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First Five Year Review Report
for
Ruston/North Tacoma Superfund Site
Ruston and Tacoma, Washington

March 2000

Prepared by:

Region 10
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Approved by:

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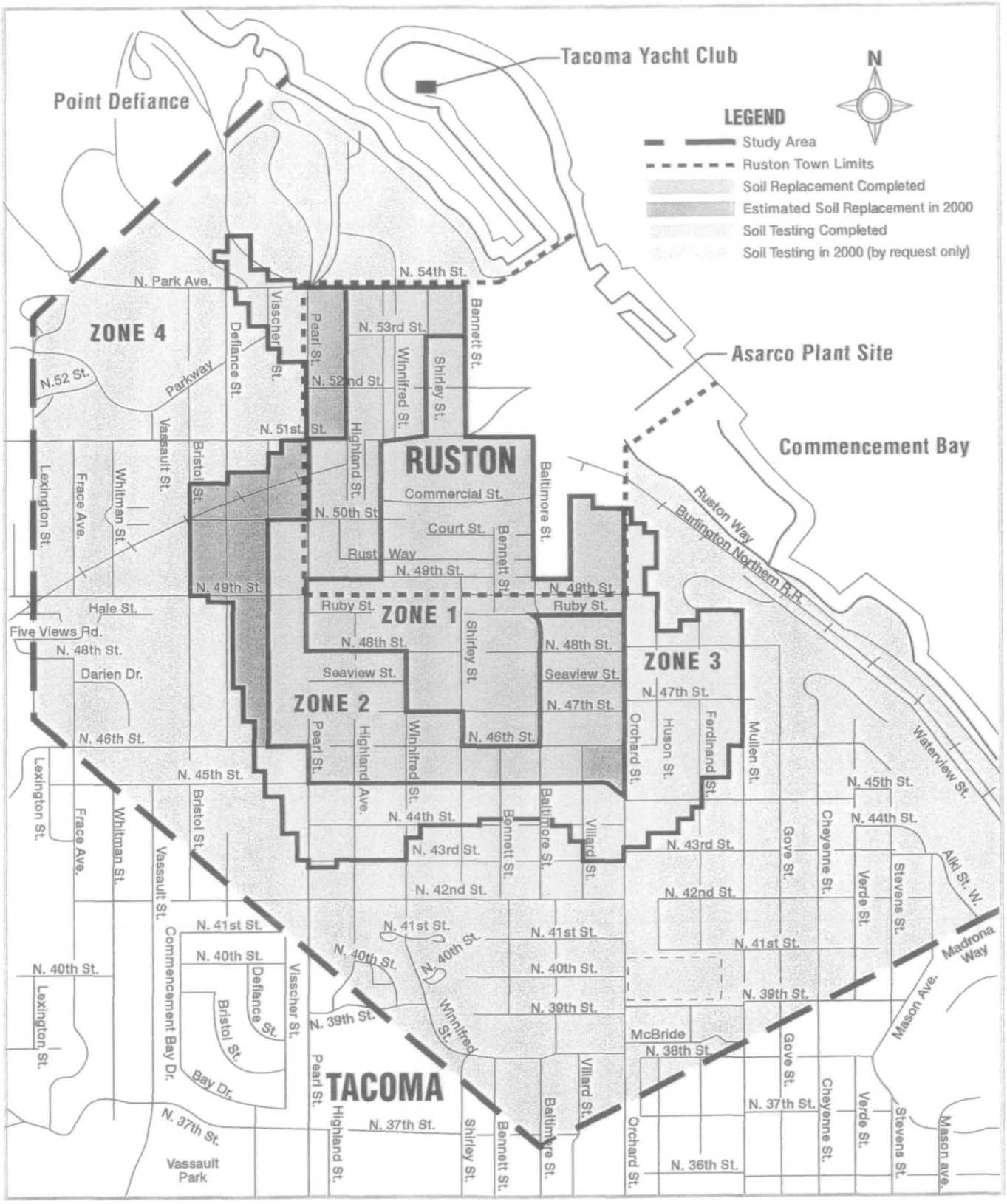
Date: 3/31/00

Study Area Zones



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Executive Summary

This report is the first five year review for the Ruston/North Tacoma Superfund site (site) which is located in Ruston and Tacoma, Washington. The site is part of the larger Commencement Bay Nearshore/Tideflats Superfund site. The Environmental Protection Agency (EPA) is required by law to conduct this review at least every five years after the beginning of cleanup activities. Cleanup actions at the site were started in the Spring of 1994. The purpose of the review is to determine whether the remedy at the site remains protective of human health and the environment.

The site includes approximately 950 acres and comprises an arc of approximately one mile radius around the Asarco Tacoma smelter (smelter). It consists of the Town of Ruston and a northern portion of the City of Tacoma, Washington. Land use is primarily residential and includes schools, playgrounds, and parks. The site includes an estimated population of approximately 4,290 people, and about 1,820 housing units. Contamination at the site is the result of airborne emissions from smelting operations and consists primarily of arsenic and lead in surface soils. Smelter slag has also been used by residents in various applications.

The Record of Decision for the site was signed on June 16, 1993. The goal of the cleanup actions is to reduce potential exposure by community residents to arsenic and lead contaminated soil, dust, and slag. EPA and Asarco signed a Consent Decree in May 1995 under which Asarco is conducting soil sampling and cleanup actions. Soil in excess of the action levels is being excavated and replaced with clean soil. The action levels are 230 parts per million (ppm) arsenic and 500 ppm lead. Slag, where it is used in driveways, walkways or other areas as crushed rock, is also being removed. In areas where soil arsenic concentrations are between 20 ppm - 230 ppm, and lead concentrations are between 250 ppm - 500 ppm, residents are being provided with educational information on steps that they can take to reduce potential exposure to this residual contamination. A workgroup, called the Program for Area Cleanup Education (PACE), is responsible for developing the educational program and materials.

Properties are first sampled to determine whether they need to be cleaned up, and to what extent and depth. Excavated soil is then replaced with clean dirt, and properties are landscaped. Property owners provide permission for the initial sampling, and Asarco coordinates with the owners on all cleanup and landscaping activities.

The site was divided into four areas or zones. Sampling and cleanup efforts are proceeding from the most to least contaminated areas. Sampling in zones 1-3 was completed in 1999. Cleanup in zones 1-3 will be completed in 2003. Sampling of properties in zone 4 has not yet been completed. It is too early to predict when cleanup in that area will be completed.

This five year review was prepared by the EPA and reviewed by the Department of Ecology, the PACE workgroup, several local residents, and others involved in the cleanup process. Findings of the five year review include the following:

- The overall status and progress of the project is consistent with the expectations of the Record of Decision.
- Sampling of individual properties as well as replacement soil and sod has been done in accordance with the project sampling and analysis plan.
- Soil removal and backfill activities are being accomplished in accordance with the Record of Decision.
- Asarco and its contractors are working cooperatively with property owners to resolve any site specific cleanup issues as they arise.
- Community relations activities conducted by Asarco as well as the overall educational program being implemented by the PACE workgroup is consistent with the Record of Decision.
- There is currently no new information about arsenic or lead exposure or toxicity that warrants reconsideration of the current site action levels for arsenic and lead.

The following recommendations and follow-up actions were noted during the five year review:

- Asarco should track property owners who have refused access for sampling or cleanup and periodically contact those individuals to determine if they have changed their minds.

- A subset of properties which have already been cleaned-up should be re-sampled for the purpose of identifying whether recontamination is a potential issue at the site.

- Prior to completion of the cleanup EPA will make a determination about how to address soils in the steeply sloped area surrounding the Burlington Northern railroad tracks.

- EPA will continue to monitor evolving information regarding arsenic toxicity as well as general changes in risk assessment guidance and policies. If views on arsenic exposure and resulting risk change significantly, a revised risk assessment may be warranted to determine if changes to the arsenic action level should be considered.

Overall, the remedy at the Ruston/North Tacoma Superfund site is expected to be protective of human health and the environment upon completion by achieving the cleanup goals as identified in the Record of Decision. The site requires ongoing five year reviews. The next review will be conducted within five years of the completion of this five year review report.

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Ruston/North Tacoma Superfund Site
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I. Introduction

The United States Environmental Protection Agency (EPA) Region 10 has conducted the first five year review of the remedial actions implemented at the Ruston/North Tacoma site in Ruston and Tacoma, Washington. The Ruston/North Tacoma site is an operable unit of the Commencement Bay Nearshore/Tideflats (CB N/T) Superfund site. Each part of the CB N/T site is being treated as a separate site by EPA Region 10 for the purpose of conducting five year reviews. This review was conducted from January through March, 2000. This report was prepared by the EPA to document the results of the review. Asarco Incorporated, the responsible party, as well as CH2M Hill, EPA's oversight contractor, provided information used in preparation of the five year review.

The purpose of this five year review is to determine whether the remedy at the Ruston/North Tacoma Superfund site will be protective of human health and the environment upon completion. The methods, findings, and conclusions of the review are documented in this five year review report. In addition, this report identifies any deficiencies found during the review, and recommendations to address them.

This review is required by statute. EPA must implement five year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA and the NCP require that a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site shall be reviewed no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected.

This is the first five year review for the Ruston/North Tacoma site. Remedial actions at the site were initiated in the Spring of 1994. The review is necessary as elevated levels of arsenic and lead will remain on site in soil in residential yards.

II. Site Chronology

Below is a table which identifies important events and relevant dates at the Ruston/North Tacoma Superfund site. Interest in the impact of smelter operations on the surrounding residential community was piqued in the early 1970's, resulting in numerous studies being conducted throughout the 70's and 80's. As those efforts were numerous, only those studies conducted after NPL listing, which formed the basis for taking cleanup actions at the site, will be identified below. These studies will be further discussed in Section III below.

Event	Date
NPL Listing	September 1983
Exposure Pathways Study	March 1987
Field Investigation Report, Endangerment Assessment, and Engineering Evaluation/Cost Analysis	September 1988
Urinary Arsenic Survey	December 1988
Administrative Order on Consent for Expedited Response Action	March 1989
Formation of Ruston/North Tacoma Community Workgroup	Fall 1989
Formation of Ruston/North Tacoma Coordinating Forum	March 1991
Remedial Investigation, Feasibility Study, and Risk Assessment	January 1992
Preliminary Remedial Action Objectives Decision Memorandum	January 1992
Record of Decision (ROD)	June 1993
Unilateral Administrative Order for Remedial Design/Remedial Action	August 1993
Formation of Community Protection Measures Workgroup	Fall 1993
Explanation of Significant Difference	November 1993
Remedial Action Start	Spring 1994
Consent Decree for Remedial Design/Remedial Action	May 1995
Estimated Remedial Action Completion	2003 for properties in zones 1 - 3 *(see Attachment 1)*. Unable to estimate completion date for properties in zone 4 until sampling in that area is finished.

III. Background

The Ruston/North Tacoma Study Area, approximately 950 acres, comprises an arc of approximately one mile radius surrounding the Asarco Tacoma smelter (Asarco smelter) and consists of the Town of Ruston and a northern portion of the City of Tacoma, Washington *(see Attachment 2)*.

The smelter began operations in 1890 as a lead smelter. Asarco purchased the smelter in 1905 and converted it to a copper smelter in 1912. The smelter specialized in processing ores with high arsenic concentrations and recovered arsenic trioxide and metallic arsenic as by-products. Operation of the Asarco smelter for over 95 years resulted in contamination, primarily arsenic and lead, of the surrounding area. That contamination was the result of airborne emissions from smelting operations. In recovering copper from ores and concentrates, the smelting process also produced slag, a hard, glassy material containing elevated concentrations of arsenic, lead, and other metals. Smelter slag has been used in various locations throughout the community for driveway, walkway, and parking area surfacing, and in larger pieces for retaining walls and rockeries. Copper smelting operations ceased in 1985, and the arsenic production plant was closed in 1986. The Asarco smelter facility and sediments adjacent to the smelter property are being addressed as separate operable units of the CB N/T Superfund site.

