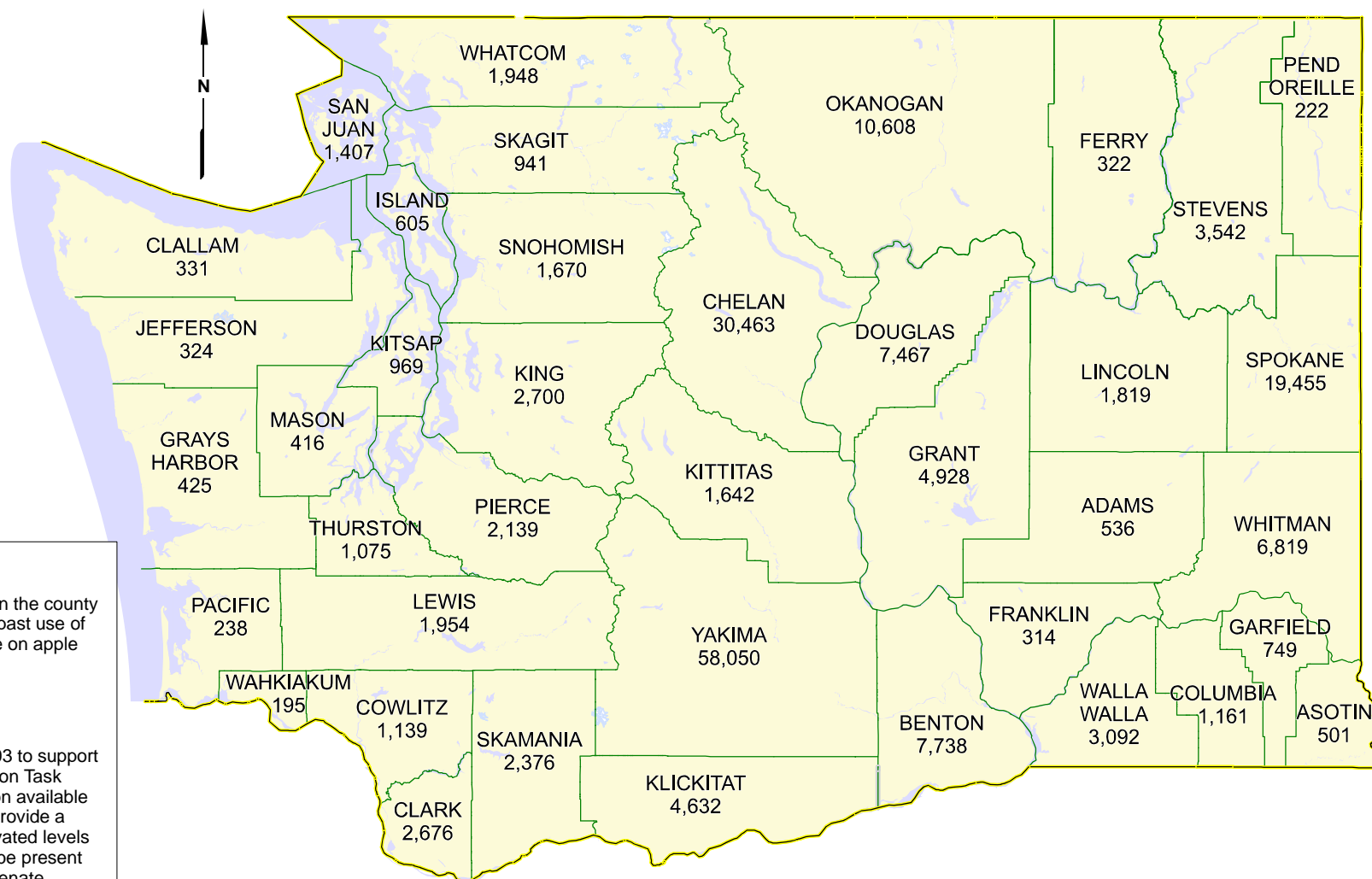
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**Figure 3: Estimate of Areas Potentially Affected by Historical Smelter Emissions
(Based on Data Available as of January 2003)**



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Figure 4: County Acreage Potentially Affected by Historical Use of Lead Arsenate Pesticide on Apple and Pear Orchards



Legend

1,948 Number of total acres in the county potentially affected by past use of lead arsenate pesticide on apple and pear orchards

Disclaimer

This map was developed in 2003 to support the Area-Wide Soil Contamination Task Force. It is based on information available at that time and is intended to provide a general indication of where elevated levels of arsenic and lead in soil may be present due to historical use of lead arsenate pesticides, so individuals and communities can assess whether to look in to additional information on area-wide soil contamination.

Recommendations for Improving Our Understanding of the Nature and Extent of Area-Wide Soil Contamination in Washington

The Task Force has two types of recommendations for improving understanding of the nature and extent of area-wide soil contamination: 1) recommendations that address developing and updating maps; and 2) recommendations for additional study of roadside lead contamination (discussed in Section 11).

Developing and Updating Maps

The Task Force has four recommendations for developing and updating maps of area-wide soil contamination areas:

- The maps produced to support Task Force deliberations (many of which were based on pre-existing maps developed to support ongoing cleanup efforts associated with the Tacoma and Everett smelters) represent an important investment and should be used as the starting point for further mapping efforts, including any use of maps to describe area-wide soil contamination zones, as discussed in Section 10 of this report. They are examples of the types of maps that the Task Force believes are needed to communicate information about potential locations of area-wide soil contamination.
- The Agencies should use their statewide GIS capability to maintain state maps of area-wide soil contamination areas and to update the maps based on newly available data from sampling on public properties, including public schools and parks, and other public data sources.
- The Agencies should encourage, support, and provide financial assistance to local governments that want to identify historical orchard locations and, if appropriate, develop smaller scale maps of areas potentially affected by lead arsenate pesticide contamination. Depending on available data sources and local needs, these smaller scale maps may show areas potentially affected by lead arsenate based on land-use information and/or may more specifically show historical orchard locations. The Task Force believes that accurate, smaller-scale maps of areas potentially affected by lead arsenate pesticide contamination would be useful, but that decisions about whether to undertake this mapping should remain with local governments.
- The Agencies should coordinate with local governments to maintain and update smaller-scale maps of areas potentially affected by historical smelter emissions and areas potentially affected by lead arsenate pesticides. These maps should be updated on a reasonable timetable based on newly available information from sampling on public properties, including public schools and parks, and other public data sources. Data from sampling on private properties may also be used to update maps, provided that the Agencies ensure that data from sampling at residences is not recorded at the level of individual properties, except in certain circumstances (see Section 8b).

Because the areas potentially affected by historical smelter emissions are already relatively well defined, the highest priority for funding efforts to refine understanding of the nature and extent of area-wide soil contamination should be to encourage, support, and provide financial assistance

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to local governments to identify historical orchard locations. In order to use financial resources most effectively, the Agencies should consider first providing “seed” money to local jurisdictions to research available data sources to determine the most appropriate means of identifying and mapping areas potentially affected by lead arsenate pesticide before providing full funding for map development. Financial resources should be made uniformly available to local governments that choose to develop maps.

One Task Force member questioned the benefit of updating maps of area-wide soil contamination in the future. This Task Force member thought than limited funds would be better used to help defray the cost of soil testing for private landowners. After participating in the process, this Task Force member chose not to sign the Task Force report because of concerns over funding future mapping projects and the potential economic impact of creating area-wide soil contamination zones.

6. Range of Protection Measures Considered and Evaluation of Protection Measures

Part of the charge to the Task Force was to consider the full range of protection measures that might be used to respond to area-wide soil contamination and to make recommendations about the most appropriate responses. To organize their discussions, the Task Force identified six categories of protection measures:

- **Education programs** refer to broad-based, community-wide efforts to inform individuals and businesses of the presence of contamination and changes in behavior that can be made to limit or reduce exposure to the contamination. Such programs use a wide range of techniques to distribute information and increase public awareness.
- **Public health programs** involve activities designed to identify and focus protection measures to prevent or reduce certain disease outcomes or exposure risks for communities. Targeted populations within a community considered to be at high risk often receive additional public health assistance. This often includes health monitoring activities (e.g., blood lead testing or urinary arsenic screening), one-on-one education on steps to reduce exposure, and intervention activities to reduce sources contributing to elevated exposures.
- **Individual protection measures** are simple, day-to-day things that individuals can do to limit or reduce exposure to soil contaminants. Examples include washing hands with soap and water frequently, removing shoes before entering homes, using gloves while gardening, scrubbing fruits and vegetables before eating them, wet mopping to clean surfaces indoors, and frequently bathing pets and washing toddler toys.
- **Land-use controls** are actions by government or private agreements that provide information on the presence of contamination on a property and/or that limit or prohibit activities that could result in exposure to contaminants. Examples include zoning, permits and licenses, covenants, easements, deed and plat notices, and real-estate disclosures.
- **Physical barriers** prevent or limit exposure to contaminated soil or unauthorized access to a property. Examples include fences, grass cover, wood chips, clean soil cover, geotextile fabric barriers (used under wood chips or clean soil cover), and pavement. Contaminated soil might be consolidated into a smaller area of a property and then covered with a physical barrier such as a parking lot, building, or landscape berm.

Protection Measures Considered

Education Programs: Public Meetings, Brochures and Newsletters, School-Based Programs, Posting No Trespassing Signs

Public Health Programs: Health Monitoring and Home Visits or One-on-One Intervention

Individual Protection Measures: Personal Hygiene Practices, Washing Garden Vegetables and Fruit, Reducing Dirt and Dust Inside the Home

Land Use Controls: Permits and Licenses, Deed and Plat Notices, Real Estate Disclosure Forms and Practices

Physical Barriers: Fencing, Vegetative Cover, Wood Chip Cover, Clean Soil Cover, Pavement

Contamination Reduction: Soil Blending/Tilling, Soil Removal and Replacement, Phytoremediation

- **Contamination reduction** involves reducing the concentration of contaminants in soil through activities such as soil blending or tilling or phytoremediation, or removing contaminated soil for disposal at another location.

