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EARECKSON AFS
ALASKA

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 297

TECHNICAL DOCUMENT TO SUPPORT INSTALLATION RESTORATION DECISION

BASE OPERATIONS SPILL (SS14) EARECKSON AIR STATION, ALASKA

FINAL

JULY 2004

FINAL

TECHNICAL DOCUMENT TO SUPPORT INSTALLATION RESTORATION DECISION

PART I DECLARATION

SITE NAME AND LOCATION

Site Number: SS14
Site Name: Base Operations Spill
Location: Eareckson Air Station, Alaska

STATEMENT OF BASIS

This Record of Decision (ROD) presents the selected remedy for the United States Air Force (Air Force) Installation Restoration Program (IRP) Site SS14 (Base Operations Spill) at Eareckson Air Station (AS), Alaska. This document was developed in accordance with the Defense Environmental Restoration Program, 10 United States Code (USC) 2701 and is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9604(a) and Executive Order 12580, 52 Federal Register 2923. In addition, to the extent practicable, this ROD is also consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations 300); and 18 Alaska Administration Code 75 Article 3 *Discharge Reporting, Cleanup and Disposal of Oil and Other Hazardous Substances*.

This ROD is based on information contained in the Administrative Record of the Air Force IRP for Eareckson AS, which includes the following documents:

- 1990 IRP Stage 1 Final Technical Report for Shemya Air Force Base
- 1993 Shemya Air Force Station IRP Site Investigation, Field Investigation Report (samples collected in 1992)
- 1996 Eareckson AS Remedial Investigation/Feasibility Study Report (Volume III) (samples collected in 1994)

ASSESSMENT OF THE SITE

SS14 is located in the south-central portion of Shemya Island on the aircraft asphalt parking area near the former Base Operations Terminal (Figure 1). The site consists of a flat, graded parking apron that is partially paved and is still actively used for aircraft maintenance. On 9 August 1983, a cracked fuel tank in a damaged C-5A aircraft spilled approximately 50 gallons of JP-4 fuel on the parking apron. The approximate source area of the spill is shown on Figure 2. The

Station Fire Department reportedly hosed the fuel off the asphalt with water. The resulting water/fuel mixture flowed into the sandy soils between the parking apron and the south side of the runway. The fuel-saturated soils were later excavated, containerized, and stored at another location on base.

Since 1988, several investigations were conducted to ensure that all petroleum related contamination was removed from the site. During investigations in 1992 and 1994, soil samples were collected for laboratory analysis. During the 1994 investigation, groundwater samples were also collected. The samples were analyzed for petroleum hydrocarbons, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. The findings are summarized below.

Soils. In 1992, four surface soil samples were collected for on-site laboratory analysis. United States Environmental Protection Agency (EPA) Method 418.1 tested the samples for total petroleum hydrocarbons. Contaminants were detected in all four surface soil samples. It is unlikely that significant petroleum contamination exists at the site, since additional samples analyzed for other petroleum hydrocarbon constituents (such as VOCs and SVOCs) were either not detected or detected at very low levels.

In 1994, five soil samples were collected for off-site laboratory analysis. Four samples were collected from surface locations, and one sample was collected from subsurface soil at a depth of 5 feet below ground surface. Three SVOCs were detected at concentrations above cleanup levels; however, these SVOCs were limited to the surface samples. The SVOCs are attributed to asphalt chips associated with the runway and the incomplete combustion of fuels from aircraft exhaust. No other contaminants were detected above cleanup levels (see Tables 3 and 4). There is no unacceptable risk in the soil based on the updated risk assessment (Appendix A) and the current site conditions.

Groundwater. One groundwater sample was collected from an on-site monitoring well for off-site laboratory analysis. Aluminum was the only analyte detected above cleanup levels (see Table 5); however, aluminum is not a component of JP-4 and therefore is not associated with the fuel spill. In addition, it is unlikely that aluminum is a result of anthropogenic activities. There is no unacceptable risk in the groundwater based on the updated risk assessment (Appendix A) and the current site conditions.