The Study Area land use is primarily residential and includes schools, playgrounds, and parks. In 1993, EPA estimated that the Study Area included a population of approximately 4,290, and about 1,820 housing units. Commercial development consisting of retail shops and small businesses is limited in extent and mainly confined to an area along Pearl Street. The Asarco smelter, which ceased operations in 1985, is located to the northeast of the Study Area and was the principal industrial facility in the area. The southern portion of Point Defiance Park and Zoo, which extends along a wooded peninsula to the northwest of the smelter, is located within the Study Area and includes access to the Vashon Island Ferry. Properties to the southeast of the Study Area, which were previously industrial in nature, are actively being redeveloped with restaurants, a fishing pier, park areas, and other public uses.

The residential area adjacent to the smelter has been the subject of many investigations over the past 30 years. Several studies, identified in the table in Section II above, are described in the following text. Some of these studies formed the basis for a 1989 EPA decision to conduct an Expedited Response Action (ERA) at several publicly accessible properties in the Study Area.

Exposure Pathways Study

Initiated in 1985 and released in 1987, the Exposure Pathways Study (see *Ruston/Vashon Arsenic Exposure Pathways Study, University of Washington, 1987*) investigated the pathways contributing arsenic to the bodies of residents in Tacoma and Vashon/Maury Islands. One of the objectives of this study was to determine what environmental media required remediation to effectively reduce the body burden of arsenic in the affected population. The study involved the

repeated sampling of urine and a number of environmental media for arsenic analyses. It was performed just at the time when smelter operations ceased. Results of the study indicated that an individual's age was shown to be significant for determining urinary arsenic levels, with young children most affected. Arsenic concentrations on children's hands were significantly associated with urinary arsenic concentrations, and with time spent in contact with soil and house dust. Ingestion of contaminated soil was identified as the primary route of exposure to arsenic.

Field Investigation Report

In 1988, a detailed investigation (see *Field Investigation Report [FIR], Ruston/Vashon Island Area, Black & Veatch, 1988*) of post-shutdown soil contamination in the Study Area was performed by the Washington State Department of Ecology (Ecology). Approximately 288 soil samples were collected from residential and non-residential high-use areas (parks, playgrounds, and vacant lots) within approximately 1 mile of the smelter. The FIR included an evaluation to determine if soil contamination was related to smelter emissions.

Endangerment Assessment and Engineering Evaluation/Cost Analysis

In conjunction with the FIR, an Endangerment Assessment (EA) (see *Endangerment Assessment Ruston/Vashon Island Area, Black & Veatch, 1988*) and Engineering Evaluation/Cost Analysis (EE/CA) (see *Engineering Evaluation/Cost Analysis of Removal Action Alternatives: Ruston/Vashon Island Area, Black & Veatch, 1988*) were also performed by Ecology. The EA evaluated the potential health effects from exposure to smelter-related contamination in soil, house dust, and air. The EE/CA was developed to evaluate removal action alternatives.

Urinary Arsenic Survey

As a follow-up to the Exposure Pathways Study, an additional urinary arsenic survey (see *Urinary Arsenic Survey, North Tacoma, Washington, Tacoma-Pierce County Health Department, 1988*) was performed by the Tacoma-Pierce County Health Department (TPCHD) of children ages 2 - 8 years living within approximately ½ mile of the smelter. The results indicated that urinary arsenic levels had generally declined since smelter closure. Some individuals, however, still had elevated levels.

Expedited Response Action

Of the 20 nonresidential high-use areas identified and sampled as part of the FIR, 11 were determined to have arsenic concentrations resulting in estimated risks outside of EPA's range of acceptable risks for carcinogens. In March 1989, EPA and Asarco signed an Administrative Order on Consent (AOC) for the performance of an ERA. Under the ERA, Asarco agreed to remove three inches of arsenic-contaminated soil at the 11 nonresidential high-use properties, and replace the excavated soil with 9 to 12 inches of imported soil. The 11 sites totaled about 15 acres and included playgrounds, parks, and vacant lots - locations where children were likely to

spend time playing *(see Attachment 3)*. While additional information was required to fully characterize the nature and extent of contamination in the residential community, these nonresidential sites were selected for early remedial action because of elevated concentrations of arsenic in soil, and accessibility by the public, especially children. Ten of the 11 ERA sites were completed by Asarco under the ERA AOC. The 11th property was addressed under the ROD as part of the current cleanup.

Remedial Investigation and Risk Assessment

EPA completed a Remedial Investigation and Risk Assessment in January 1992. The RI was designed to focus on the area most likely to require cleanup, on soils as the primary environmental medium of concern, and on arsenic as the primary contaminant of concern. During the RI, soil samples were collected to provide additional information on the distribution of arsenic and other metals (antimony, cadmium, copper, lead, mercury, selenium, zinc, and silver) in surface and subsurface soils in the Study Area. The soil sampling results demonstrate the presence of metals above background concentrations in Study Area soils. The RI data also indicate an overall pattern of decreasing contaminant concentrations with increasing distance from the smelter, with a directional component reflecting wind patterns.

In the Risk Assessment, arsenic and lead were determined to be the two contaminants of primary concern for human health. Other metals did not pose significant risks to individuals even at the highest levels detected. Of the six exposure scenarios evaluated, the scenario of most concern, that resulted in the highest exposure potential, was the ingestion of soils and dusts. Arsenic was evaluated for both cancer (lung and skin) and noncancer (skin hyperpigmentation and skin keratoses) effects. For lead, the LEAD4 model was used to estimate the potential for a child to exceed a 10 ug/dl blood lead level. For both arsenic and lead, the estimated exposures and risks in the Study Area exceeded those levels that generally require remedial action at a Superfund site as defined by EPA in the NCP and program guidance.

IV. Remedial Actions

A. Remedy Selection

The only Record of Decision (ROD) for the R/NT site was signed on June 16, 1993. The remedial action objectives and goals, identified in *Attachment 4*, were based upon the results of the risk assessment, and a number of other risk management considerations including the scope, costs, and impact on the community of remedial actions, as well as community acceptance of the remedy. Further information on how EPA considered these factors in the selection of the action levels for the site can be found in EPA's January 1992 *Ruston/North Tacoma Site Preliminary Remedial Action Objectives Decision Memorandum*.

The action levels identified for cleanup of residential soil were 230 ppm for arsenic and 500 ppm for lead. The arsenic action level of 230 ppm was based on reducing the additional

potential skin cancer risk to no more than 5 in 10,000, within EPA's acceptable risk range for cancer causing chemicals.[1] The 500 ppm action level for lead was based upon a national goal of reducing levels in children's blood to no greater than 10 ug/dl, as well as EPA guidance that recommended establishing soil lead cleanup levels of 500 to 1,000 ppm.

In addition to being protective of human health and the environment, the ROD established the applicable or relevant and appropriate requirements (ARARs) that had to be met. The Washington State MTCA cleanup standards were applicable requirements for the Ruston/North Tacoma site. EPA coordinated with Ecology in evaluating the MTCA requirements. Under MTCA Method A, the soil cleanup levels for residential areas were 20 ppm for arsenic and 250 ppm for lead. MTCA requires that some form of action be taken to address contamination above these levels. In evaluating the available remedial actions to address contamination at this site, Ecology considered the nature and extent of site contamination, the nature of human health risks, the exposure pathways, and the potential impacts and costs associated with physical remediation activities in the community. Ecology concluded that the EPA action level of 230 ppm for soil arsenic represented a best balancing of factors for a level at which engineering actions (e.g., soil removal) for remediation should begin at this site. Institutional controls (otherwise known as community protection measures), mostly consisting of educational measures, were deemed by Ecology to be suitable for protection of human health and the environment at those locations within the Study Area where soil arsenic concentrations were between the MTCA cleanup level of 20 ppm and 230 ppm (*see Ecology Concurrence with EPA's Record of Decision for the Ruston/North Tacoma Operable Unit, June 7, 1993, Carol L. Fleskes, Program Manager, Toxics Cleanup Program*). Community protection measures are further discussed in the following section. For lead, Ecology could elect to use the conservative Method A cleanup level of 250 ppm, or it could use site-specific information and EPA's biokinetic model to establish a cleanup level (see WAC 173-340-702(6)). Ecology determined that the results of applying the "LEAD4" model supported setting the soil lead cleanup level under MTCA at 500 ppm for this site.

In their comments on this five year review, Ecology has informed EPA that it has changed its interpretation of MTCA since the signing of the Ruston/North Tacoma ROD, and that the cleanup decision no longer complies with the cleanup requirements for residential soils under MTCA. Specifically, Ecology states that:

> *"Under WAC 173-340-740(1)(a), some form of "treatment, removal, or containment remedy" must be employed for residential soils containing hazardous substances in excess of soils cleanup levels (e.g., 20 ppm arsenic). We believe this applies to each exposure unit, that is, each residential property. Under WAC 173-340-440(2), institutional controls cannot be used as a substitute for cleanup actions that are*

[1] EPA's "Ruston/North Tacoma Site Preliminary Remedial Action Objectives Decision Memorandum" documented why an action level corresponding to a 5×10^{-4} level was warranted based on site-specific considerations.

otherwise technically possible. In short, we do not believe that reliance on institutional controls to reduce exposure to and risk from arsenic in surface residential soils at levels between 20 ppm and 230 ppm counts as a form of "treatment, removal, or containment" under the applicable regulation." (see Ecology Comments on the Draft First Five-Year Review Report, Ruston/North Tacoma Superfund Site, Ruston and Tacoma, Washington, March 28, 2000, Tim Nord, Toxics Cleanup Program).

Under the National Contingency Plan, EPA is required to consider newly promulgated or modified requirements after the ROD has been signed to evaluate whether the remedy is still protective of human health and the environment (*55 Federal Register 8757 (March 8, 1990)*). Although Ecology's change in interpretation is not a promulgated change to MTCA, EPA has considered Ecology's revised position. As explained in Sections VI. E. and VII. E. below (Risk Information Reviews), EPA believes that the 230 ppm action level for this site is still within EPA's acceptable risk range for carcinogens given consideration of exposure, technical, and uncertainty factors, and still protective of human health. Accordingly, EPA is not modifying the action level at this time based on Ecology's revised interpretation of MTCA.

The selected remedy called for sampling (surface and depth) of individual properties within the Study Area, and the excavation, removal, and replacement of soil which exceeded the action levels. Where contamination above the action level remained below a depth of 18 inches, a geotextile fabric or marker would be placed at the base of the excavation, and replacement soil would serve as a cap or barrier to the remaining contaminated soil below. A November 29, 1993 Explanation of Significant Difference provided for the temporary storage of soils excavated from the R/NT site at the Asarco smelter facility. The March 1995 ROD for the Asarco smelter facility called for the use of those soils as part of the cap for the smelter site.
Slag driveways within the Study Area (as well as other areas where small, ingestable, pieces of slag were used) would be excavated and replaced with gravel.

The community had an extensive role in the remedy selection process for the site. A community workgroup, consisting of local area citizens was formed in the Fall of 1989 and continued to meet approximately monthly through the signing of the ROD in 1993. The workgroup reviewed and commented on technical and community relations documents and provided input to EPA on remedy components that would be acceptable to community members. The Ruston/North Tacoma Coordinating Forum (Forum) formed in March 1991 and met monthly through April 1992. Participants included elected officials, key agency decision makers, and management and staff of various organizations that would be involved in or affected by the cleanup project. The purpose of the Forum was to facilitate discussion and coordination, and to assist in the development and selection of a remedy that would be implementable in the communities. In addition, community members were involved in the remedy selection process through public meetings, open houses, interviews, and workshops. A part time community liaison was also hired to staff a local office, answer questions, and research information for citizens.