The Task Force identified four criteria for evaluation of protection measures: effectiveness at limiting human exposure, effectiveness at limiting exposure of ecological receptors (plants, wildlife), cost, and practicality. To support Task Force deliberations, the contractor project team researched specific protection measures within each category and rated each protection measure according to the Task Force's criteria. Each protection measure considered was rated for three land-use scenarios: a 0.2-acre residential property, a 2-acre residential property, and a 20-acre undeveloped property. The results of this evaluation are summarized in Appendix J.

7. Broad-Based Education and Awareness-Building

The Task Force believes that in most cases decisions about responses to area-wide soil contamination should be made by the individuals who may be exposed to the contamination or, in the case of children, by parents or other caretakers. Broad-based education and awareness-building will give residents the information they need to make responsible choices about managing their potential exposure to arsenic and lead. These recommendations support and underlie the recommendations on responses in specific land-use scenarios discussed later in this report.

Recommendations

The Task Force has four recommendations with respect to broad-based education and awareness-building:

- The Agencies should work with and through local governments, particularly local health jurisdictions, to increase knowledge of area-wide soil contamination through a broad-based education and awareness-building campaign. The goal of broad-based education and awareness-building should be to provide individuals, organizations, and communities with the information and materials they need to make knowledgeable and responsible choices about responding to area-wide soil contamination.
- Education and awareness-building materials and activities should be carefully balanced to provide accurate information while at the same time avoiding creation of unnecessary concerns or other unintended consequences. To meet various needs and to target resources, a toolbox of information and materials is needed, and a step-wise approach to outreach should be taken.
- Education and awareness-building should focus on risks associated with exposure of children and of adults who have frequent contact with soil. The most important audiences for education and awareness-building are people and organizations that care for children, including parents, educators, health care providers and childcare providers, and gardeners and other adults who frequently work in soil.
- The Agencies should monitor and evaluate the success of education and awareness-building efforts.

The Task Force believes that broad-based education and awareness-building is an appropriate foundation recommendation for a number of reasons. First, this approach will give individuals the information necessary for them to make prudent and informed choices about the use of their property and what measures they might take to understand and respond to the potential for area-wide soil contamination. Second, an information-based approach creates the possibility for Ecology to use less intrusive methods for promoting protection of human health. Given the limited State resources that could be devoted in the short- and mid-term to more expensive, resource-intensive approaches to addressing area-wide soil contamination, the Task Force concluded that it may be more feasible for Ecology to focus now on promoting voluntary efforts

by property owners. The Task Force believes that the effectiveness of the education programs and individual protection measures will be enhanced by the step-wise approach recommended, so that education programs combined with programs encouraging practice of individual protection measures and maintenance of good soil cover are likely to be more effective than either program would be on its own. Finally, the Task Force emphasizes that, as recognized by the Agencies in initiating this project, currently there is no systematic statewide effort to address area-wide soil contamination, the majority of potentially affected properties are not being addressed, and there is no comprehensive plan to address them. In this context, any approach that systematically encourages individuals to understand area-wide soil contamination problems and provides them with the support and information necessary to make responsible choices about limiting exposure to arsenic and lead in soil is an improvement over the current situation.

A “Toolbox” of Information is Needed

The Agencies should develop a toolbox of information and materials to help individuals (e.g., parents) and organizations (e.g., schools) understand the potential for arsenic and lead contamination at specific properties and identify actions they can use to reduce their potential for exposure to arsenic and lead. At a minimum, this toolbox should include the following:

- Maps showing where area-wide soil contamination is most likely to be found. The Task Force recommends a specific approach to mapping, discussed in detail in Section 5 of this report.
- Materials that provide context for the maps and describe the variability of the nature and extent of area-wide soil contamination, so that individuals outside of areas identified on maps are not given a false sense of assurance that they cannot encounter elevated levels of arsenic and lead in soil and individuals inside areas identified on maps are not given a false sense of concern.
- Materials, including flow charts and checklists that describe how residents can use easily observable features of a property and readily available factual information to evaluate whether elevated levels of arsenic and lead in soil are likely to be present and whether exposure to soil is likely (see Figure 2 above and Table 2 below). This process is referred to as a “qualitative evaluation” and is discussed further in the child-use areas section of this report, which includes a specific qualitative evaluation checklist.
- Materials providing guidance on how to collect and analyze soil samples at typical types of properties (e.g., a residential yard) to determine if elevated levels of arsenic and lead in soil are present. Note that the Task Force does not assume or recommend that soil testing is necessary at each property potentially affected by area-wide soil contamination.
- Information on the health risks associated with exposure to low- to moderate-level arsenic and lead soil contamination, particularly the health risks associated with exposures of children and information on how parents can obtain blood lead level tests for their children.
- Materials, such as those developed by Public Health-Seattle & King County and the Tacoma-Pierce County Health Department, that encourage good personal hygiene practices and other individual protection measures, such as frequent hand washing with soap and water to reduce exposure to arsenic and lead in soil.

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- Materials, such as those developed by the Washington State University Cooperative Extension, that describe individual protection measures for gardening in soil that has elevated levels of arsenic and lead, such as thorough washing of vegetables to remove dirt particles before eating.
- Materials, such as those developed by the Snohomish Health District, that describe individual protection measures such as wearing gloves and not eating or drinking in contaminated areas for utility and other workers who may frequently come into contact with contaminated soil through their work.

Individual Protection Measures to Minimize Potential Exposure to Arsenic and Lead in Soil

(Based on Guidelines Developed by the Public Health—Seattle & King County, Tacoma-Pierce County Health Department, and Snohomish Health District)

Inside Your Home:

- Take off your shoes before entering your home.
- Wash hands and face thoroughly after working or playing in the soil, especially before eating or preparing food. Use water and soap to wash—avoid “waterless” soaps.
- Wash your hands after handling your pet, and bathe pets frequently.
- Wash toddler toys and pacifiers often.
- Wash clothes dirtied by contaminated soil separately from other clothes.
- Clean surfaces by wet mopping, spraying with water, or vacuuming with a HEPA filter. Don't sweep or blow the surface.
- Change air filters regularly and properly maintain your heating, ventilation, and air conditioning system.
- Maintain painted surfaces in homes. Homes built before 1978 may contain lead-based paint. When older paint flakes, it may become a source of lead.
- Minimize children's exposure to hobbies that use lead (e.g., in lead solder or paint).
- Eat a balanced diet. Iron and calcium help keep lead from becoming a problem in the body.

Outside Your Home:

- Keep children from playing in contaminated dirt.
- Do not eat or drink while working or playing in contaminated areas.
- Keep pets off of exposed dirt so they don't track it into the house.
- Fill any holes where dogs may be digging as soon they are noticed.

Special Considerations for Gardeners:

- Dampen dusty soils before gardening in soil.
- Wear gardening gloves.
- Keep vegetable gardens away from old painted structures and treated wood.
- Do not plant food crops under the roof overhang of your home.
- Scrub vegetables and fruits with soap and water before eating them.

Special Considerations for Adults Doing Construction or Yard Work:

- Avoid all unnecessary exposure to soil or dust.
- Dampen dusty soils before and during the work project.
- Wear clean, full body protective clothing (coveralls or long sleeve shirt and pants), shoes, and gloves. For maximum protection, wear a dust mask or other respiratory protection.

- Materials describing the range of additional protection measures that might be taken to respond to area-wide soil contamination to complement use of individual protection

measures, in particular materials that describe actions that can be taken to maintain good soil cover. This information should include guidance on how individuals or organizations may locate clean soil for use in gardens.

- Materials that identify organizations—such as local health jurisdictions, land-use planning offices, the National Lead Information Center, and regional offices of the Department of Ecology, the U.S. Department of Housing and Urban Development (HUD), and the Environmental Protection Agency (EPA)—and individuals that are available to answer questions and provide additional help in understanding and responding to area-wide soil contamination.

What are Additional Protection Measures?

Additional protection measures are actions that individuals or organizations can take to physically alter properties in a way that reduces the potential for people to come into contact with contaminated soil. Additional protection measures might include:

- Contain contaminated soil under paved surfaces, structures, or in landscaping berms.
- Remove and replace small amounts of contaminated soil, especially in children's play areas and gardens.
- Till or blend soils to reduce surface concentrations of arsenic and lead.

The Task Force has developed a toolbox on area-wide soil contamination for the Agencies to consider. This is attached as Appendix K.

In addition to materials for general use, targeted materials should be developed for individuals who care for children (e.g., parents, teachers, and child and health care providers), for adults who have a higher potential to come into contact with contaminated soil (e.g., gardeners and construction and utility workers), and for others who may play a role in implementing the Task Force's recommendations (e.g., real estate professionals). In particular, targeted materials for people who care for children should explain the health risks associated with exposures of children to arsenic and lead, how to use qualitative evaluations to determine the potential for children to be exposed to arsenic and lead in soil at a specific property, and, if potential exposures exist, how to mitigate exposures through good personal hygiene practices, other individual protection measures, and maintenance of good soil cover. Parents and others should be encouraged to consider not only the potential for exposure on their properties, but also the potential for exposure in other places where children play, including open land, and at construction and work sites in area-wide soil contamination areas. Materials developed for adults who work in soil—including utility, construction, and farm workers—

Targeted Audiences for Education and Outreach

Targeted materials should be developed for the following specific audiences:

- Parents of young children
- Childcare providers and preschool operators
- School officials and operations, maintenance and grounds keeping staff
- Park officials and operations, maintenance and grounds keeping staff
- Gardeners
- Real estate and financial professionals
- Construction, utility, and other workers who have routine contact with soil
- Health care providers
- Homebuilders associations
- Local planning and zoning officials
- Agricultural workers and landlords with farm

should incorporate existing requirements for protecting the health and safety of workers and their families.