Access to Shemya Island is limited to Air Force approved activities. There are no current plans for future development at the site.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for SS14 is no further remedial action planned with site closure. Contaminants at SS14 are at low levels, appear to be decreasing, and pose no unacceptable risk to human health or the environment. The reported 50-gallon fuel spill on the parking apron has been sufficiently remediated through soil removal and natural attenuation, and no further

monitoring is needed. This remedy is cost-effective in its approach to control exposures to human and ecological receptors.

DECLARATION AND STATUTORY DETERMINATIONS

The selected remedy for SS14 is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant, and is appropriate and cost-effective. The selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy, because contaminant levels have been determined to present no unacceptable risk to human health or the environment or, for soil and groundwater, or are not attributable to any contaminant sources at SS14.

It has been determined that no further remedial action is necessary at the site. The reported 50-gallon fuel spill on the parking apron has been sufficiently remediated through soil removal and natural attenuation, and no further monitoring is needed, including a five-year review.

In light of information presently available regarding SS14, the Alaska Department of Environmental Conservation (ADEC) has determined that the requirements of Alaska laws and regulations relative to the cleanup of oil and hazardous substances at SS14 have been satisfied and that the site will be closed on the ADEC database with No Further Action.

This signature sheet documents the decision made for SS14, Eareckson AS, Alaska. The ADEC concurs with the Air Force's selected remedy. This decision may be reviewed and modified in the future if new information becomes available which indicates the presence of previously undiscovered contamination or exposure routes that may cause a risk to human health or the environment.

Kathleen I. Ferguson — 7 OCT 04

KATHLEEN I. FERGUSON, P.E.
The Deputy Civil Engineer
DCS/Installations & Logistics

Date

John Halverson, for — 19 November 04

JENNIFER ROBERTS
Contaminated Sites Section Manager
Alaska Department of Environmental Conservation

Date

PART II

RECORD OF DECISION

BASE OPERATIONS SPILL (SS14)
EARECKSON AIR STATION, ALASKA

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Eareckson Air Station (AS) is situated on Shemya Island, approximately 1,500 miles southwest of Anchorage, Alaska, at the westernmost tip of the Aleutian Islands. Shemya Island is part of the Near Islands group of the Aleutian Archipelago (Figure 1).

The United States Government owns Shemya Island. Eareckson AS is one of many United States Air Force (Air Force) communication installations that are part of a defense communication network and aircraft warning system across Alaska. Shemya Island is relatively small (approximately 4.5 miles long by 2 miles wide) and flat. In accordance with Public Law 106-554, Section 302, the Air Force has primary jurisdiction, custody, and control over Shemya Island and its appurtenant waters. The Secretary of the Interior has secondary jurisdiction over Shemya Island consistent with the inclusion of Shemya Island in the Alaska Maritime National Wildlife Refuge System.

The United States Army (Army) first developed facilities on Shemya Island in 1943 to support operations against the Japanese occupation forces on the nearby islands of Attu, Agattu, and Kiska. In 1954, the site was deactivated, and was turned over to the Civil Aeronautics Authority in 1955. In 1958, the Air Force returned to Shemya Island to support various Air Force and Army strategic intelligence-gathering activities. It has remained active in this capacity to the present. In 1995, the AS was downsized and converted to caretaker status and a private operation and maintenance contractor took control of the facility under contract to the Air Force.

SS14, also known as the Base Operations Spill, is located in the south-central portion of Shemya Island near the former Base Operations Terminal (Figure 1). A release occurred on the aircraft parking area and was hosed with water into the adjacent sandy soils south of the runway. SS14 is included in the Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program. Figure 2 shows the approximate location of SS14 and includes a groundwater contour map.

Access to Shemya Island is limited to Air Force approved activities. There are no current plans for future development at the site.

1.1 SITE HISTORY AND REGULATORY ENFORCEMENT ACTIVITIES

SS14 is the location of a reported 50-gallon, JP-4 spill on an aircraft parking apron that is still actively used for aircraft maintenance. SS14 is a flat, graded area that is primarily paved and has

remained an active runway since construction in 1944. On 9 August 1983, a cracked fuel tank in a damaged C-5A aircraft spilled approximately 50 gallons of JP-4 fuel on the asphalt parking area near the former Base Operations Terminal (USAF, 1993b). According to the Phase I report, the Station Fire Department hosed the fuel off the asphalt with water, which subsequently drained into the sandy soils south of the runway (USAF, 1984). According to documentation prepared to support a No Further Action Decision in 1992, "the resulting mixture of water and fuel was observed to have flowed off the apron onto the ground between the parking apron and the runway."