B. Remedy Implementation

The remedial design for the site was started in the Fall of 1993. Sampling began in October 1993, and cleanup activities were initiated in the Spring of 1994. The Study Area was divided into four zones, based on known soil arsenic concentrations, in an effort to focus sampling and cleanup activities on the most contaminated areas first *(see Attachment 1)*. Sampling of all properties in zones 1 - 3, the preliminary remediation area, is required in the ROD and has been completed. Remedial actions in zones 1 - 3 are expected to be completed in 2003. Sampling in zone 4 was initiated in 1999 and will occur where previous soil sample results from the RI or FIR indicated an exceedance of the action level, at properties surrounding an area that has been identified as exceeding an action level, or otherwise upon request of the property owner. The extent of action necessary in zone 4 will not be fully understood until sampling efforts in that zone are complete. The remedy is being implemented by Asarco. EPA oversees the sampling and cleanup efforts. The remedial actions are described further below.

1. Sampling Program

Residential properties, dirt alleys, and right-of-ways are sampled to determine whether they need to be cleaned up, and to what extent. Consent from property owners is sought prior to the sampling activity, and property owners receive a copy of the sample results indicating whether cleanup is needed. During the sampling effort each property is first divided into subunits, and surface and depth samples are collected within each subunit at the 0-1 inch, 1-6 inch, 6-12 inch, and 12- 18 inch depth intervals. Property cleanup decisions are made using a two-part decision rule by comparing the sample results to the action levels for arsenic and lead (230 ppm and 500 ppm, respectively). If the property average soil concentration of arsenic and/or lead at any given depth exceeds the action levels, soil from the entire property is excavated to that depth. If the property average soil concentration is below the action levels, but samples in an individual subunit(s) exceed the action levels, soil from that subunit(s) will be excavated and replaced. Following soil removal, samples are taken again to confirm that soil at the base of the excavation does not exceed the action levels. If action levels are exceeded at the base of the excavation, additional excavation will occur. Samples are also collected from sod and soil to be used for backfill to ensure that they do not exceed the MTCA soil cleanup levels (regional urban background levels of 20 ppm arsenic and 250 ppm lead).

2. Soil Removal and Backfill Activities

At properties where soil exceeds action levels, soil and sod are excavated and replaced and the property is relandscaped. Slag driveways, and other areas where slag exists in small pieces, are also excavated and replaced with gravel. An access agreement for cleanup is negotiated with the property owner which includes a site map identifying areas where soil and vegetation will be removed, and how it will be replaced. Utilities are located and land owners are notified prior to the commencement of cleanup activities

on their property. Property owners are asked to sign-off on the property map at the completion of cleanup activities attesting that the work performed meets their satisfaction. Excavated soil is disposed at the Asarco smelter facility where it will be incorporated into a cap to be placed over the property. Sample access agreements, notices and letters to residents, and site maps can be found in the *December 6, 1994 Revised Work Plan for Excavation and Removal of Soils, Ruston and North Tacoma, Washington, prepared by Hydrometrics, Inc. for ASARCO Incorporated.*

3. Community Protection Measures Program

A community protection measures program (institutional controls) was developed for the Study Area and is being implemented by a program coordinator from the Tacoma Pierce County Health Department, the coordinator for the Asarco Information Center, and a work group consisting of representatives from government agencies, a local interest group, local officials, and Asarco personnel. The program is referred to as PACE - the Program for Area Cleanup Education. The PACE work group currently meets on a quarterly basis. The objective of the PACE program is to provide owners and residents in the Study Area with educational materials and guidance on the management of soils in the area. The PACE program consists of several components, as follows, which were identified in the ROD:

- Measures to control soil disturbances
- Soil testing, collection, and disposal program
- Measures to maintain the integrity of caps
- Development of a property specific data base
- Notification to future property owners
- Evaluations of the effectiveness of the PACE program

Educational materials are distributed to residents at the time of sampling and cleanup of their property, through a periodic newsletter distributed to all addresses in the Study Area, as annual reminders to local utilities, realtors, and private companies who have cause to dig dirt in the Study Area, and upon request at the Asarco Information Center. The information distributed by the PACE program is not enforceable upon local residents, and there are no penalties to residents for failure to comply with any of the printed information.

C. Operations and Maintenance (O&M)

Since the remedy is still being implemented, the site has not yet entered the operations and maintenance phase and no data is available on actual O&M related issues or costs. Asarco has minimized the potential need for O&M activities by removing soil above the action levels

regardless of depth[2], thereby reducing the number of capped properties. O&M efforts are anticipated to be minimal and will focus on the long term components of the PACE program including distribution of educational materials, maintenance of a property data base, and provisions for soil disposal (*see Attachment 5*). Annual costs for the PACE program to date are included in the table below as an indication of potential future costs to conduct O&M-related educational efforts. These costs do not, however, include costs associated with long term soil disposal services.

PACE Program Costs to Date	
1994	$90,119.00
1995	$88,885.00
1996	$90,137.00
1997	$47,420.00
1998	$52,258.00
1999	$45,590.00

V. Five Year Review Process

The Ruston/North Tacoma (R/NT) five year review was led by Mary Kay Voytilla, EPA Remedial Project Manager for the site. The following team members assisted in the review:

- Burt Miller, CH2M Hill oversight contractor
- Tod Gold, EPA site attorney
- Dana Davoli, EPA risk assessor
- Jeannie O'Dell, EPA community relations coordinator
- Bruce Cochran, Department of Ecology and PACE member
- Tom Aldrich, Asarco project manager and PACE member
- Willie Williams, Hydrometrics
- Karen Pickett, Asarco Information Center coordinator and PACE member
- Glenn Rollins, Tacoma Pierce County Health Department and PACE member
- Ione Claggett, Citizens for a Healthy Bay and PACE member

[2] According to the ROD and RD/RA Consent Decree, Asarco is legally required to remove soil only to a maximum depth of 18 inches. If confirmation sampling indicates that contaminants remain below 18 inches, a geotextile fabric or marker would be placed at the base of the excavation, the backfilled soil would be considered a "cap," and the capped property subject to associated community protection measures. However, in those instances where contamination has been found below 18 inches, Asarco has voluntarily performed further soil removal.

- Charlene Hagen, Town of Ruston and PACE member
- Judith Lorbeir, City of Tacoma and PACE member
- Judi Schwarz, EPA policy analyst

This five year review consisted of the following activities: a review of relevant documents *(see Attachment 6)*; interviews with EPA's oversight contractor (CH2M Hill), Asarco, and Asarco's sampling and cleanup contractor (Hydrometrics); and a review of the draft report by members of the Program for Area Cleanup Education (PACE) workgroup and several Study Area residents. A specific site inspection was not conducted for this five year review as EPA conducts oversight of Asarco's sampling and cleanup activities on a regular basis of one or two days per week, has an ongoing presence in the community, interacts with residents as cleanup issues or concerns arise, and interacts with the local governments on a quarterly basis at PACE meetings. In addition, a notice regarding the forthcoming review was placed in the local newspaper, and an announcement about the purpose and schedule for the review was made at an Asarco public meeting in February, 2000. The completed report is available in the information repository. Notice of its completion was placed in the local newspaper and a brief summary of this report was distributed to community members.

VI. Five Year Review Findings

Below are the findings of the five year review for the Ruston/North Tacoma site. This section is divided into categories consistent with the significant components of the site work including: overall status of the project; sampling program; soil removal and backfill activities; and general community relations activities and PACE program. A review of any new risk-related information since the time of the ROD is also presented.

A. Overall Status of the Project

Below are findings regarding the overall conduct of the cleanup project as well as current summary statistics for the sampling and cleanup efforts.

- EPA provides oversight of Asarco's sampling and cleanup efforts through its contractor, CH2M Hill. During the early years of the project, EPA oversight was provided on a full time basis. Over the years, as Asarco demonstrated its ongoing ability to conduct work in a manner satisfactory to the Agency, oversight efforts have been reduced. Currently, EPA oversight is provided one or two days per week. In addition, during the first five years of the project (1994 - 1998), EPA collected and analyzed split soil samples. Beginning in 1999, and based upon five years of acceptable comparisons of EPA's and Asarco's data, this practice ceased. Split samples may be taken again in the future if the need arises.

- In addition to the ongoing project oversight efforts described above, Asarco submits several different types of reports on an ongoing (annual or semi-annual) basis including

Project Forecast Reports, Project Completion Reports, and Data Validation reports. The purpose of these documents is to: 1) identify properties scheduled for sampling and cleanup in the upcoming construction season; 2) document property cleanups completed during the previous construction season; and 3) transmit the results of data validated during the previous construction season. These reports undergo review and comment by EPA and CH2M Hill, and require the approval of the EPA.

- Soil sampling in zones 1 - 3 (sampling of all properties in these zones is required under the ROD) was completed by the end of 1998. Soil sampling in 1999 and beyond is focused on properties in zone 4 (sampling is at the request of the property owners). *See Attachment 1.* Cleanup of properties in zones 1 and 2 was completed in 1999. Cleanup of properties in zone 3 is estimated to occur from 2000 - 2003. Cleanup of properties in zone 4 may begin during 2003. As the total number of properties in zone 4 requiring cleanup is currently unknown, it is impossible at this time to estimate a completion date for cleanup of all properties in the Study Area.

- Summary of cleanup statistics as of December 1999:

Properties sampled (zones 1-3, and some zone 4)	1,695
Number of properties remediated in zones 1-3	733[3]
Number of properties remaining for cleanup in zones 1-3	573
Number of properties for which property owners have refused access for sampling or cleanup	17

B. Sampling Program

Based upon a review of site data conducted by Asarco, the following data trends/observations were noted:

- In general, and as predicted by the RI/FS, the further distance from the former smelter stack (point of emissions), the less the amount of remediation required. This is evidenced by more partial remediations, and shallower removals at many properties, as cleanup progresses.

- Backfill soils have not exceeded the MTCA cleanup levels for arsenic and lead (20 ppm arsenic and 250 ppm lead), and actual sample results have been significantly lower *(see Attachment 7)*. Backfill soils and sod have been sampled in accordance with the project sampling and analysis plan throughout the project.

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[3] Includes three properties outside of the Study Area which were specifically designated in the Record of Decision for cleanup due to contamination above the arsenic action level.

C. Soil Removal and Backfill Activities

- No major problems or issues have arisen during the course of the remedial actions. However, there have been some recurring items of concern among various homeowners including drainage, quality of replacement soil, and maintenance of newly placed sod. Asarco has taken the following steps to respond to these issues:

  Drainage: Hydrometrics has met with various residents in regard to drainage within the properties, and minor drainage improvements have been made, as well as return calls to discuss or improve drainage after remediation is complete.

  Topsoil: The topsoil used is as specified in the work plan, and is tested to ensure compliance.

  Lawn care: In order to assist homeowners in maintaining the newly sodded lawns a handout on proper lawn maintenance was developed and is distributed by Asarco to homeowners at the time of property cleanup and lawn replacement.

  In 1995, Asarco undertook a lawn revitalization project for several lawns on the same block that had experienced problems. A lawn care service was hired to aerate and perform routine fertilization for one summer. Asarco consulted with a horticulturist and turf expert from Washington State University Extension Office in Puyallup (WSU) to advise on proper care. By the end of the summer, all the lawns involved showed improvement and returned to an adequate texture and color.

  Asarco found that newly remediated lawns required different care than older, established yards. These yards need to be fertilized and watered more frequently, and periodically aerated to promote proper growth. During 1998, Asarco set up an ongoing experiment with WSU to try different types and rates of fertilization on a vacant lot owned by Asarco. WSU has consulted with their soils, turf and horticultural experts and laid out a grid using several different types of fertilizers, different application rates and is monitoring watering times, weather, wind patterns, and mowing height. As results become available, they are posted at the vacant lot.