The Task Force emphasizes that it is important for education and outreach materials to be written in a way that is balanced and makes the information easily understandable for people who may not be accustomed to evaluating issues associated with exposure to hazardous substances in soil. Materials should be made available in appropriate languages for the range of potentially affected communities. To be effective, materials must be targeted for specific audiences and must be accompanied by outreach and follow-up. Ongoing outreach is particularly important because it is likely that elevated levels of arsenic and lead in soil will remain at many properties for many years. Outreach will encourage people to remain attentive to area-wide soil contamination issues over time, and remind them to continue their practice of individual protection measures and maintaining good soil cover.

A Step-Wise Approach is Appropriate

To use resources effectively, the Agencies should take a step-wise approach to providing information about area-wide soil contamination, as follows:

Step 1: The Agencies should make basic, overview educational materials about area-wide soil contamination available to all Washington State residents. At a minimum, materials should be made available using the following means:

- Development and maintenance of an area-wide soil contamination website.
- Distribution to libraries and other public information repositories.
- Distribution to Ecology regional and field offices, local health departments, and to other locations where residents may go to seek information on environmental and health conditions.

Step 2: Where area-wide soil contamination is likely, the Agencies should supplement educational materials with outreach. Outreach should include routine briefings, trainings, and workshops for local health jurisdictions, planning and zoning agencies, operators of child-use areas, and other appropriate organizations to facilitate informed distribution of educational materials and ensure a solid understanding of health risks and exposure reduction measures. The Agencies should work with local governments and other organizations such as parent-teacher associations to develop strategies designed to ensure that educational materials reach target audiences. For example, a county planning department could distribute a fact sheet on minimizing exposure to arsenic and lead in soil as part of the building permitting process.

Where is Area-Wide Soil Contamination Likely?

Based on available data, area-wide soil contamination is likely to be found in portions of counties potentially affected by off-site smelter emissions, such as portions of King, Pierce, Snohomish, and Stevens counties, and areas where apple and pear trees historically were grown, such as portions of Chelan, Okanogan, Spokane, and Yakima counties.

Step 3: Where area-wide soil contamination is known to exist because of soil testing, the Agencies should provide additional outreach, education, and resources as described below in the discussions of specific land-use scenarios.

Monitoring and Evaluating Effectiveness

Finally, the Agencies should monitor and evaluate whether the area-wide soil contamination education program effectively changes behavior and encourages greater adoption of individual protection measures and other measures recommended by the Task Force to reduce the potential for exposure to arsenic and lead in soil. Information gathered during this monitoring and evaluation should be used to improve and update education and awareness-building materials and activities. Recent efforts to evaluate the effectiveness of area-wide soil contamination education programs in Pierce and King Counties have focused primarily on improving the content and format of educational materials such as posters and brochures, based on feedback from focus groups and written surveys. These studies have also gathered data on the extent to which residents report that they implement or would implement specific individual protection measures, such as taking off shoes before entering one's home. The Agencies should consider the lessons learned from these and other evaluation efforts as they design a statewide evaluation and develop the toolbox and other broad-based and targeted educational materials about area-wide soil contamination.

8. Recommendations for Specific Land-Use Scenarios

This section contains Task Force recommendations for actions that should be taken in specific land-use scenarios in places where area-wide soil contamination is likely. Additional actions are recommended in situations where the Task Force was particularly concerned about a specific population, such as children, or to take advantage of opportunities to leverage ongoing activities to implement more aggressive measures to reduce the potential for exposure to arsenic and lead in soil. The Task Force emphasizes that these activities are meant to build upon and complement—not replace—broad-based education and awareness-building.

8a. Child-Use Areas

The Task Force is particularly concerned about exposure of young children to arsenic and lead in soil. Children tend to have greater exposure than adults to soil and dust because they often play on the ground and tend to put things—such as hands, pacifiers, and toys—that may have soil on them into their mouths. Children are at greater risk than adults from lead because, when exposed, they absorb more lead than adults, and their rapidly developing nervous systems are more sensitive to lead damage. Parents already may be aware of the need to protect children from lead poisoning as a result of long-standing programs established to prevent children's exposure to residues from lead-based paint. Actions in other states or countries to address widespread soil contamination, as well as ongoing efforts to address area-wide soil contamination in Washington State, tend to prioritize activities that protect children. The Task Force felt a special responsibility to recommend actions that address the potential for children to be exposed to arsenic and lead in soil and spent much of its time considering recommendations for child-use areas.

What are Current Approaches for Child-Use Areas?

There are a number of ongoing projects to address area-wide soil contamination at child-use areas across Washington State, including projects associated with the cleanups of the Tacoma and Everett smelter sites and other affected properties, and projects at a number of schools and parks built on properties affected by past use of lead arsenate pesticides, including schools in Chelan and Okanogan counties and parks in Yakima. Current approaches often involve outreach to school officials to provide information and support for implementation of individual protection measures and maintenance of good soil cover, and systematic soil sampling at child-use areas, followed by selection and implementation of additional protection measures. The Agencies typically provide both technical and financial assistance for responses at child-use areas.

Types of Child-Use Areas and Prioritizing Activities at Publicly Maintained Areas

The Task Force considered a number of types of child-use areas: primary schools and their associated playgrounds and playfields; public playgrounds and playfields (such as those at parks); childcare facilities, including preschools and family home childcare facilities; and camps. The Task Force also distinguished between publicly maintained child-use areas, such as public schools and parks, and privately maintained areas, such as private schools, playgrounds, and childcare facilities.

In general, the Task Force believes that the same responses are appropriate at both public and private child-use areas and that over time potential exposure should be addressed at all child-use areas where area-wide soil contamination is likely. However, the Task Force also recognizes that it may not be practical to address all child-use areas immediately. Accordingly, the Task Force recommends that publicly maintained child-use areas should be prioritized and responses in these areas should set the standard for protection of children.

Recommendations

In addition to the education and awareness-building discussed earlier in this report, the Task Force recommends five responses for child-use areas where area-wide soil contamination is likely:

- Individual protection measures and maintenance of good soil cover in areas where children play to reduce the potential for children to be exposed to contaminated soil.
- Qualitative evaluations to increase understanding of where exposure could occur and to focus implementation of soil testing and additional protection measures.
- Soil testing where qualitative evaluations indicate the potential for exposure to contaminated soil and implementation of additional protection measures if contamination is found.
- Mandatory soil testing at new public child-use area construction sites and implementation of additional protection measures if contamination is found.
- Special approaches, including targeted outreach and a voluntary certification program, for family home childcare facilities and childcare centers.

Individual Protection Measures and Good Soil Cover

The first step to minimize the potential for children to be exposed to elevated levels of arsenic and lead in soil should be implementation of individual protection measures and maintenance of good soil cover in areas where children play. The Task Force emphasizes that it is not necessary to confirm that elevated levels of arsenic and lead are present in soil before implementing individual protection measures and providing for good soil cover. Rather, where area-wide soil contamination is likely, the Task Force strongly recommends that these measures be instituted immediately unless 1) qualitative property evaluations indicate that elevated soil levels of arsenic

What Does It Mean for the Agencies to Provide Support, Encouragement, and Assistance to Local Jurisdictions?

Local governments, such as health districts and school districts, often will play a key part in implementing Task Force recommendations. In many places in this report the Task Force advises the Agencies to provide “support, encouragement, and assistance” to local jurisdictions. Besides financial support—the need for which the Task Force expects will be widespread—the Task Force has not attempted to precisely define what “support, encouragement, and assistance” might involve. The Task Force emphasizes that the first step is for the Agencies to reach out to local jurisdictions in areas where area-wide soil contamination is likely to provide information on the issue and the Task Force recommendations, and to ask what types of assistance and support the local jurisdiction might need.

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and lead are not likely or it is unlikely that children could be exposed to soil, or 2) quantitative soil testing shows that elevated levels of arsenic and lead in soil are not present.

The Task Force believes this is a reasonable approach primarily for two reasons. First, as discussed above, children are the population most vulnerable to adverse health effects from soil contamination, particularly from exposure to lead. Second, implementing individual protection measures and providing for good soil cover in play areas are, to a great extent, consistent with the types of personal hygiene practices and routine maintenance activities that should already be in place at schools, parks, childcare facilities, and other child-use areas.

The Task Force recommends that the Agencies work with local health jurisdictions to support, encourage, and assist with implementation of individual protection measures. This may include providing training, briefings, or other assistance or materials to local health jurisdictions. In addition, the Agencies should work with local jurisdictions and other organizations, such as the Washington Association of Maintenance and Operations Administrators, to support, encourage, and assist with activities that maintain good soil cover and to integrate these activities into ongoing landscaping and maintenance practices. This may include providing training or information on the relative effectiveness of various soil covers and methods to maintain effective soil cover. Grass, for example, may not be an effective cover for contaminated soil on an athletic field or other child-use area if it is not properly maintained.

Qualitative Evaluations of Potential Exposure

The Task Force strongly encourages property owners/managers of other child-use areas to carry out qualitative evaluations of the potential for exposure to arsenic and lead in soil in places routinely used by children. Qualitative evaluations should use easily identifiable factors (such as elevation at properties potentially affected by historical use of lead arsenate pesticides) to determine if elevated levels of arsenic and lead in soil are likely, and easily observable features (such as the presence or absence of bare dirt) to identify situations when there is the greatest potential for exposure. Qualitative evaluations should help identify situations where there is or could be direct, frequent contact with contaminated soil over a period of months. The Task Force recommends that the following checklist be used to carry out qualitative evaluations.

Table 2: Qualitative Evaluation Checklist for Understanding Potential Exposures to Arsenic and Lead in Soil	
<i>Please visit and walk around the site, preferably during daylight hours, before answering these questions.</i>	
Q1. <i>Is the property near a historical smelter location in Pierce, King, Snohomish, or Stevens counties?</i>	If YES or UNSURE, go to Q4. If NO, go to Q2.
Q2. <i>Were lead arsenate pesticides used on the property historically (e.g., on apple or pear trees)?</i>	If YES or LIKELY, go to Q4. If NO, go to Q3.
Q3. <i>Are portions of the property within 25 feet of a road built before 1995?</i>	If YES or UNSURE, go to Q4. If NO, elevated levels of arsenic and lead are not likely to be present in soil.

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Table 2: Qualitative Evaluation Checklist for Understanding Potential Exposures to Arsenic and Lead in Soil	
Q4: Do children routinely play in this area?	<p>If YES or UNSURE, go to Q7.</p> <p>If NO, go to Q5.</p>
Q5: Do people spend a lot of time in this area (e.g., while gardening)?	<p>If YES or UNSURE, go to Q7.</p> <p>If NO, go to Q6.</p>
Q6: Are there frequently used, unpaved paths or trails through this area?	<p>If YES or UNSURE, go to Q7.</p> <p>If NO, potential exposure to elevated levels of lead and arsenic in soil is less likely.</p>
Q7: Is there any exposed dirt in play and high-use/traffic areas (e.g., swing sets, gardens, sports fields, lawns, and paths)? Note: Asphalt, wood chips, grass cover, or other natural/synthetic barriers may help limit potential exposure to contaminated soil. The Consumer Product Safety Commission recommends that surfaces around playground equipment have at least 5-12 inches of wood chips, mulch, sand, or pea gravel, or are covered with mats made of safety-tested rubber or rubber-like materials.	<p>If YES or UNSURE, there may be a higher potential for exposure to contaminated soils. Use individual protection measures to minimize potential exposure and determine whether to test soils.</p> <p>If NO, go to Q8.</p>
Q8: Would you expect soils to be exposed at any time during the year (e.g., due to seasonal sports or other activities)?	<p>If YES, there may be a higher potential for exposure to contaminated soils. Use individual protection measures to minimize potential exposure and determine whether to test soils.</p> <p>If UNSURE, check with the landowner or organization responsible for maintaining the property to see whether a maintenance program is in place to ensure that play and high-use/traffic areas remain thoroughly covered year round.</p> <p>If NO, the potential for exposure to contaminated soils is less likely.</p>

Soil Testing and Implementation of Additional Protection Measures

Where qualitative evaluations indicate that children may be routinely exposed to contaminated soil, the Task Force recommends that property owners/managers of child-use areas conduct soil sampling to determine if elevated levels of arsenic and lead are actually present. Guidance on how to carry out soil sampling is part of the toolbox of information discussed in Section 7 of this report and included in Appendix K.

Where soil sampling results indicate that elevated levels of arsenic or lead are present, property owners/managers of child-use areas should implement additional protection measures to reduce the potential for children to come into contact with contaminated soil. Additional protection measures to reduce potential exposure could include: installing protective barriers such as geotextile fabric between contaminated soil and the overlying protective cover; removing and replacing small amounts of contaminated soil; or consolidating and containing contaminated soil under buildings, paved surfaces, or landscaping berms. The Agencies should assist local jurisdictions, other organizations, and individuals to select and implement additional appropriate protection measures where soil contamination is found.

In addition, the Agencies should work with school districts, park agencies, and other appropriate organizations to facilitate understanding of area-wide soil contamination and to prioritize response actions at schools, parks, and other child-use areas. In particular, parents of young children should be kept informed during all stages of assessment and cleanup processes through Parent-Teacher Association meetings, school newsletters, community events, and other appropriate means. As with the broad-based education and awareness-building materials described earlier in this report, outreach activities should balance the need for accurate and complete information with the need to avoid unnecessarily frightening parents and other audiences, or creating unintended consequences or overreactions.

Finally, the Agencies should work with local jurisdictions to continue collection of soil data at public child-use areas where area-wide soil contamination is likely, to better understand the extent of area-wide soil contamination and the potential for children to be exposed.

Special Considerations for Playgrounds and Playfields

The Task Force believes children have a high potential to come into contact with contaminated soil at playgrounds and playfields. By the nature of their use, playgrounds and playfields often have areas of bare dirt to which children could be exposed. Because these areas are typically publicly owned and operated, the Task Force believes there is a special responsibility to ensure that children who use these areas are protected.

The *Handbook for Public Playground Safety* published by the U.S. Consumer Product Safety Commission (CPSC) contains guidelines for maintaining children's safety in public playgrounds. It recommends that wood chips, mulch, sand, gravel, or shredded tires be installed and maintained to a depth of at least 5-12 inches (depending on the surfacing material selected) under playground equipment. The *Health and Safety Guide for K-12 Schools in Washington*, published by the Office of Superintendent of Public Instruction (OSPI) and the Department of Health, recommends that all playground equipment at primary and secondary schools in Washington conform to CPSC's playground safety standards.

The Task Force recommends that the CPSC surface material guidelines be fully implemented at existing playgrounds at parks, schools, private camps, and childcare facilities. In areas where area-wide soil contamination is likely, the Task Force recommends that a geotextile fabric barrier (such as landscaping fabric or weed block) be incorporated below the surfacing material under play equipment to further limit the potential for contact with soil. For other play areas, such as sports fields, the Task Force recommends that efforts be made to minimize the potential for children to come into contact with contaminated soil, by maintaining good year-round grass cover and ensuring clean soil in areas of bare dirt, such as baseball field baselines. Sports fields primarily used by adults and older children may not need the same types of actions to reduce exposure because, in general, exposure is expected to decrease with age.

Soil Testing and Additional Protection Measures at New Child-Use Areas

Construction of new child-use areas, such as schools and playgrounds commonly involves earth-moving activities. These activities create important opportunities to address area-wide soil contamination. Incorporating soil sampling into the site selection and design process for new construction allows officials to modify construction plans to incorporate cost-effective, practical,

and effective measures to reduce the potential for exposure of children, and this may be more efficient than retrofitting existing child-use areas.

Where area-wide soil contamination is likely, the Task Force recommends that officials (e.g., school district superintendents or park managers) be required to test soils at proposed child-use sites during the site selection and design process. This is especially relevant at publicly funded child-use areas. Where soil sampling shows that elevated soil levels of arsenic and lead are present, officials should incorporate protection measures into construction plans and budgets. Protection measures might include installing a geotextile fabric barrier and surfacing material such as wood chips, mulch, or grass cover in play areas; removing and replacing small amounts of contaminated soil; consolidating and containing contaminated soil under buildings, paved surfaces, or landscaping berms; or other activities.

At school sites, the Agencies should work with local health jurisdictions and with OSPI to assist school officials to interpret sampling results and to select appropriate protection measures. Local health inspectors should confirm during regular site visits that appropriate responses have been implemented. The Agencies should assist local health jurisdictions with these inspections.

Targeted Outreach and Voluntary Certification Programs for Childcare Providers

Many children spend significant amounts of time in commercial or family home childcare settings. This is particularly true for children who have not yet reached school age and who may be particularly vulnerable to exposures to arsenic and lead. Where area-wide soil contamination is likely, the Agencies should collaborate with DSHS and local health districts to work with childcare providers to give them information about area-wide soil contamination and encourage them to take actions to reduce the potential for children to be exposed to arsenic and lead. The Agencies should also collaborate with DSHS to establish a voluntary certification process that childcare providers can use to communicate that they have taken precautions to reduce the potential for children to be exposed to area-wide soil contamination or have verified through sampling that elevated soil levels of arsenic and lead are not present.

The Task Force recommends that targeted outreach to childcare centers and family homes should be integrated into and build upon existing processes that provide for the health and safety of children, including regular inspections of childcare facilities by DSHS and local health jurisdictions and the DSHS licensing process. In particular, the Task Force recommends that training on how to identify and minimize potential exposure to area-wide soil contamination using individual protection measures, good soil cover, and other protection measures be incorporated into the existing State Training and Registry System (STARS) childcare training program and/or other annual training requirements for childcare providers.

The goals of the voluntary childcare certification program should be to: 1) create a mechanism to raise awareness of area-wide soil contamination issues among childcare providers, 2) provide parents and other caretakers with information about how individual businesses have chosen to address area-wide soil contamination issues, and 3) assist parents to make informed choices about in which childcare facility to place their children. The Task Force recommends a three-step education and certification process:

- Step 1: Childcare operators receive and review information prepared by the Agencies and/or complete training (through the existing STARS childcare training program and/or other annual training) on how to identify and minimize potential exposure using individual protection measures, good soil cover, and other protection measures.
- Step 2: Childcare operators conduct qualitative assessments and/or contact local health districts to help them identify and take steps to minimize children's potential exposure to arsenic and lead in soil.
- Step 3: Childcare operators certify that soils have been tested using approved soil sampling protocols and have been found not to contain elevated levels of arsenic and lead or that the recommended protection measures have been implemented.

Upon completion of Step 3, the childcare operator can request that DSHS issue a letter recognizing that the childcare operator has certified the steps that have been taken at the facility to minimize children's potential exposure to lead and arsenic. To encourage further adoption (and maintenance) of the actions and measures the Task Force is recommending, DSHS childcare inspectors and local health jurisdictions should review information about which childcare facilities have self-certified in order to tailor outreach, education, and other discussions during regular facility inspections. DSHS should also function as a clearinghouse for information on which childcare facilities have participated in the voluntary certification program and should make this information publicly available.

The Task Force emphasizes that education and the opportunity for voluntary certification should be made available to all childcare providers, not just those who are covered by current licensing requirements. To minimize disruption at licensed facilities, certifications should be timed to renew and expire in conjunction with the childcare licensing cycle (i.e., every three years). If the soil at a childcare facility has been tested and found not to contain elevated levels of arsenic and lead, the certification should be permanent and not need to be renewed.