- As envisioned in the project work plan, some areas of the site that qualified for remediation (had soil arsenic or lead above the action levels) were found to be inaccessible for cleanup, e.g., some areas under decks, on steep slopes, or in wetland areas. All decks that had sufficient space to provide access were remediated. In some cases this required hand work to be performed. There were three decks where access was restricted and cleanup did not occur. In these and other instances where access was restricted, confirmational sample results and site plans were provided to the homeowner and incorporated into the project data base indicating where remediation had and had not occurred. In addition, four steeply sloped areas have been left vegetated rather than

disturb the existing root structure and possibly cause erosion problems, and three sites have had the remediation areas reduced due to wetlands features. In these instances, the site plan and confirmational sampling results furnished to the property owner and incorporated into the project data base reflect the decision to not remediate those areas. The PACE brochure *"Property Owner Guidelines and Responsibilities in Remediated Yards"* describes procedures for disposal of soil from these areas in the future if necessary.

- While the ROD and project work plan require Asarco to excavate only to a maximum depth of 18 inches, Asarco has voluntarily excavated deeper in those areas where confirmational sampling indicated soil remaining above the action levels. As of the end of 1999, 111 sites properties have had excavation beyond 18 inches. Most of this over-excavation has been an additional 6 inches, but a few sites have been excavated to greater depths. Two subunits were excavated to 42 inches, and one to 48 inches to reach acceptable levels. A portion on one site was excavated to 5-1/2 feet to remove visual slag concentrations. This action (performing additional excavation) was voluntarily taken by Asarco in lieu of capping the properties and implementing the long term care provisions associated with a capped property.

- Asarco has worked with property owners to successfully redevelop 4 of the 10 existing capped ERA sites, including coordination with property owners' contractors and disposal of soils from beneath the caps. In these instances, Asarco and the property owners have implemented the development and coordination procedures as outlined in the PACE brochure "*Property Owner Guidelines and Responsibilities for ERA Sites.*"

- The ROD identified a steeply sloped portion of the Study Area surrounding the Burlington Northern railroad tracks *(see Attachment 8)*. Should sampling indicate that this area is in need of remediation, the ROD noted that excavation would.not be possible. Rather, fencing, planting with low lying shrubs, and application of a geotextile material to provide erosion protection would be undertaken. Limited sampling has occurred to date in this area due to difficult access. Of 4 samples collected in this area, one indicates the presence of arsenic and lead in excess of the action levels. Fencing already existed surrounding most of the area. No further actions have been taken on this property.

D. General Community Relations Activities and PACE Program

- Asarco operates the Asarco Information Center in Ruston, Washington. On a monthly basis, the Asarco Information Center receives an average of 170 telephone calls and 30 visitors. Inquiries include requests to set up meetings regarding cleanup of a specific property, general questions about cleanup activities, disposal issues, and redevelopment concerns.

- Asarco issues a Soils Bulletin to residents of the Study Area to provide updates and information regarding the sampling and cleanup activities. Asarco also distributes general information packets to the public at large upon request which include an overview of the cleanup process, a soil sampling schedule and map, a questions and answers brochure, and soils handling and disposal guidelines.

- Asarco sends out an annual reminder letter at the start of each remediation season to local municipalities, utilities, and contractors who conduct excavation operations in the Study Area. The letter provides a reminder of the ongoing cleanup operations, suggests soil handling procedures, and includes a map indicating where soils have been tested and/or replaced. An annual update to the real estate community is also issued by way of an article in the newsletter of a local real estate association.

- Asarco also provides presentations/tours for groups to discuss the history of the smelter and the various Asarco cleanup projects. Groups have included University of Puget Sound, University of Washington at Tacoma, Stadium High School, Bainbridge Island Alternative School, Clover Park Vocational School, Gieger Elementary and Cub Scout Pack #3, Tacoma Community College, Truman Middle School, Point Defiance Retirement Center, and several garden, Kiwanis and Rotary Clubs.

- The PACE workgroup began meeting in early 1994. For the first several years, as the program was developing, meetings were held on a monthly basis. Currently, the workgroup meets quarterly. A list of the educational materials prepared by the PACE work group is included in *Attachment 9*. Major activities undertaken and accomplished by the PACE workgroup to date are summarized below:

  - The development and distribution of information on measures to control soil disturbances.
  - A soil testing , collection, and disposal program for residents to use prior to Asarco's sampling or cleanup of their property.
  - The development and distribution of information on measures to maintain the integrity of caps on properties.
  - The development of a property specific data base of sampling results and cleanup efforts on specific properties. Initially, the data base was maintained in paper format and then shifted to microfiche. Plans are currently underway to computerize the data base system. The data base can be accessed through the Asarco Information Center, the City of Tacoma permit office, and the Ruston Town Hall.
  - The development and distribution of information regarding cleanup and soils-related issues to current and future property owners.
  - The development of procedures for using the Tacoma Landfill to dispose of soils containing less than 230 ppm arsenic.

- The development of an arbitration process for citizens with unresolved concerns about remediation of their property. The arbitration process has been used once at the site.
- Conducted community surveys to assess the level of local knowledge regarding the Superfund cleanup process.
- Developed guidelines and protocols for the initial health screening program for urinary arsenic and blood lead testing.
- Worked with an official from Tacoma Public Schools to develop curriculum for use in local public schools. While the full curriculum was not implemented due to competing educational priorities, elements have occurred, e.g., group tours of the smelter, community cleanup area, and on-site laboratory.
- Assisted the Tacoma Pierce County Health Department in it's Community Assessment processes for the Ruston and North Tacoma areas to gather perceptions and priorities of community residents.
- Coordinated PACE program efforts with the community health nurse from the Point Defiance Family Support Center.
- Developed procedures to remind citizens planning construction projects that soil under hard surfaces, e.g., sidewalks, was not removed as part of the cleanup, and the procedures for handling and disposal of such. This process is being coordinated by the Tacoma Pierce County Health Department and in conjunction with the permitting processes for the Town of Ruston and City of Tacoma.
- Worked with the Town of Ruston and City of Tacoma to coordinate the development of procedures for local utilities to use when conducting activities in the Study Area that involve soil excavation.

- The PACE workgroup developed criteria to evaluate the PACE program and assess the program components as identified in the Record of Decision. PACE program evaluations have been conducted in November, 1994, July, 1995, May, 1996, July, 1997, and most recently in May of 1999. The first two evaluations were conducted by a panel of non-workgroup members from the Tacoma Pierce County Health Department (TPCHD), City of Tacoma, Asarco, Town of Ruston, Department of Ecology, and the EPA (the panel). Based on the recommendation of the panel, the third evaluation was conducted by the workgroup members. The fourth evaluation consisted of an independent peer review conducted by Jerry Cobb of the Panhandle Health District in Kellogg, Idaho, Patty Kay-Clapper of the Aspen Medical Community/Smuggler Citizens' Caucus in Aspen, Colorado, and Alice Collingwood of the Puget Sound Air Pollution Control Authority. The latest evaluation was conducted by workgroup members.

  At the conclusion of each program evaluation, a report or letter of findings was prepared and discussed among the workgroup members. In addition, a workgroup response to the evaluation was prepared noting any changes to the PACE program based on the evaluation. It is anticipated that program evaluations will continue to occur every two years under the domain of the workgroup as coordinated by the TPCHD. A peer review

of the program, accomplished by parties outside of the workgroup, will occur again near the completion of the cleanup efforts and prior to establishment of the long term community protection measures discussed below and included in *Attachment 5*.

The conclusion from the latest program evaluation was that while some changes were necessary to fine tune certain elements of the program, the requirements of the ROD and program scope of work were being met. See *PACE Evaluation Summary, October 15, 1999, Tacoma Pierce County Health Department*. The work group remains interested in the future of the education program after Study Area cleanup is complete and there is no longer an ongoing awareness of soil contamination and related issues in the community. The PACE workgroup developed a list of goals for the establishment of long-term community protection measures, and plans to have the proposed goals and tasks in place prior to the completion of the Asarco cleanup project. *See Attachment 5*.

An additional item noted during the last program evaluation concerns the role of the PACE program and workgroup in evaluating the effectiveness of its educational activities on changing the behavior of Study Area residents and thereby reducing residents risks from exposure to soil containing 20 ppm to 230 ppm arsenic. The Department of Ecology (Ecology) believes that the success of the PACE program should be evaluated based on a quantitative evaluation/survey of whether residents have changed their behaviors based on PACE educational materials. Other workgroup members disagree noting that this approach is overly intrusive in the lives of area residents, potentially devalues property, does not provide added value for the level of assurances it may obtain, may unnecessarily frighten and antagonize people, and is much broader than the communities' and local governments' understanding of the educational program selected in the ROD. These views of PACE workgroup members have been shared with Ecology staff in writing, and most recently as a point of discussion at a PACE workgroup meeting at which the Institutional Controls Coordinator for Ecology's Toxics Cleanup Program was present (*see Summary of November 2, 1999 PACE Meeting, January 3, 2000, prepared by Tacoma Pierce County Health Department*). EPA notes that the current PACE program evaluation criteria and process, developed by the workgroup and discussed in the section above, are consistent with the ROD and Community Protection Measures Scope of Work (*see Scope of Work, Community Protection Measures, Ruston/North Tacoma Study Area, Revised October 21, 1999*). Based on workgroup members' comments, and overall program consistency with the ROD and other project documents, EPA is not implementing at this time the survey being suggested by Ecology. Ecology is not precluded, however, from conducting additional evaluative measures under its own regulatory authorities and sharing such information with the PACE workgroup.

E. Risk Information Review

EPA has conducted a review of the applicable or relevant and appropriate requirements (ARARs) identified in the 1993 Ruston/North Tacoma ROD. There were no revisions or amendments to the ARARs that were determined to affect the protectiveness of the remedy. In addition, a review of the site baseline risk assessment and *Preliminary Remedial Action Objectives Decision Memorandum* was conducted to identify any risk-related information that has changed since the time of the ROD and that has the potential to call into question the protectiveness of the remedy. The following section presents the findings of that review.

- Exposure pathways: Land use at the site is still primarily residential, potential routes of exposure to soil contamination remain as indicated in the site baseline risk assessment, and there are no newly identified contaminants of concern.

- Potential for changes in the future to the cancer slope factor and reference dose for arsenic: In 1996, EPA's Office of Water requested that the National Research Council (NRC) review the arsenic toxicity data base and evaluate the adequacy of EPA's interim maximum contaminant level for arsenic in drinking water. The NRC's report (*Arsenic in Drinking Water, National Research Council, 1999*) reviews new studies on arsenic which strengthen the data on arsenic's ability to cause cancer when ingested, especially internal cancers, e.g., lung and bladder. The report also provides data which strengthens conclusions regarding arsenic's ability to cause non-cancer effects including hyperkeratosis and hyperpigmentation, as well as other chronic non-cancer effects (e.g., cardiovascular system, nervous system, and diabetes). There is some speculation that this data, in the future, could be the basis for changes to the cancer slope factor and reference dose (toxicity factors) for arsenic as reported in the Agency's Integrated Risk Information System (IRIS). If such changes are implemented, the new toxicity factors could differ from those used in the 1992 Ruston/North Tacoma (R/NT) baseline risk assessment. In such event, Region 10 would review the new information to determine whether modification of the arsenic action level is necessary in order to maintain protection of human health and the environment.

- Potential for changes in the future to Agency guidance on assessing risks from dermal (skin) exposure to contaminants: The EPA is currently in the process of updating it's guidance on assessing risks from dermal exposure to contaminants. When finalized, the new guidance would likely contain parameters (e.g., contact rate, adsorption factor) that are different from those used in the 1992 R/NT baseline risk assessment where dermal exposure was not considered to be a significant pathway of concern.