The Task Force acknowledges that many childcare facilities, particularly those not covered by current licensing requirements, may have significant resource limitations and may be difficult to locate and reach. One potential benefit of broad-based education and awareness-building is that it can create momentum for evaluating and responding to area-wide soil contamination issues within the childcare market, by creating increased demand on the part of parents for childcare facilities that have taken steps to understand and, when necessary, respond to area-wide soil contamination. The Agencies should consider the differences between types of childcare facilities in collaborating with DSHS and local health jurisdictions to develop education and outreach strategies, and should make financial resources available to childcare providers to support responses to area-wide soil contamination.

8b. Residential Properties

The Task Force is concerned about the number of properties potentially affected by area-wide soil contamination and the practicality and cost of implementing protection measures at residential properties. At the same time, the Task Force recognizes that most residential properties are, essentially, child-use areas and that both children and adults are most likely to

come into regular contact with soil at home, through play, gardening, and other activities. However, the Task Force also recognizes that residents can choose whether and how to implement protection measures at their properties to address low-to-moderate levels of soil contamination. Therefore, the Task Force emphasizes that the Agencies should focus on helping residents to understand the potential for elevated levels of arsenic and lead in soil at individual properties and take appropriate response actions. With these considerations in mind, the Task Force decided that responses to area-wide soil contamination at residential properties should be similar to, and no more stringent than, the approaches described above for child-use areas and that particular attention should be paid to three populations: children, gardeners, and other adults who frequently work in soil.

Recommendations

In addition to broad-based education and awareness-building to increase residents' knowledge about area-wide soil contamination, the Task Force recommends that the Agencies:

- Offer both technical and financial assistance to support and encourage residents potentially affected by area-wide soil contamination to:
 - Implement individual protection measures and maintain good soil cover in areas where children play to reduce the potential for exposure to contaminated soil.
 - Conduct qualitative evaluations to increase understanding of where exposure could occur and to focus implementation of soil testing and additional protection measures.
 - Conduct soil testing where qualitative evaluations indicate there is potential for exposure to contaminated soil and implement additional protection measures if contamination is found.
- Provide information on where and how to dispose of contaminated soil that individuals choose to remove from their properties and help residents locate sources of soil that meets the MTCA cleanup standards for arsenic and lead.

The Task Force emphasizes that these are not recommendations for creating new regulatory requirements for residential properties or residents. The Agencies should focus on providing incentives for residents to implement Task Force recommendations and supporting residents who choose to implement recommended activities through education, outreach, and financial assistance.

Individual Protection Measures and Good Soil Cover

As with child-use areas, at residential properties the first step in taking action to minimize the potential for children and adults to come into contact with contaminated soil is to practice individual protection measures and to maintain good soil cover. It is not necessary to confirm that elevated levels of arsenic and lead are present in soil before taking these actions. Rather, where area-wide soil contamination is likely, the Task Force recommends that all residents follow individual protection measures and maintain good soil cover unless 1) qualitative property evaluations indicate that elevated soil levels of lead and arsenic are not likely or exposure to soil

is not likely, or 2) quantitative soil testing shows that elevated soil levels of arsenic and lead are not present.

Qualitative Evaluations

Residents of properties affected by area-wide soil contamination should carry out qualitative evaluations to determine the potential for their property to have elevated levels of arsenic and lead in soil and the potential for exposure to contaminated soil. Qualitative evaluations should use easily identifiable features (such as property elevation in areas potentially affected by historical use of lead arsenate pesticides) to determine if elevated soil levels of arsenic and lead are likely and easily observable features (such as the presence or absence of bare dirt) to determine if exposure to contaminated soil is likely. A qualitative evaluation checklist is included in Section 8a, above.

Soil Testing and Additional Protection Measures

Where qualitative evaluations show that elevated levels of arsenic and lead in soil and/or exposures to contaminated soil are likely, residents should consider soil sampling. Soil sampling will provide a basis for residents' decisions about what steps, if any, beyond implementation of individual protection measures and maintenance of good soil cover should be taken to reduce potential exposures. It may also help confirm the absence of elevated levels of arsenic and lead, thereby obviating the need for other responses. Guidance on how to carry out soil sampling is included in the toolbox of information discussed in Section 7 of this report and included in Appendix K.

The Agencies should provide incentives and opportunities for individuals who choose to sample soils on their properties. Specifically, the Agencies should work with local health jurisdictions to provide do-it-yourself sampling kits to residents upon request. These kits should include instructions on how to collect soil samples, tools for collecting samples, clear explanations of why the sampling procedures should be followed, and instructions on how to have soil samples analyzed. Furthermore, the Agencies should establish a mechanism to subsidize the costs of sampling at residential properties in area-wide soil contamination areas so that residents only need to pay, at most, nominal fees for soil analysis. Fees should be comparable to the costs to residents of other environmental monitoring programs, such as water quality testing. The Agencies could, for example, make X-ray fluorescence (XRF) machines available routinely throughout the year at easily accessible locations and charge residents only minimal fees for the on-site soil analysis. As an alternative, or to supplement use of XRF machines, the Agencies could provide vouchers to residents for reduced or low-cost analysis of soil samples at independent laboratories.

Finally, the Agencies should work with local health jurisdictions to assist property owners to interpret soil testing results and select any appropriate protection measures. The Agencies should provide the appropriate context for sampling results so that residents understand the potential health risks from exposure to contaminated soils without becoming unduly alarmed.

Confidentiality and Reporting of Sampling Results

To protect the privacy of residents who choose to take advantage of soil sampling opportunities, data from soil testing conducted by individuals for their own use should be kept confidential and

should not be associated with specific property locations in Agencies' records (i.e., residents' names and addresses should not be recorded in writing), unless 1) individuals volunteer to have the data used to update maps of area-wide soil contamination, 2) they request a No Further Action letter for the property from Ecology, or 3) the sampling results reflect concentrations that are not associated with area-wide soil contamination (i.e., that are not low-to-moderate).

The Agencies' assistance with the interpretation of sampling results should be provided in ways that prevent property-specific data from becoming public. This is not the case for public and public-use properties such as public child-use areas, where the Agencies have the responsibility to educate parents and others about any contamination that is present.

Real Estate Disclosure Requirements

Regardless of how the Agencies track and record sampling data, individual property owners who have information about the presence of elevated levels of arsenic, lead, or other contaminants on a property are required under existing real estate disclosure laws to disclose this information to buyers during real estate transactions.

If it is necessary for the Agencies to include information on sampling results from private residences in their records to provide financial and technical assistance, or as a way to provide for information that might be used to make maps of locations of potential area-wide soil contamination more precise, these data should be recorded only at the section, township, and range level. This level of detail should allow the Agencies to update area-wide soil contamination maps and help further target outreach activities and financial resources, while protecting the privacy of residents who choose to test soil on their properties.

Support for Additional Protection Measures Individuals Choose to Implement

Where soil sampling results indicate that elevated levels of arsenic or lead are present, residents should be encouraged to consider implementing additional protection measures to further reduce the potential for exposure to contaminated soil. In some instances, individuals may choose to take additional actions to further contain or remove contaminated soil. Additional protection measures might include installing protective barriers such as geotextile fabric (e.g., weed cloth) between soil and landscaping materials, particularly in areas where children play. Alternatively, additional protection measures might include replacing contaminated soil with clean soil in gardening areas or filling raised garden beds with clean soil.

The Agencies should support individuals who choose to implement additional protection measures by providing guidance on affordable, effective, and practical solutions for covering contaminated soils, removing and replacing small quantities of soil, and other appropriate activities. The Agencies should also provide information on where and how to dispose of contaminated soil that individuals choose to remove from their properties.

To support individuals who choose to replace small quantities of contaminated soil with clean soil, the Agencies should look for ways to help residents locate sources of soil that meet the MTCA cleanup standards for arsenic and lead by identifying soil suppliers or other means. Residents may also choose to test fill soils to determine whether it is suitable for its intended use.

8c. Commercial Areas

As discussed above, the Task Force is most concerned about exposure of children to arsenic and lead in soil. In general, commercial areas are not frequently used for play by children and tend to be covered with impervious surfaces such as buildings, parking lots, or other man-made and maintained cover, such as landscaping bark or gravel.

Recommendations

For commercial areas affected by area-wide soil contamination, the Task Force recommends:

- Where commercial areas are covered with surfaces such as buildings, parking lots, or other effective soil cover, the Task Force recommends that no further response actions are necessary to address area-wide soil contamination.
- For mixed-use areas, such as a childcare facility located in a shopping center, the Task Force recommendations for non-commercial use should be considered for the non-commercial operation. In other words, in this example, the child-use area recommendations should be considered for a childcare facility located in a largely commercial area.

8d. Open Land

Open land includes undeveloped properties, agricultural land that is no longer in production, and other developed properties that are currently vacant or abandoned. Agricultural land that is intended to be returned to active production within regular growing cycles (e.g., fallow land in dry-land wheat growing areas) is not considered open land and is not addressed by these recommendations. The Task Force considered two categories of open land: open land that is being developed and open land that is not proposed for development. Although there is the potential for both human health and ecological impacts from area-wide soil contamination at open land, this section only addresses risks from human exposure. Ecological concerns are discussed in Section 11 below.

Recommendations

In addition to broad-based education and awareness-building, the Task Force recommends that the Agencies support and encourage the following activities for open land in areas where area-wide soil contamination is likely.

- Amending the State Environmental Policy Act (SEPA) checklist to include a question designed to prompt consideration of the potential for area-wide soil contamination during new development.
- For open land being developed, qualitative evaluations to increase understanding of whether area-wide soil contamination is likely, soil testing before construction where

area-wide soil contamination is likely, and implementing additional protection measures if contamination is found.