- Agency policy on evaluating health risks to children: In 1995, EPA issued its *Policy on Evaluating Health Risks to Children.* This policy notes that the Agency will develop a "separate" assessment of risks to infants and children where applicable. In the 1992 R/NT baseline risk assessment, an "integrated" child-adult assessment was conducted.

As this policy is not retroactive, and was meant to apply only to those assessments started or revised on or after November 1, 1995, a separate child only risk assessment has not been conducted for this five year review.

- Changes to the integrated exposure uptake biokinetic model for assessing lead exposure: In the 1992 baseline risk assessment for the Ruston/North Tacoma site, EPA used the Agency's LEAD4 model to evaluate potential lead exposures and risks, and to calculate a 500 parts per million (ppm) action level for lead. EPA's most recent guidance on lead is summarized in two directives from EPA's Office of Solid Waste and Emergency Response (OSWER): *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, OSWER Directive #9355.4-12, July 14, 1994*; and *Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, OSWER Directive #9200.4-27, August 1998*. These directives recommend a screening level for lead in soil for residential land use of 400 ppm, and the use of the Agency's updated lead model for the selection of site-specific remediation goals. The soil lead screening level is defined as "a level of contamination above which there may be enough concern to warrant site-specific study of risks." The guidance further states that "levels of contamination above the screening level would not automatically require a removal action, nor designate a site as contaminated." As this guidance was meant to apply to remedial investigations/feasibility studies conducted after the guidance was finalized in 1994, and not generally at sites for which risk assessments had already been completed, EPA did not run the updated model for this five year review.

VII. Assessment

In this section, EPA explains the conclusions of the five year review based upon the information presented above. The outline for this section follows the same as used in the section above.

A. Overall Status of the Project

- Current oversight efforts by EPA are appropriate and commensurate with the level of experience gained by Asarco and its contractors during the past six years. Actions by EPA to reduce oversight efforts over time are also consistent with the Agency's related Superfund reform (see *Reducing Federal Oversight at Superfund Sites with Cooperative and Capable Parties, July 31, 1996, OSWER Directive No. 9200.4-15*).

- Project Completion Reports, Forecast Reports, and Data Validation reports have been submitted by Asarco to the Agency on time, and are consistent with the requirements of the project work plan. Comments or issues raised by EPA or its oversight contractor regarding property cleanup decisions or data quality issues have been satisfactorily addressed.

- Asarco has completed at least the minimum number of properties required to be sampled and cleaned-up each year as identified in the project Consent Decree and modified by way of technical memorandum (see *EPA's Response to Asarco's February 1, 1999 Letter Regarding Requested Schedule Changes for the Tacoma , Washington Asarco Projects, April 21, 1999, Michelle Pirzadeh, Acting Associate Director, Environmental Cleanup Office*, and *EPA's Response of April 21, 1999 to Asarco's Requested Schedule Change, August 31, 1999, Thomas L. Aldrich, Asarco*).

- To date, only 17 property owners have refused access for sampling or cleanup. Fourteen property owners have refused access for sampling and three for cleanup. The project approach to these refusals to date has been to meet with property owners and discuss the benefits of obtaining sampling information or a cleanup, but not to enforce the sampling or cleanup activities at this time. Over time, as the cleanup has proceeded, property owners have grown more comfortable with the cleanup process and results, and/or personal situations have changed, some owners who initially refused access have in fact permitted such to occur. For example, two of the three property owners who originally refused access for cleanup are now agreeable. Given the long term nature of the cleanup program, the relatively low number of refusals, the fact that work is not being held-up by these refusals, and that some refusals are changing their minds over time, EPA believes that this approach should be continued. At some point, near the end of the cleanup project, EPA will consider the use of its enforcement authorities for any remaining refusals. See Section IX Recommendations and Follow-Up Actions.

B. Sampling Program

- Sampling of individual properties as well as replacement soil and sod has been done in accordance with the project sampling and analysis plan. Evaluations of soil samples split between EPA and Asarco indicate overall comparability of results. Overall, summary quality control information shows that project goals for data have been met. For replacement soils, actual replacement soil sample results have been lower than permissible cleanup levels, i.e., MTCA urban background levels of 20 ppm arsenic and 250 ppm lead *(see Attachment 7)*.

C. Soil Removal and Backfill Activities

- Soil removal and backfill activities are being accomplished in accordance with the ROD and project work plan. To date, over one-half of the properties requiring cleanup in zones 1-3 have been completed. Asarco and its contractors are working cooperatively with property owners to resolve any site specific issues as they arise. Asarco's willingness to voluntarily excavate deeper in those areas where contamination remained below 18 inches has minimized the need for long term measures to protect soil caps. In those few areas where soil caps exist (10 ERA sites), four properties have been successfully

redeveloped according to the procedures outlined in the PACE brochure "*Property Owner Guidelines and Responsibilities for ERA Sites.*"

- There are no early indicators of potential remedy failure. EPA notes, however, that sampling to determine whether there has been any recontamination of remediated properties has not occurred. While this is not a requirement of the ROD or any other project decision document, EPA recommends that such sampling occur (see Section IX Recommendations and Follow-Up Actions).

- Given the steepness of the area surrounding the Burlington Northern railroad tracks (*see Attachment 8*), it may not be practical to implement all components of the remedy as identified in the ROD, specifically planting with low lying shrubs and application of a geotextile material to prevent erosion. While fencing and steeply sloped surfaces currently serve to reduce access to the area, and limited sampling indicates marginal contamination levels, a final decision regarding the appropriate level of remediation will need to be made. See Section IX Recommendations and Follow-Up Actions.

D. General Community Relations Activities and PACE Program

- Community relations activities conducted by Asarco have met the requirements of the ROD and have provided various avenues for ongoing coordination and communication with Study Area property owners.

- Requirements of the ROD and program scope of work for implementing community protection measures are being met through the efforts of the PACE workgroup. See *PACE Evaluation Summary, October 15, 1999, Tacoma Pierce County Health Department.*

E. Risk Information Review

- EPA's soil arsenic action level of 230 ppm, selected in the 1993 ROD, was based upon reducing the additional potential skin cancer risk to no more than 5 in 10,000, within EPA's acceptable risk range for cancer causing chemicals. This action level was set based upon consideration of exposure, technical, and uncertainty factors, as well as community views as they were known at the time. This five year review identifies information which could, in the future, potentially affect the protectiveness of the remedy, and EPA's determination that 230 ppm arsenic was within EPA's acceptable risk range.

  A revised risk assessment was not conducted for this five year review as the new and developing information noted has either not occurred (changes to the toxicity factors for arsenic), is not final (draft dermal guidance), or was not meant to apply retroactively to already completed risk assessments (child-only exposure scenarios). EPA Region 10 will

continue to monitor the IRIS data base for potential future changes to the arsenic toxicity factors. If changes are made, a recalculation of risk using the new toxicity factors, and considering any new risk assessment guidance or policies, would be conducted. At that time, an update to the Ruston/North Tacoma (R/NT) baseline risk assessment would be conducted and released for public review and comment, a determination would be made as to whether the remedy at the R/NT site could still be considered to be protective, and this information would be reported in a future five year review.

In the meantime, EPA notes that any potential future changes to the current arsenic action level would not likely impact the protective nature of the current cleanup efforts underway since: 1) properties with the highest arsenic concentrations would still remain the first priority for cleanup, and 2) soil that is excavated under the current cleanup (in excess of 230 ppm) is replaced with sod and soil that is below MTCA cleanup levels for arsenic (20 ppm). See Section IX Recommendations and Follow-Up Actions.

- EPA's soil lead action level of 500 ppm, selected in the 1993 ROD, was based upon a national goal of reducing levels of lead in children's blood to not greater than 10 ug/dl, as well as EPA guidance that recommended establishing soil lead cleanup levels of 500 to 1,000 ppm.

  The updated lead model was not run for this five year review for the following reasons: 1) The policy describing use of the updated model (see OSWER directives 9355.4-12 and 9200.4-27) was not generally meant to be applied at sites where risk assessments had already been completed. 2) Study area lead and arsenic levels in soil are highly correlated, a majority of properties with elevated lead levels are also expected to have elevated arsenic levels that would trigger cleanup.[4] 3) In addition, EPA conducted an evaluation of 135 properties cleaned up in 1999 (see *1999 Semi-Annual Project Completion Report, December 14, 1999, prepared for Asarco by Hydrometrics, Inc.*) to determine the number of properties that had soil remaining between 400 ppm (soil lead screening level) - 500 ppm lead following cleanup. Only 9 of the 135 properties (roughly 7%) had soil concentrations between 400 -500 ppm lead. These concentrations were generally found in one of several subunits on the properties, and at depth, thus further reducing the potential for human exposure.

  As noted above, if it is necessary to conduct a revised risk assessment for this site in the future, the updated lead model would be included and a further evaluation of site data conducted.

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[4] During the remedial investigation and feasibility study, EPA estimated that remediation of soil arsenic above 230 ppm would likely result in remediation of about 80 - 90% of the locations with soil lead exceeding 500 ppm.

VIII. Recommendations and Follow-Up Actions

EPA has not noted any deficiencies in current site operations which would prevent the remedy from being protective. However, several items noted in this report are included here so that they can be tracked for the purpose of the next five year review, and readdressed at that time. They are reported below in the order that they were discussed in this report.

- Asarco should continue to track the property owners who have refused access for sampling or cleanup. Periodically, at least once per year and prior to the start of remediation, contact should be made with those individuals to determine if they have changed their minds. If so, those properties could be added to the list of properties for sampling and cleanup during the current year as identified in the annual Project Forecast Report which is submitted to EPA by Asarco by January 31 of each year. EPA will discuss this recommendation with Asarco within six months of completion of this report so that it can be implemented prior to the 2001 construction season.

- A subset of properties which have already been cleaned-up should be re-sampled for the purpose of identifying whether recontamination is a potential issue at the site. Although this is not a requirement of the ROD, EPA will initiate discussions with Asarco within six months of the completion of this report to add such sampling to the project work plan during the 2000 or 2001 construction season. If Asarco is unable or unwilling to undertake such an effort, EPA will conduct the sampling itself so that the potential for recontamination can be addressed during the next five year review.

- Prior to completion of the cleanup in the Study Area, and no later than the next five year review, EPA will make a determination about how to address soils in the steeply sloped area surrounding the Burlington Northern railroad tracks (*see Attachment 8*). A combination of additional field reconnaissance and sampling efforts, enhancements to existing fencing, and discussions with residents, local officials, and railroad staff regarding use of the area may be appropriate.

- EPA will continue to monitor evolving information regarding arsenic toxicity, as well as general changes in risk assessment guidance and policies. No later than the next five year review, a determination will be made as to whether Agency views on arsenic exposure and resulting risk have changed significantly enough to warrant a revised risk assessment and potential changes to the arsenic action level for the site.

IX. Protectiveness Statement

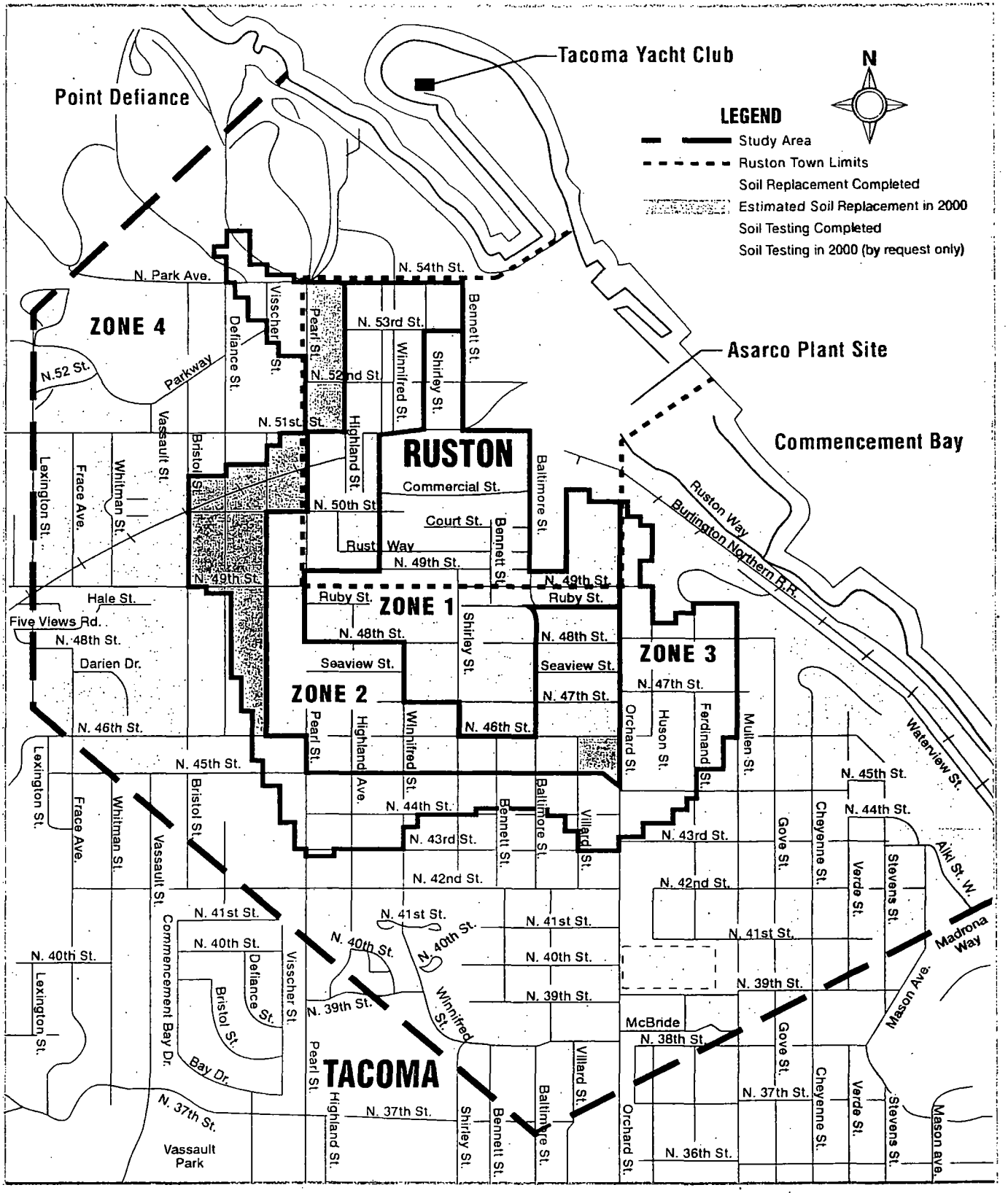
The remedy at the Ruston/North Tacoma Superfund site is expected to be protective of human health and the environment upon completion by achieving the remedial action objectives and remediation goals as identified in the ROD. Immediate threats have been addressed by implementation of an Expedited Response Action in 1989 - 1990 at 10 nonresidential high-use

areas, and by dividing the Study Area into zones for the purpose of sampling and cleanup at the most highly contaminated areas first. Community protection measures, mostly educational in nature, are in place for those areas which have soil arsenic concentrations between the MTCA cleanup level of 20 ppm and the EPA action level of 230 ppm.

X. Next Review

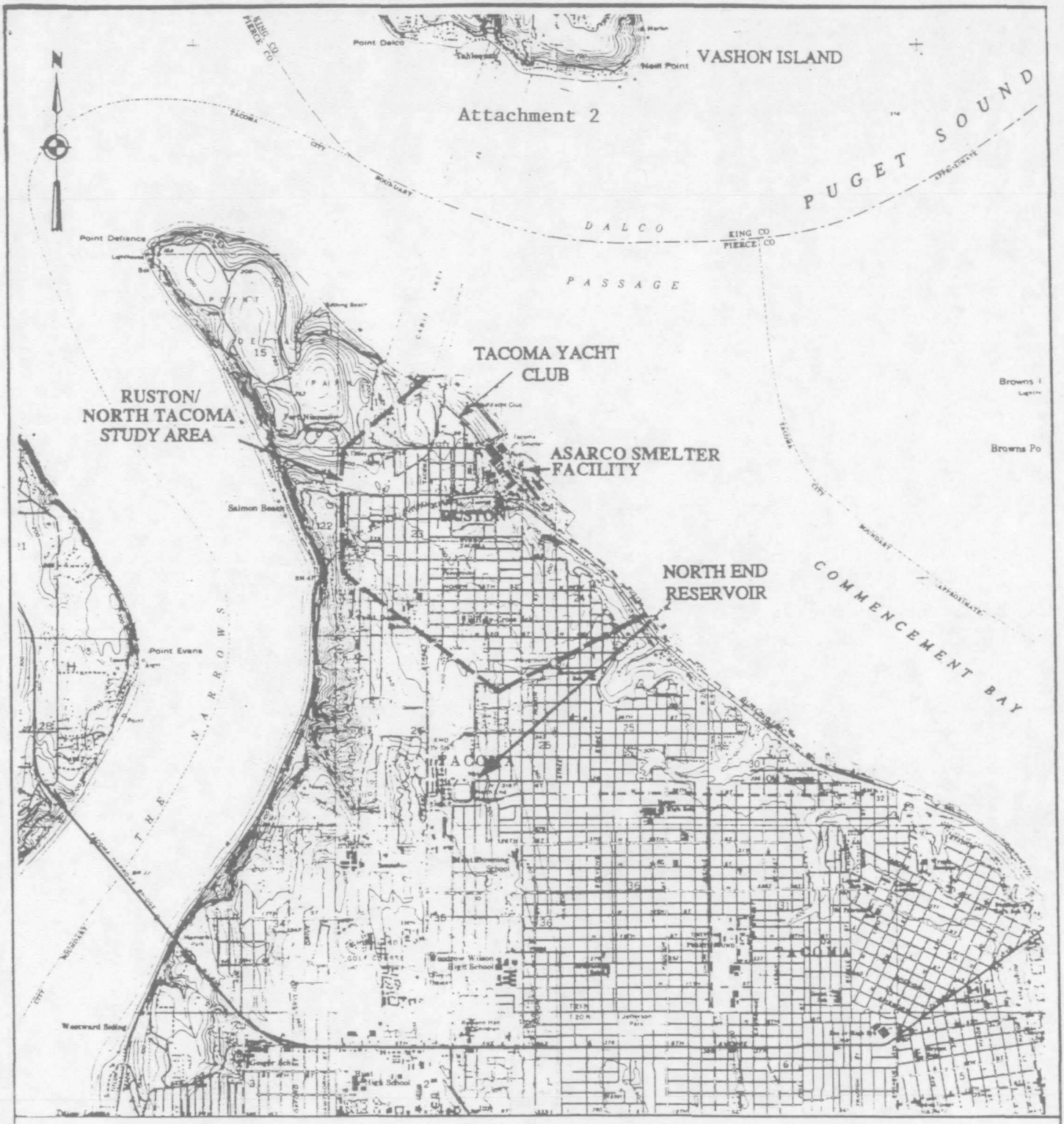
This site requires ongoing five year reviews. The next review will be conducted within five years of the completion of this five year review report. The completion date is the date of the signature shown on the signature cover attached to the front of this report.

Study Area Zones



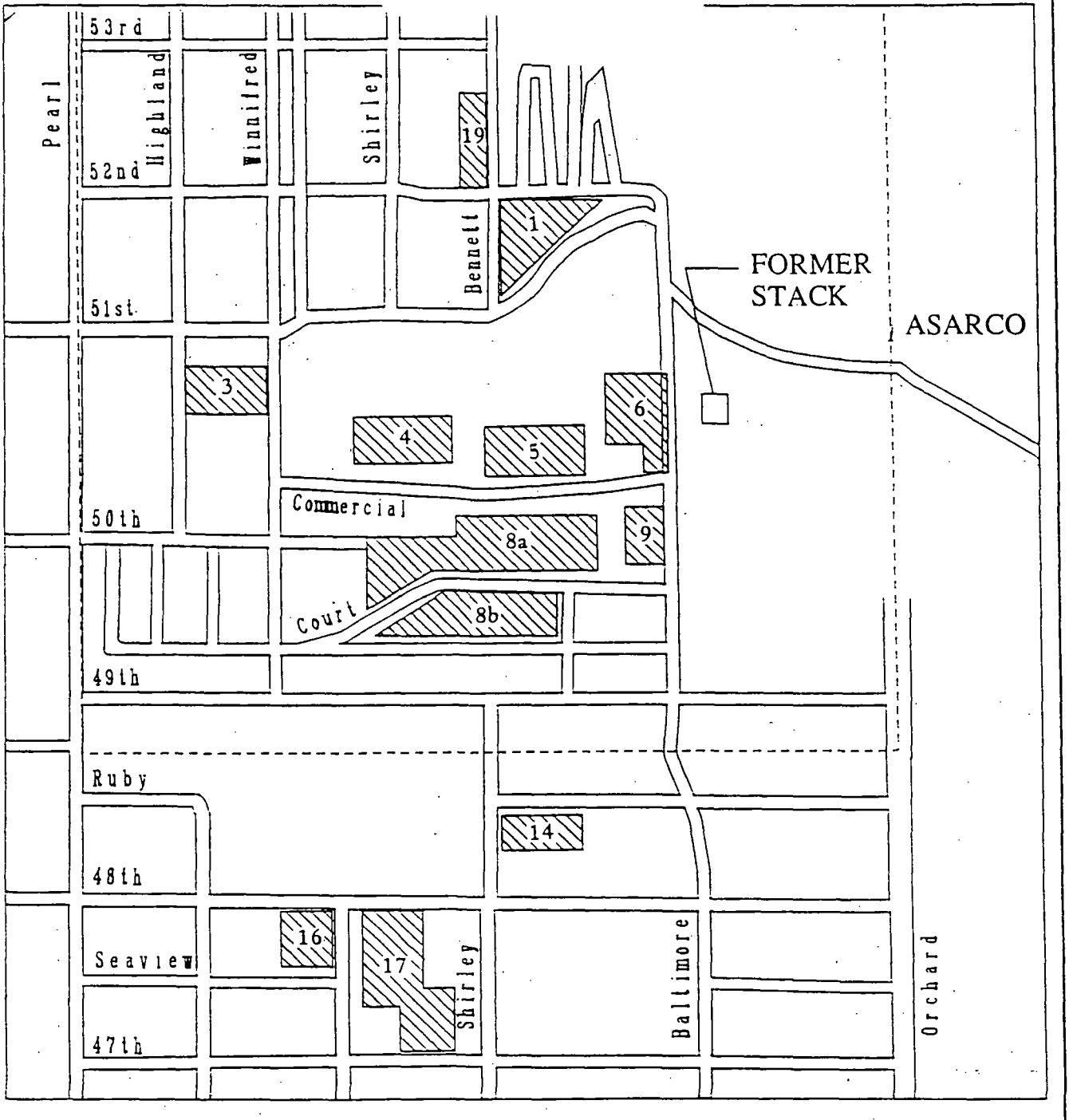
1/00

Attachment 2



LOCATION MAP

Attachment 3



- - - - - - Ruston Town Limits

17 ERA Site Number

FEET

0 500 1000

Expedited Response Action Sites

Attachment 4

REMEDIAL ACTION OBJECTIVES AND REMEDIATION GOALS

REMEDIAL ACTION OBJECTIVES

Contaminant	Arsenic	Lead
Environmental Media	Soil	Soil
Exposure Pathway	Direct contact and incidental ingestion	Direct contact and incidental ingestion
Exposed Population	Current and future residents of north Tacoma and Ruston	Current and future residents of north Tacoma and Ruston
Remedial Action Objectives for Arsenic and Lead	Reduce potential exposure of current and future community residents to soil and dust so that these exposures will be within acceptable risk levels. Reduce the potential transport of soil contaminants inside homes or other buildings where exposures may occur.	