- Use of plat or other notices to record information on property status.
- For open land being developed, implementation of existing requirements and policies governing worker protection and safety, and control of dust, erosion, and surface water runoff during construction.
- For open land not being developed that is in or near residential areas, use of practical, cost-effective measures to limit trespassing, the potential for exposure to contaminated soil, and windblown dust.

Open Land Being Developed into Other Land Uses

In general, the Task Force believes that responses to area-wide soil contamination at open land being developed should be consistent with the responses the Task Force recommends for the end land use, since the end land use most affects the potential for exposure. For example, the recommended responses described in Section 8a above for child-use areas are appropriate to consider when open land is being developed into schools, parks, childcare facilities, or other child-use areas. Because development activities generally include manipulation of the soil and grade at a site, new development also may offer opportunities to implement certain protection measures more easily and for less cost than at developed properties. Additional precautions are also warranted to prevent or reduce exposure of people who live near or work at construction sites and may be exposed to contaminated soil (including windblown dust) during construction activities.

The Task Force believes that the most appropriate way to address potential exposures during and after development is to integrate responses to area-wide soil contamination into the land-use review and development process. The Task Force recommendations include a series of actions that developers, construction workers, and property owners should take to reduce potential exposure and recommendations for how to work with existing land-use planning and permitting processes to encourage implementation of the recommendations.

Recommended Activities for Developers, Construction Workers, and Property Owners

The Task Force recommends that developers conduct qualitative evaluations of properties and, where warranted, carry out soil testing prior to construction. Depending on the results of these evaluations, developers should incorporate appropriate additional protection measures into site development and construction plans to reduce the potential for exposure to area-wide soil contamination after properties are developed. Developers, for example, could take advantage of the opportunities construction activities provide to contain and cap contaminated soil under roads, structures, or landscaping berms. Other options that might be considered include tilling or blending soils to reduce surface concentrations of arsenic and lead, installing protective barriers and good soil cover, and removing and replacing small quantities of soil, all of which are more cost effective if implemented during rather than after properties have been developed. In general, as indicated in the Task Force's principles, the level of effectiveness and permanence of the responses should be greatest for proposed land uses where there is the greatest potential for

exposure of children, gardeners, and other adults who have frequent contact with soil. The Agencies should set an example for private developers by adopting these practices for their construction projects.

During construction, the Task Force recommends that construction workers implement individual protection measures to reduce their potential for exposure to contaminated soil, consistent with U.S. Occupational Safety & Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) requirements. Moreover, as a precautionary measure, the heightened awareness and safety precautions required for construction at properties where hazardous substances are known to be present should also be applied at properties where area-wide soil contamination is likely, unless soil sampling shows that elevated levels of contaminants are not present. Finally, the Agencies should work with State and local air and other authorities to ensure that regulations to control dust, erosion, and run-off during construction are implemented and enforced to minimize potential exposure at and near construction sites.

Large Construction Sites

The Task Force received a number of comments from individuals concerned about proper transportation and disposal of contaminated soil during construction projects and the potential for windblown dust during construction, particularly at large construction sites. The Task Force is sympathetic to these concerns and believes that existing regulations should be fully implemented and enforced to ensure safe management of soil with elevated levels of arsenic and lead and to control windblown dust.

Encouraging Implementation of the Task Force Recommendations for New Development

To encourage implementation of the Task Force recommendations, the Task Force recommends that the Agencies educate people who work on SEPA issues in local government, as well as other local planning and permitting officials, about area-wide soil contamination and how to respond appropriately to it. The Task Force believes that local land-use planning and permitting processes represent an important opportunity to educate developers about the Task Force recommendations and assist developers with implementation of recommended activities. Local planning and permitting officials should be provided with educational materials to distribute to developers, property owners, and others early in the site development process. Materials should provide guidance on qualitative evaluations, soil sampling, and how to select and implement protection measures.

Furthermore, the Task Force recommends that the SEPA checklist, which is used to determine whether government actions require an environmental impact statement, be modified to incorporate a question about whether the property is likely affected by area-wide soil contamination. For construction activities that are exempt from SEPA requirements, such as the construction of fewer than four single-family homes, the Agencies should work with local governments to leverage appropriate land-use or building processes to reach these development activities. The Task Force also encourages local jurisdictions to use plat or other notices to record information on the status of properties where area-wide soil contamination is likely, as part of the land-use approval and development process. Notices should, for example, record whether contamination is likely to be present, whether a property has been sampled, and/or whether protection measures are in place.

Specific Protocols for Addressing Area-Wide Soil Contamination

During the focus group meetings about the preliminary Task Force recommendations, a number of officials from local building and planning departments emphasized their need for clear, standard protocols for addressing area-wide soil contamination. The officials agreed that they were often in the best position to work with land developers and builders to address area-wide soil contamination, but explained that they were not, and were not likely to become, experts on qualitative evaluations, soil testing, or protective measures. Officials mentioned general permits under the Clean Water Act as an example of a successful standard protocol. Standard protocols (guidance) for qualitative evaluations and soil testing are included in the Task Force's recommended "toolbox." The Task Force supports standard protocols, but recognizes that in many cases it will be difficult to standardize selection and implementation of protective measures, due to the site-specific nature of these decisions. The Task Force recommends that Ecology work with local building and planning departments to continue to explore the concept of standard protocols, with a view toward providing as much certainty and predictability as possible to local planning officials, builders, and developers.

Open Land Not Proposed for Development

At open land not proposed for development that is *not* in or near residential areas, the potential for exposure to area-wide soil contamination is generally low, because these areas are not likely to be frequented by children or other sensitive populations. The Task Force believes that broad-based education and awareness-building activities should be sufficient to address potential health risks from human exposure to area-wide soil contamination in these areas.

For open land not proposed for development that *is* in or near residential areas, children could be exposed to area-wide soil contamination if they play or trespass on this land. The Task Force recommends that the Agencies encourage property owners to take practical steps to limit trespassing on their properties, such as posting signs at open lots in residential areas. Concerned parents should take steps to ensure that their children do not trespass on open lands. Where appropriate, property owners might also consider taking practical, cost-effective steps to limit the potential for soil exposure and windblown dust, such as keeping open land covered with grass, hay, or other vegetation.

8e. Root Vegetables

Some root vegetables have the potential to take up lead from the soil. Lead concentrations exceeding the U.S. Food and Drug Administration's in-house level of concern for lead in processed foods were found in a shipment of Washington root vegetables in 1998. That shipment was traced back to one commercial crop of carrots that had been grown on a former orchard site. The Northwest Food Processors Association (NWFPFA) developed an internal task force to review and assess the scientific data and develop recommendations to address any possible future sources of contamination for root vegetables. Nearly all commercial food processors in Washington are associated with this organization. The Food and Drug Administration, through its Market Basket program, also continues to test foods marketed locally and nationally.

The NWFPA published Interim Recommendations (since finalized) on February 17, 1999 to inform commercial growers and processors about the possibility of risk from lead uptake when root vegetables are planted on old orchard sites. A copy of this advisory bulletin is included in Appendix L. The Task Force considered this voluntary, privately initiated effort and views it as a potential model for using private-sector efforts to prevent possible human exposure problems from arising. However, the Task Force did not have further information on the results of the voluntary action or additional Market Basket testing results. Accordingly, the Task Force recommends a survey to determine the effectiveness of the NWFPA advisory program, with an eye toward possibly using it as a model for similar programs in the future. The Task Force recommends that the Washington State Department of Agriculture (WSDA) request from NWFPA an analysis of the NWFPA voluntary program regarding its effectiveness in preventing human exposure to heavy metals in root crops.

The NWFPA bulletin, however, was distributed only to commercial processors. It is unlikely, due to the membership of the NWFPA, to have been distributed to home gardeners or local farmer's market growers whose properties may have become affected by area-wide soil contamination. The Task Force believes that home gardeners and local farmer's market growers may want to take precautions to avoid similar uptake problems. Information about protective measures—which may include testing soil, replacing soil, growing crops on raised beds with clean soil, using compost or manure to dilute concentrations, and other actions—should be developed and distributed to growers to help prevent consumption of root crops with elevated concentrations of lead and arsenic. Such information already is available from the Washington State University Extension Service, WSDA, or other agencies, and distribution of such information should be coordinated, wherever possible, with the other information distribution programs administered by Ecology, the Department of Health, and local health officials.

9. Real Estate Disclosure Recommendations

Over the course of its deliberations, the Task Force discussed Washington State real estate disclosure practices related to lead-based paint (in part as a response to the Residential Lead-Based Paint Reduction Act of 1992-Title X) as well as similar types of environmental disclosure forms used elsewhere around the country. Current Washington State disclosure practices are centered around the mandatory use of the Real Property Transfer Disclosure Statement (WAR Form D-5 and NWMLS Form 17) for one to four single-family properties and the Disclosure of Information on Lead-Based Paint and Lead-Based Paint Hazards for homes built prior to 1978. The Real Property Transfer Disclosure Statement requires sellers to disclose any knowledge of the presence of hazardous substances (including soils with concentrations of hazardous substances above cleanup levels). Although it is not typical for sellers and real estate professionals to use the Lead-Based Paint and Lead-Based Paint Hazards booklet to address elevated levels of lead in soil, the definition of “lead-based paint hazard” in the Residential Lead based Paint Reduction Act of 1992–Title X includes “any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, and lead-contaminated paint that is deteriorated or present in accessible surfaces. . .that would result in adverse human health effects as established by the appropriate Federal agency.”

Recommendations

Real estate transactions create another important opportunity to educate Washington State residents about low-to-moderate arsenic and lead soil contamination and ways to protect themselves, their families, and others from potential exposure to such contamination. The Task Force supports the use of real estate disclosure practices to raise Washington State residents’ awareness of potential lead and arsenic contamination on properties. To help enact these practices, the Task Force recommends that the Agencies take the following specific steps:

- Encourage the Washington Association of Realtors to work with interested legislators to enact legislation requiring a real property transfer disclosure statement for open land (in addition to the existing requirements for residential properties) and encourage the voluntary use of the existing seller’s property condition report for open land until such legislation is adopted. For example, in Chelan County, a voluntary environmental disclaimer form is used during real estate transactions to inform sellers and buyers of potential local environmental conditions including orchards, mold, and radon.
- Work with and through the Washington Association of Realtors to strongly encourage real estate agents to use the lead-based paint disclosure form and the EPA lead pamphlet for all transactions (not simply sales of homes built before 1978) or use similar disclosure documentation for the potential presence of contaminated soils where area-wide soil contamination is likely.
- Support the Washington Association of Realtors to create an education course for real estate agents about area-wide soil contamination or to incorporate relevant Task Force findings and recommendations (such as those contained in the Area-Wide Soil Contamination Toolbox [Appendix K]) into realtors’ existing course materials.

- Encourage the Washington Association of Realtors to draft an article highlighting the Task Force's findings and recommendations, including key elements of individual protection measures, for the *Washington Realtor*.

10. Application of the Model Toxics Control Act

The Area-Wide Soil Contamination Task Force was chartered, in part, to recommend alternatives to traditional ways of addressing soil contaminated with low-to-moderate levels of arsenic and lead under MTCA. The Task Force debated MTCA and its application to area-wide soil contamination extensively, and over the course of discussions raised many questions as to how the Task Force's recommendations could be reconciled with the MTCA statute and Ecology's current MTCA regulations and policies. In an effort to find agreement, the Task Force identified a number of objectives to guide the MTCA discussions. The group then agreed to address the objectives collectively; that is, to accept and attempt to meet all of them, even if as individuals they did not value each objective equally. The objectives the Task Force worked to meet are:

- Areas characterized as having area-wide soil contamination are neither "MTCA-free zones" nor "MTCA-everywhere zones"; a viable alternate approach is needed consistent with the current MTCA statute;
- Predictability/certainty about what is expected of property owners where area-wide soil contamination is present;
- Predictability/certainty about what Ecology will do where area-wide soil contamination is present;
- Minimal financial impacts on innocent property owners affected by area-wide soil contamination;
- Minimal adverse impacts on property transactions;
- Providing a streamlined way for property owners to get as much certainty about their property's status as they desire; and
- Providing incentives for property owners to implement Task Force recommendations.

The Task Force also identified a number of elements of the current MTCA regulations and policies, as well as other mechanisms, which might be used to meet these objectives. These elements are:

- Zones or regulatory definitions of area-wide soil contamination instead of property-specific listings;
- Rulemaking to revise the MTCA regulations and other administrative action to revise MTCA policies;
- Conditional No Further Action letters or other "comfort" letters or documents from Ecology;
- Model actions or standard protocols for protection measures and/or sampling;
- Enforcement forbearance policies;
- Independent cleanup models;
- Self-certification models;

- Delivery of services recommended by the Task Force, such as technical assistance and sampling assistance (e.g., with an XRF machine); and
- Real estate disclosure and other market-based models to distribute information.

Recommendations

From their discussions of these objectives and elements, the Task Force makes six recommendations relative to MTCA.

- Ecology should provide as much predictability and certainty as possible in how MTCA will be applied to properties affected by area-wide soil contamination. In general, this will mean using regulations instead of policies to implement Task Force recommendations on MTCA.
- Avoid listing individual properties affected by area-wide soil contamination and instead identify and describe area-wide soil contamination zones.
- Establish in regulation a new enforcement forbearance policy available where property owners choose to implement Task Force recommendations at residential and commercial properties within area-wide soil contamination zones. To complement this policy, establish a standard checklist that can be used to document property status and the applicability of enforcement forbearance. Announce the new regulations and checklist when area-wide soil contamination zones are first described.
- Where property owners choose not to implement Task Force recommendations, they would remain under the current MTCA system, which includes a policy under which Ecology in general forbears from taking enforcement actions at residential properties.
- Where properties are sampled and concentrations of arsenic and lead are below cleanup levels, provide a streamlined process to reflect that properties are clean.
- The traditional MTCA approach remains available to property owners who want to use it to address area-wide soil contamination and to Ecology where property is affected by other than area-wide soil contamination.

Use Regulations to Provide Predictability

The Task Force believes that predictability and certainty with respect to what is expected of property owners and how Ecology will apply MTCA at properties affected by area-wide soil contamination are very important. In implementing Task Force recommendations relative to MTCA, Ecology should choose methods that provide the most predictability and certainty possible given the circumstances. In general, the Task Force believes that this will be achieved by Ecology using regulations rather than policies to implement Task Force recommendations relative to MTCA. Regulations provide a greater degree of certainty than policies because they cannot be changed as easily. In addition, the formal administrative process associated with enacting regulations will provide the benefit of opportunities for public review and comment on Ecology's approaches to implementing Task Force recommendations relative to MTCA and on any subsequent modifications to these approaches that Ecology might propose.

Avoid Listing Individual Properties

Ecology should avoid individual property listings for properties affected by area-wide soil contamination. Instead, Ecology should use an area-wide soil contamination zone approach. The process of identifying area-wide soil contamination zones could involve mapping areas using community or regional boundary lines, shaded geographic area designations, and/or property category descriptions to locate areas likely to have elevated levels of lead or arsenic, or could involve using narrative descriptions (or regulatory definitions) of area-wide soil contamination. Given the differences in the types of data available on area-wide soil contamination, it might be appropriate to use different approaches in different areas. For example, where there have already been mapping efforts to identify area-wide soil contamination, such as the mapping efforts associated with the Tacoma and Everett smelter plumes, maps may be the most appropriate way to identify area-wide soil contamination zones. Where less mapping has been undertaken, or where it is more difficult to map potentially affected areas, such as in historical apple and pear growing areas, a narrative description or regulatory definition of area-wide soil contamination, potentially based on the Task Force property evaluation flowchart, may be most appropriate.

The Task Force reiterates that one of the key elements of responding to area-wide soil contamination is to give individuals the information and technical and financial support they need to understand the potential risks associated with area-wide soil contamination and take steps to address it consistent with their own lifestyles, property uses, and values. Consistent with this approach, the Task Force recommends that the Agencies' efforts to conduct broad-based education and awareness-building activities and to support individuals who choose to take action to address the potential for elevated levels of arsenic and lead in soil at their properties be focused within area-wide soil contamination zones. These activities are discussed in detail earlier in this report and include:

- Targeted outreach and informational materials for parents, educators, and others who care for children; for home gardeners; and for adults who have frequent contact with soil because of their work (e.g., construction and underground utility workers).
- Support for qualitative evaluations and, where appropriate, support for soil testing to help individuals make decisions about when and how to protect people from exposure to arsenic and lead in soil.
- Support for implementation of individual protection measures, such as frequently washing hands with soap and water and removing soil from home-grown fruits and vegetables, to minimize the potential for ingestion or inhalation of contaminated soil.
- Assistance with identification and implementation of additional protection measures, such as covering bare soil, particularly in areas where children routinely play.

The Task Force emphasizes that regardless of the method used to identify and describe area-wide soil contamination zones, care should be taken in identifying and describing area-wide soil contamination zones to avoid misinterpretation of the zones and other unintended consequences. For example, if maps are used, Ecology should make clear that because of the variability in the distribution of area-wide soil contamination, zones will not precisely distinguish contaminated

from uncontaminated areas. Many properties within mapped zones may, if sampled, be shown to have concentrations of arsenic and lead that are below MTCA cleanup levels.

Enforcement Forbearance

Within area-wide soil contamination zones, property owners who choose to take actions consistent with Task Force recommendations should receive the benefits of enforcement forbearance specific to area-wide soil contamination. Enforcement forbearance should be established in regulation rather than merely in a policy document, and it should make clear that Ecology will, in the exercise of its enforcement discretion, generally not pursue enforcement actions against landowners and tenants who maintain their property in a way that is consistent with the Task Force recommendations. As precedent, Ecology should consider the current residential forbearance policy and the former “plume policy” (now codified in the MTCA statute), which described Ecology’s enforcement discretion relative to owners of properties affected by contaminated ground water from other sources.

To assist property owners in obtaining the benefits of enforcement forbearance, Ecology should create a checklist that property owners can use to track their implementation of Task Force recommendations. This checklist should be based on the Task Force’s qualitative property evaluation checklist, and should list the Task Force recommendations by property type. The Task Force believes that use of these checklists will complement existing real estate disclosure requirements and, over time, may prompt market action to encourage property owners to maintain their properties in ways that are consistent with Task Force recommendations. To facilitate this market action, and to encourage buyers and sellers to rely on completed checklists, Ecology should require that landowners who choose to use the checklist complete it truthfully and accurately.

The Task Force does not recommend that property owners be required to submit completed checklists to Ecology or any other agency. As with the implementation of the Task Force recommendations at specific properties in general, use of the checklist should remain strictly voluntary on the part of the property owner. Both the new enforcement forbearance rule and the checklist should be made available electronically and should be incorporated into the broad-based education and awareness-building activities described earlier in this report. In particular, education and outreach should target financial institutions and real estate professionals who may encounter these documents during property transactions. The Task Force emphasizes that to reduce the potential for unintended, adverse reactions to identifying and describing area-wide soil contamination zones, the new enforcement forbearance policy and checklist should be made available and announced when zones are first described. It is critical to provide property owners who may be affected by area-wide soil contamination with information about effective, practical, and affordable steps they can take (i.e., solutions) and about what to expect from Ecology when they receive information describing the area-wide soil contamination problem.