REMEDIATION GOALS

Contaminant	Arsenic	Lead
Goal	Reduce arsenic exposures to ensure that the upper-bound lifetime excess cancer risk to an individual is between 10^{-4} and 10^{-6}	Reduce exposures to lead to ensure that no individual has greater than a 5 percent chance of exceeding a blood lead level criterion of 10 µg of lead per deciliter of blood (10 µg/dL)
Contaminant Concentrations in Soil	230 ppm of arsenic	500 ppm of lead

Attachment 5

PACE Workgroup Goals for the Establishment
of Long Term Community Protection Measures

Ruston/North Tacoma
DRAFT - June1998

Task/Goal	Frequency	TPCHD	RUSTON	TACOMA	ECOLOGY	ASARCO	Comments
1) Provide notice prior to disturbing soil under hard surfaces	ongoing	P	s	s			Requires developing educational materials (TPCHD) and TPCHD tying into Ruston and Tacoma's systems.
2) Maintain an effective level of awareness for future generations:							
• annual reminders	once a year	P					
• historical markers	ongoing						Sponsor unidentified.
• community events		s	P	P			
• educational materials	ongoing	P	s	s	s	s	
• Provide educational resources for handling soils between 20 ppm and 230 ppm							
3) Monitor effectiveness of ongoing program	?	P	s	s	s	s	Adjustments to meet changing needs by committee of TPCHD, Ecology, Ruston, N. End Neighborhood Assoc, and Asarco.
4) Maintain property specific data base	ongoing	P	s	s			
5) Provide soil disposal service for generated soils >230 ppm	ongoing	s				P	

P = primary responsibility
s = support

Attachment 6

Documents Reviewed

1. Record of Decision, Commencement Bay Nearshore/Tideflats Superfund Site Operable Unit 4, Ruston/North Tacoma Study Area, Ruston and Tacoma, Washington, EPA Region 10, June 1999

2. Remedial Investigation Report for Ruston/North Tacoma, prepared by Bechtel Environmental, Inc for EPA, January 1992

3. Feasibility Study Report for Ruston/North Tacoma, prepared by Bechtel Environmental, Inc for EPA, January 1992

4. Baseline Risk Assessment, Ruston/North Tacoma Operable Unit, Commencement Bay Nearshore/Tideflats Superfund Site, Tacoma, Washington, prepared for EPA Region 10 by Gregory Glass and Science Applications International Corporation, January 1992

5. Revised Work Plan for Excavation and Removal of Soils, Ruston and North Tacoma, Washington, prepared by Hydrometrics, Inc for Asarco, December 5, 1994

6. Ruston/North Tacoma Study Area Consent Decree for Remedial Design/Remedial Action, May 2, 1995

7. Ruston/North Tacoma Site Preliminary Remedial Action Objectives Decision Memorandum, EPA, January 1992

8. Scope of Work, Community Protection Measures, Ruston/North Tacoma Study Area, Revised October 21, 1999

9. Monthly and Quarterly Progress Reports of the PACE Workgroup from 1994 - 1999.

10. PACE Evaluation Summary, Tacoma Pierce County Health Department, October 15, 1999

Attachment 7

ASARCO

Thomas L. Aldrich
Site Manager
Tacoma Plant

February 9, 2000

Mary Kay Voytilla
US EPA, HE 113
1200 Sixth Avenue
Seattle, WA 98101

RE: Sample Results

Dear Mary Kay,

As per your request, attached are the sample results for sod, topsoil and backfill used in the Ruston/North Tacoma Residential Remediation Project from 1994 – 1999. If you have any questions, please don't hesitate to call me.

Respectfully submitted,

Thomas L. Aldrich
Site Manager

Cc: Don Robbins, TSC
Karen Pickett, Asarco
Willie Williams, Hydrometrics
Marcia Newlands, HEWM

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Ruston / North Tacoma Sampling Results
Topsoil

SAMPLE NUMBER	LAB NUMBER	SAMPLE DATE	ANALYSIS DATE	As (ppm)	Pb (ppm)	
NWCD-BKF-1-A1	39338-1	4/8/94	4/11/94	< 11	44	wet chemistry
NWCD-BKF-1-B1	39338-2	4/8/94	4/11/94	< 11	39	wet chemistry
NWCD-BKF-1-C1	39338-3	4/8/94	4/11/94	< 11	43	wet chemistry
NWCD-BKF-1-D1	39338-4	4/8/94	4/11/94	< 11	49	wet chemistry
NWCD-BKF-1-A4	39813-1	4/28/94	4/29/94	< 11	14	wet chemistry
NWCD-BKF-1-B2	39813-2	4/28/94	4/29/94	< 11	23	wet chemistry
NWCD-BKF-1-B3	39813-3	4/28/94	4/29/94	< 11	21	wet chemistry
NWCD-BKF-1-C2	39813-4	4/28/94	4/29/94	< 11	15	wet chemistry
NWCD-BKF-1-A1	40811-1	6/7/94	6/8/94	< 11	14	wet chemistry
NWCD-BKF-1-A1	94R-04557	8/24/94	8/26/94	< 11	11	
NWCD-BKF-1-A1	94R-05243	9/22/94	9/22/94	< 11	< 6	
NWCD-BKF-2-A1	94R-05244	9/22/94	9/22/94	< 11	13	
NWCD-BKF-1-A1	94R-05711	10/17/94	10/12/94	< 11	17	
NWCD-BKF-3-A1	94R-06716	11/21/94	11/21/94	< 11	67	
NWCD-BKF-3-A2	94R-06717	11/21/94	11/21/94	< 11	66	
HLOD-9503-001	95R-09766	3/31/95	3/31/95	< 11	< 6	
HLOD-9503-002	95R-09767	3/31/95	3/31/95	< 11	< 6	
HLRD-9507-004	95R-03779	7/19/95	7/19/95	< 11	< 6	
HLRD-9508-005	95R-05440	9/1/95	9/1/95	16	< 6	
ASRS-HLRD-200	96R-02212	3/6/96	3/7/96	12	40	
ASRS-HLRD-201	96R-03572	4/30/96	4/30/96	< 11	8	
ASRS-HLRD-202	96R-03573	4/30/96	4/30/96	< 11	< 6	
ASRS-HLRD-203	96R-04568	6/11/96	6/11/96	< 11	64	
ASRS-HLRD-204	96R-07188	8/19/96	8/20/96	< 11	40	
ASRS-HLRD-205	96R-07189	8/19/96	8/20/96	12	32	
ASRS-HLRD-206	96R-10055	10/30/96	11/1/96	16	31	
ASRS-HLRD-207	96R-10056	10/30/96	11/1/96	12	21	
ASRS-HLRD-210	97R-06113	6/6/97	6/6/97	< 11	< 6	
ASRS-HLRD-211	97R-06114	6/6/97	6/6/97	< 11	< 6	
ASRS-HLRD-212	97R-09510	9/26/97	9/26/97	< 11	< 6	
ASRS-HLRD-300	97R-03338	5/1/97	5/1/97	< 11	< 6	
HYLD-0398-001	98R-00766	3/14/98	3/27/98	< 11	81	
HYLD-0398-002	98R-00767	3/14/98	3/27/98	< 11	57	
HLRD-0598-03	98R-01529	5/27/98	5/27/98	< 11	29	
HLRD-0998-04	98R-02536	9/10/98	9/10/98	< 11	< 6	
HLRD-9903-100	99R-00073	3/16/99	3/16/99	< 11	< 6	
HLRD-9904-101	99R-00708	4/27/99	4/27/99	28	62	
HLRD-9904-101B	87162-02	4/27/99	2/7/00	< 11	32	wet chemistry retest
HLRD-9905-102	99R-01416	5/24/99	5/24/99	< 11	11	
HLRD-9905-103	99R-01417	5/24/99	5/24/99	< 11	11	
HLRD-9906-104	99R-02428	,6/26/99	6/26/99	< 11	14	
HLRD-9906-105	99R-02429	6/26/99	6/26/99	< 11	13	
HLRD-9909-106	99R-04974	9/11/99	9/11/99	< 11	76	
HLRD-9910-107	99R-05927	10/17/99	10/17/99	< 11	24	
HLRD-9910-108	99R-05928	10/17/99	10/17/99	< 11	16	
HRLD-9910-109	99R-06484	10/29/99	10/29/99	< 11	< 6	
HLRD-9911-110	99R-07177	11/16/99	11/16/99	< 11	13	
HLRD-9911-111	99R-07178	11/16/99	11/16/99	< 11	12	

All test results from XRF analysis, unless otherwise noted.

Ruston / North Tacoma Sampling Results
Backfill

SAMPLE NUMBER	LAB. NUMBER	SAMPLE DATE	SAMPLE TIME	ANALYSIS DATE	As (ppm)	Pb (ppm)	
LSNW-BKF-A1	39337-1	4/8/94		4/11/94	< 11	< 6	wet chemistry
LSNW-BKF-B1	39337-2	4/8/94		4/11/94	< 11	< 6	wet chemistry
LSNW-BKF-C1	39337-3	4/8/94		4/11/94	< 11	< 6	wet chemistry
LSNW-BKF-C2	39337-4	4/8/94		4/11/94	< 11	< 6	wet chemistry
LYDS-BKF-1-A1	39920-1	5/3/94		5/6/94	< 11	< 6	
LSNW-SBSL-1-A1	39920-2	5/3/94		5/6/94	< 11	< 6	
LYDS-BKF-1-A1	40461-1	5/24/94		5/25/94	< 11	< 6	
LSNW-SBSL-1-A1	40461-2	5/24/94		5/25/94	< 11	< 6	
LNST-PTRN-1-A1	94R-05902	10/21/94		10/21/94	< 11	< 6	
Lonestar8189CR	94R-03551	7/20/94		7/20/94	< 11	< 6	
PTRN-BKF-1-A1	95-R-09818	4/7/95	1500	4/7/95	< 11	< 6	
LSPS-9504-100	95R-00233	4/18/95	950	4/25/95	< 11	< 7	
LSPS-9504-101	95R-00234	4/18/95	1205	4/25/95	< 11	< 6	
LSNW-SBSL-95054	95R-01890	5/26/95	1300	5/30/95	< 11	< 6	
LSNW-SBSL-95055	95R-01891	5/26/95	1305	5/30/95	< 11	< 6	
LSPS-9507-102	95R-03777	7/18/95	1520	7/24/95	< 11	< 6	
LSPS-9508-103	95R-05441	9/1/95	845	9/13/95	20	< 6	
LSPS-9508-103B	87209-02	9/1/95		2/7/00	< 11	< 6	wet chemistry retest
ASRS-LLPR-001	96R-02210	3/6/96	1015	3/7/96	< 11	< 6	
ASRS-LLPR-002	96R-02211	3/6/96	1030	3/7/96	< 11	< 6	
ASRS-LLPR-003	96R-02598	3/26/96	1020	3/26/96	< 11	< 6	
ASRS-LLPR-004	96R-02599	3/26/96	1025	3/26/96	< 11	< 6	
ASRS-LLRD-003	96R-03585	5/1/96	1100	5/1/96	< 11	< 6	
ASRS-LLRP-004	96R-03586	5/1/96	1105	5/1/96	< 11	< 6	
ASRS-LLRD-005	96R-05398	6/26/96	1100	6/27/96	< 11	< 6	
ASRS-LLRD-006	96R-05399	6/26/96	1105	6/27/96	< 11	< 6	
ASRS-LLPR-007	96R-07606	8/27/96	1100	8/28/96	< 11	< 6	
ASRS-LLPR-008	96R-07607	8/27/96	1105	8/28/96	< 11	< 6	
ASRS-LLPR-009	96R-09896	10/24/96	1100	10/28/96	< 11	< 6	
ASRS-LLPR-010	96R-09897	10/24/96	1105	10/28/96	< 11	< 6	
ASRS-LLRD-020	97R-02593	3/24/97	1300	3/26/97	< 11	< 6	
ASRS-LLRD-021	97R-02594	3/24/97	1310	3/26/97	< 11	< 6	
ASRS-LLPR-210	97R-06116	6/6/97	1320	6/6/97	< 11	< 6	
ASRS-LLPR-211	97R-09677	10/1/97	1300	10/2/97	< 11	< 6	
LLPR-0398-01	98R-00763	3/12/98	1310	3/13/98	< 11	< 6	
LLPR-0398-02	98R-00764	3/12/98	1315	3/13/98	< 11	< 6	
LLPR-0598-03	98R-01527	5/27/98	1300	5/27/98	< 11	< 6	
LLPR-0598-04	98R-01528	5/27/98	1305	5/27/98	< 11	< 6	
LLPR-0998-05	98R-02535	9/9/98	1310	9/09/98	< 11	< 6	
LLPR-9903-100	99R-00071	3/16/99	1325	3/17/99	< 11	< 6	
LLPR-9903-101	99R-00072	3/16/99	1330	3/17/99	< 11	< 6	
LLPR-9905-102	99R-00832	5/5/99	1110	5/6/99	< 11	< 6	
LLPR-9905-003	99R-01636	5/27/99	1050	5/27/99	< 11	< 6	
LLPR-9907-004	99R-03205	7/23/99	1000	7/23/99	< 11	< 6	
LLPR-9909-005	99R-05291	9/20/99	1105	9/20/99	< 11	< 6	
LLPR-9910-006	99R-06302	10/26/99	1230	10/27/99	< 11	< 6	
LLPR-9911-107	99R-07180	11/17/99	950	11/18/99	< 11	< 6	
LLPR-9911-108	99R-07181	11/17/99	955	11/18/99	< 11	< 6	