Property Owners Who Choose Not to Implement Task Force Recommendations

Property owners who choose not to implement Task Force recommendations will continue to be covered by the current MTCA regulations and existing Ecology policies and practices related to enforcement forbearance, such as current policies describing Ecology’s intention to, in general, forbear from taking enforcement action against residential homeowners and, in certain

circumstances, other property owners. The Task Force notes that many of its recommendations are consistent with the types of practices already followed by many property owners. This is particularly the case for commercial properties, where the Task Force recommends maintaining good soil cover through buildings, parking lots, and other structures. The Task Force expects that most commercial property owners are already taking actions consistent with Task Force recommendations and, therefore, will likely be covered by the additional enforcement forbearance recommended in this report.

Streamlined System to Reflect Where Properties are Clean

Ecology should create a streamlined system to recognize property owners who choose to sample their properties and discover that concentrations of arsenic and lead in soil are below MTCA cleanup levels. It is recommended that this system be made available electronically and through other means. Guidance on sampling is included in the toolbox of materials recommended by the Task Force.

Traditional MTCA Process Remains Available

Finally, the Task Force recognizes that there will be some circumstances in which the traditional MTCA approach is appropriate, either because a property owner wants to use the traditional MTCA process or because Ecology determines that site-specific conditions warrant use of the traditional MTCA process. These situations may include:

- Properties where contaminants other than arsenic and lead are found.
- Properties where there is ground water contamination.
- Properties where arsenic or lead are found at high levels.
- Properties where the owner has implemented what would traditionally be considered a final remedy under MTCA and therefore desires a settlement or other traditional MTCA liability assurance.

Ecology should monitor, in an informal way, circumstances within area-wide soil contamination zones where the traditional MTCA approach is used. This information should be used to refine application of MTCA within area-wide soil contamination zones over time. For example, Ecology might consider establishing a model remedy under MTCA if owners of commercial properties are routinely adding institutional controls to implementation of the Task Force recommendations, thereby creating a remedy that would likely be considered a final remedy under MTCA that deserves formal recognition.

11. Recommendations for Additional Information Needed

Monitoring of Arsenic and Lead Exposure

To develop recommendations for responding to area-wide soil contamination, the Task Force had repeated discussions about the implications that elevated levels of arsenic and lead in soil may have for the health of Washington State residents. Based on these discussions, the Task Force understands there is only limited information available on the actual health of Washington residents who, because of where they live, work, or go to school, may be exposed to elevated levels of arsenic and lead in soil. The Task Force is concerned about this lack of health data for Washington residents, particularly with respect to children, who may be at greatest risk.

The Task Force encourages the Washington Department of Health, in partnership with other agencies as appropriate, to expand its use of blood-lead testing, fluoroscopy, or any other appropriate techniques to gather additional information on the health of Washington residents, particularly children, who may be exposed to arsenic and lead. The Task Force believes it is important for the Department of Health to look at both arsenic and lead, even though the test methods for arsenic have limitations. Furthermore, any studies should not be directed only at voluntary subpopulations, but should be representative of all Washington residents who might be exposed to lead or arsenic in the soil. Appropriate use of random testing and finding ways to eliminate or minimize the effects of confounding factors, such as smoking and home remedies, are also needed to give a better picture of how the health of Washington residents might be affected by lead and arsenic in the soil.

The Task Force felt so strongly that additional information on the health of Washington residents who may be exposed to elevated levels of arsenic and lead in soil is needed that it offered this recommendation to the Department of Health approximately mid-way through the Task Force process. The Task Force acknowledges and appreciates the Department of Health's concern about the practicality of implementing this recommendation and about the need to apply the precautionary principle to potentially exposed populations. Nonetheless, the Task Force continues to feel strongly that gathering additional information on the health of Washington residents is important to better understand the effects of area-wide soil contamination and thereby focus response actions over time.

Research on Roadside Lead Contamination

According to the study prepared by the contractor project team to support Task Force deliberations, little is known about the distribution of contamination from combustion of leaded gasoline in Washington or the concentrations of lead that are likely to be present in roadside soils. Analogous circumstances in other states and countries suggest that roadside lead contamination may be extensive and may occur in many areas routinely used by people, such as adjacent to driveways and residential streets. The Task Force recommends that the Agencies conduct further research to characterize the location and extent of elevated levels of lead in soil from past use of leaded gasoline in Washington. Research should be focused in areas where

there is the greatest potential for exposure of children and where concentrations are likely to be the greatest, such as areas adjacent to older, more heavily used roads. If the results of this research warrant such action, the Agencies should extend implementation of the Task Force's recommendations to areas that are most likely to be affected by combustion of leaded gasoline.

Research on Ecological Risks

There is a significant body of scientific information demonstrating that high levels of arsenic and lead in soils can adversely affect plants and animals. However, the ecological risks associated with the range of concentrations associated with area-wide soil contamination are less well understood. In general, low-to-moderate arsenic and lead soil contamination has been found to adversely impact several plant species in laboratory and field studies. At the same time, other field studies have documented healthy and thriving plant communities in areas with soil arsenic and lead concentrations of similar magnitudes. Ecological receptors such as plants and animals exhibit differing sensitivities and tolerances to soil arsenic and lead, which may over long periods of time effect some changes in the distribution and thriftiness of the ecological community relative to an uncontaminated site.

Assessments of and responses to ecological risks are further complicated by site-specific circumstances. In general, ecological concerns at developed commercial and residential properties do not trigger response actions beyond those actions that would be necessary to protect human health. Cleanups of larger properties, such as open land, however, raise more complicated concerns. The Task Force recommendations for response actions for open land not proposed for development focus on reducing the potential for human exposure to arsenic and lead in soil through education and awareness-building, but do not address protection of ecological receptors. Given the lack of definitive evidence of substantive impacts on ecological systems and the complexity of these issues, the Task Force recommends that Ecology conduct or support studies that evaluate the potential ecological impacts associated with low- to moderate-level arsenic and lead soil contamination. The results of these studies might suggest circumstances where measures beyond those recommended by the Task Force to limit human exposure are needed to protect plants and animals.

12. Costs and Funding Recommendations

The Task Force was asked by the Agencies to recommend possible funding sources for agency activities to address area-wide soil contamination. A central theme in these discussions was that the State government, and in particular the Agencies, should provide financial assistance for local government efforts to address area-wide soil contamination to avoid establishing unfunded mandates. Moreover, individual residents, childcare providers, and others who choose to take actions to address area-wide soil contamination should not bear the full burden of the costs to conduct property evaluations, implement individual protection measures, maintain good soil cover, and implement any other appropriate protection measures. The Task Force recognizes that State agencies do not have limitless resources and that there are competing demands for the use of available resources. This creates a need to target available resources effectively and seek additional funding from a broad array of potential sources.

To provide information for the Task Force's deliberations on possible funding sources and funding strategies, the project support contractor developed rough estimates of the costs to implement the Task Force's recommendations and researched potential funding sources for those recommendations. Cost estimates are included in Appendix L. Note that the Task Force did not attempt to align funding sources with cost estimates for individual activities. Although the Task Force recommends that the Agencies provide financial support to individuals who choose to take action to address area-wide soil contamination, it also recognizes that in many cases the costs of responding to area-wide soil contamination will be borne by residents, not government agencies. This recognition was one of the reasons the Task Force focused on identifying responses to area-wide soil contamination that are practical and affordable, as well as effective.

Recommendations

In developing funding recommendations, the Task Force was motivated by several guiding principles:

- Wherever possible, individuals and institutions should minimize costs by integrating responses to area-wide soil contamination into existing processes and activities to leverage resources.
- State and local government agencies should provide information, technical assistance, financial support, and other incentives to residents and property owners to evaluate the potential for exposure to arsenic and lead in soil and to take effective, practical, and affordable steps to minimize exposure.
- State and Federal agencies should provide local agencies with the financial resources needed to implement any new obligations, in order to avoid establishing unfunded mandates.
- Resources to address area-wide soil contamination should be fairly allocated across the state.

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The Task Force recognizes that MTCA is based on the “polluter pays” model for financing cleanup of contamination, and that Ecology has a statutory obligation to seek to recover its costs in administering the MTCA program from potentially liable parties. The Task Force believes that Ecology should discharge its legal duties wherever possible; at the same time, the Task Force recognizes that Ecology may face unusual challenges in trying to recover its costs for addressing area-wide soil contamination, and that, in some instances, it may not be feasible to recover some or all costs. Because of these potentially difficult circumstances, the Task Force also recommends that Ecology seek funding from a broad array of Federal, State, and private sources:

- Where possible, the Agencies should use the State and Local Toxics Accounts to implement the Task Force recommendations. These accounts, which were established under MTCA, receive revenue primarily from taxes on hazardous substances. The State Toxics Account supports State agency efforts, including the hazardous sites cleanup program, while the Local Toxics Account provides funding to local governments and non-profit organizations for public education and outreach, individual property evaluations, cleanup actions, and other activities.
- The Agencies should work with OSPI to continue its efforts to identify and address contamination during new school construction and to explore opportunities to use school construction funds to address area-wide soil contamination. The Task Force also encourages the Agencies to look for other opportunities to use existing funding programs to support local efforts to implement the Task Force recommendations.
- The Agencies should seek supplementary funding from private foundations, Federal grant programs, and other Federal, State, and private sources. Examples of potential funding sources include Federal grant programs, such as EPA Environmental Education Grants and the HUD Community Development Block Grants, and grants from private sources such as the Bullitt Foundation and the DuPont *Lead-Safe...for Kids' Sake* grant program. (See Appendix M for a more complete summary of applicable grant programs and other potential funding sources.) Many of these grant programs are available to local jurisdictions, non-profit organizations, and other entities.
- The Task Force recognizes that it will be difficult to obtain significant amounts of money from many of these sources, including the competitive and formula-based grant programs. Thus, it may also be necessary for the Agencies to seek additional funding directly from the Federal government and the State legislature.