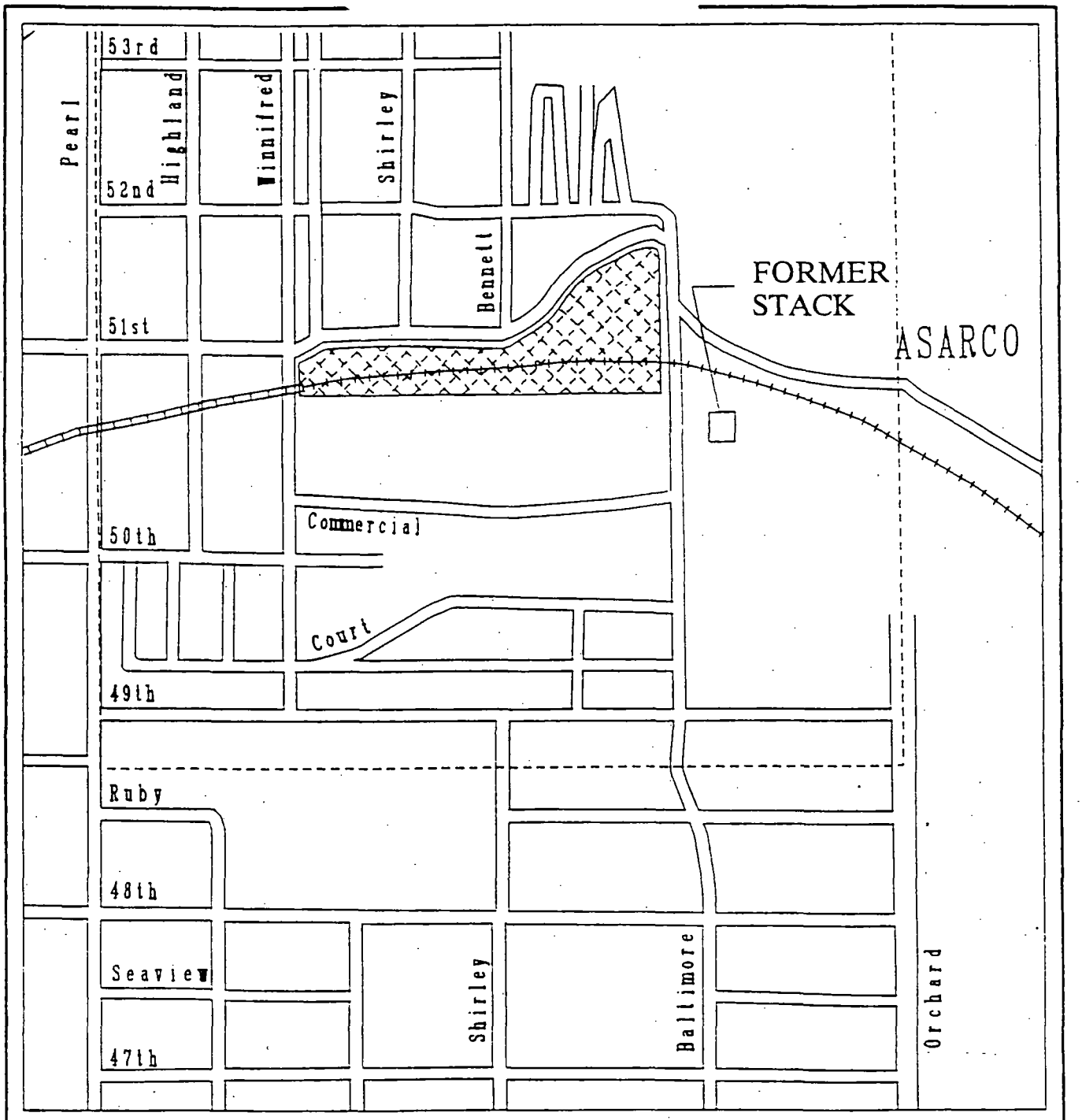
All test results from XRF analysis, unless otherwise noted.

Ruston / North Tacoma Sampling Results
Sod

SAMPLE NUMBER	LAB NUMBER	SAMPLE DATE	SAMPLE TIME	ANALYSIS DATE	As (ppm)	Pb (ppm)	
BLCK-BKF-01-A1	39186-1	4/1/94		4/11/94	< 11	10	wet chemistry
BLCK-BKF-02-A1	39186-2	4/1/94		4/11/94	< 11	9	wet chemistry
BLCK-BKF-03-A1	39186-3	4/1/94		4/11/94	< 11	10	wet chemistry
BLCK-BKF-04-A1	39186-4	4/1/94		4/11/94	< 11	12	wet chemistry
BLCK-BKF-05-A1	39186-5	4/1/94		4/11/94	< 11	9	wet chemistry
BLCK-BKF-06-A1	39186-7	4/1/94		4/11/94	< 11	11	wet chemistry
BLCK-BKF-07-A1	39186-8	4/1/94		4/11/94	130	84	wet chemistry
BLCK-BKF-08-A1	39186-9	4/1/94		4/11/94	< 11	12	wet chemistry
BLCK-BKF-09-A1	39186-10	4/1/94		4/11/94	< 11	11	wet chemistry
BLCK-BKF-10-A1	39186-11	4/1/94		4/11/94	< 11	10	wet chemistry
BLCK-BKF-11-A1	39186-12	4/1/94		4/11/94	< 11	9	wet chemistry
BLCK-BKF-12-A1	39186-13	4/1/94		4/11/94	< 11	11	wet chemistry
BLCK-BKF-13-A1	39186-14	4/1/94		4/11/94	< 11	10	wet chemistry
BLCK-BKF-14-A1	39186-15	4/1/94		4/11/94	< 11	11	wet chemistry
BLCK-BKF-15-A1	39186-17	4/1/94		4/11/94	< 11	11	wet chemistry
BLCK-BKF-16-A1	39186-18	4/1/94		4/11/94	< 11	12	wet chemistry
BLCK-BKF-17-A1	39186-19	4/1/94		4/11/94	< 11	11	wet chemistry
BLCK-BKF-18-A1	39186-20	4/1/94		4/11/94	< 11	9	wet chemistry
BLCK-BKF-19-A1	39186-21	4/1/94		4/11/94	< 11	10	wet chemistry
BLCK-BKF-20-A1	39186-22	4/1/94		4/11/94	< 11	<6	wet chemistry
CTGN-9503-001	95R-09768	3/31/95	1225	3/31/95	< 11	< 6	
CTGN-SOD-9505-4	95R-01892	5/26/95	1425	5/30/95	< 11	< 6	
CTGN-SOD-9507-5	95R-03778	7/18/95	1610	7/24/95	< 11	< 6	
CTGN-SOD-9508-5	95R-05439	9/1/95	740	9/13/95	19	< 6	
CTGN-SOD-9508-6	95R-05438	9/1/95	735	9/13/95	20	< 6	
CTGN-SOD-9508-6B	87209-01	9/1/95	735	2/7/00	< 11	9	wet chemistry retest
ASRS-CTGR-201	96R-03574	4/30/96	955	4/30/96	< 11	< 6	
ASRS-CTGR-202	96R-04569	6/11/96	1120	6/11/96	12	< 6	
ASRS-CTGR-203	96R-04570	6/11/96	1125	6/11/96	< 11	< 6	
ASRS-CTGR-204	96R-07190	8/19/96	1200	8/20/96	< 11	< 6	
ASRS-CTGR-205	96R-10057	10/30/96	1625	11/1/96	21	< 6	
ASRS-CTGR-205B	87162-01	10/30/96	1625	2/7/00	17	17	wet chemistry retest
ASRS-CTGR-206	97R-06115	6/6/97	1100	6/6/97	< 11	< 6	
ASRS-CTGR-207	97R-09509	9/26/97	730	9/26/97	< 11	< 6	
ASRS-CTGR-300	97R-03339	5/1/97	1400	5/1/97	< 11	< 6	
CTGR-0398-001	98R-00765	3/14/98	1235	3/27/98	< 11	< 6	
CTGR-0598-03	98R-01530	5/27/98	1525	5/28/98	< 11	< 6	
CTGR-0998-05	98R-02537	9/10/98	935	9/10/98	< 11	< 6	
CTGR-9903-100	99R-00074	3/16/99	1605	3/17/99	< 11	< 6	
CTGR-9904-101	99R-00706	4/27/99	655	5/3/99	< 11	< 6	
CTGR-9904-102	99R-00707	4/27/99	700	5/3/99	< 11	< 6	
CTGR-9905-103	99R-01418	5/24/99	1120	5/25/99	< 11	< 6	
CTGR-9909-104	99R-04975	9/11/99	945	9/14/99	< 11	< 6	
CTGR-9909-105	99R-04976	9/11/99	950	9/14/99	< 11	< 6	
CTGR-9910-106	99R-06483	10/29/99	1135	11/1/99	< 11	< 6	
CTGR-9911-107	99R-07179	11/16/99	1350	11/18/99	< 11	< 6	

All test results from XRF analysis, unless otherwise noted.

Attachment 8



Attachment 9

List of Informational Brochures Prepared by the Program for Area Cleanup Education Workgroup

1. Information Regarding Properties that Will Not Require Remediation
2. Background on Soil Sampling
3. Soil Sampling/Replacement questions and Answers
4. Study Area Zones Map
5. Handling and Disposal of Study Area Soils
6. Property Owner Guidelines and Responsibilities in Remediated Yards With Caps
7. Yard Replacement Care and Responsibilities Contract
8. Property Owner Guidelines and Responsibilities for Expedited Response Properties
9. Newly Planted Sod Care
10. Procedure for Out of Sequence Sampling Requests
11. Questions and Answers Regarding Soil Handling Guidelines at the City of Tacoma Landfill
12. Citizens Guide to Arbitration
13. Ruston/North Tacoma Arbitration Rules and Procedures
14. Handling and Disposal of Study Area Soils in Commercial Settings
15. Property Owner Guidelines and Responsibilities in Remediated Yards