The fuel-saturated soils were excavated, stored in barrels, and disposed of at the Fire Training Area. The Phase I report did not indicate that any records exist listing the date(s) of the soil removal, quantities of soil excavated, or the exact location at the Fire Training Area where the excavated soil was placed. It is not known if soil samples were collected as part of the excavation activity.

An area of degraded asphalt was observed on the parking apron east of the terminal building location in 1988, and might indicate the area where the fuel spill occurred in 1983. However, during the 1992 site visit, no evidence of contamination was observed in the area investigated.

Since 1983, numerous regulatory enforcement activities were conducted at SS14. Initially, SS14 was identified as Site PS-10. In 1993, the site was officially renamed SS14 and is included in the ADEC POL Program. The site was evaluated in 1988, 1992, and 1994. The following provides a brief summary for each regulatory enforcement activity:

- During the 1988 investigation, a 50- by 8-foot area along the south side of the taxiway was identified as the possible spill location. However, there was no discoloration, odor, or sign of the spill in the soil, and the vegetation appeared normal. No analytical samples were collected from SS14 during the 1988 investigation.
- The 1992 field investigation revealed no visual evidence of the spill. Surface soil samples were collected from the south side of the aircraft parking area for on-site laboratory analysis.
- The 1994 investigation consisted of installing one monitoring well and advancing three soil boreholes. Surface soil, subsurface soil, and groundwater samples were collected. A site reconnaissance and ecological survey were also conducted.

1.2 COMMUNITY PARTICIPATION

Past hazardous waste investigations and cleanup activities at Eareckson AS have been documented in several Air Force reports. These reports are listed and the information summarized in the Eareckson AS Remedial Investigation (RI) and Feasibility Study (FS) (USAF, 1996a). An Administrative Record and an information repository have been established at the 611th Civil Engineering Squadron at Elmendorf Air Force Base, Alaska, and at Eareckson AS. A list of references used in the preparation of this document is located in Appendix C.

Prior to conducting the RI at SS14, the Air Force initiated a community relations program for Eareckson AS. The most recent version of the Community Relations Plan was prepared in August 1994 (USAF, 1994a). Four community relations public meetings, two at Eareckson AS

and two in Anchorage, were held during the RI phase of the program (1988 to 1994) to discuss findings of the investigations. In addition, a Fact Sheet and newsletters have been published to update the community on the activities being conducted at Eareckson AS.

A Proposed Plan for SS14 (as well as five other sites on Shemya Island) was distributed to everyone on the interested parties list and made available to the public. A public notice was published in the *Anchorage Daily News* in April 2002 to announce the availability of the Proposed Plan for review and comment. A public meeting was held on May 2, 2002, at the Loussac Library in Anchorage to discuss the Proposed Plan and receive comments. The comment period was from May 1 to May 31, 2002.

Responses to community questions and comments made during the Proposed Plan comment period are presented in Part III (Responsiveness Summary) of this Record of Decision (ROD).

2.0 SITE CONTAMINATION AND RISKS

The RIs conducted at SS14 have provided information to evaluate the extent of contamination and the associated risks to human health and the environment. The findings are summarized in this ROD.

2.1 INVESTIGATION RESULTS

The overall objective of the numerous investigations conducted at SS14 was to identify migration pathways associated with the accidental release of JP-4 fuel and to determine the potential impacts to human and ecological receptors. In order to achieve this objective, laboratory analytical samples from SS14 were collected in site media, including surface soil, subsurface soil, and groundwater. Surface soil samples are defined as a soil sample that was collected from 0 to 2 feet below ground surface (bgs). Subsurface soil samples are defined as a soil sample collected below 2 feet bgs. A summary of media sampled, year of sampling, number of samples collected, analytical methods used, and the suite of analyses conducted for SS14 is presented in Table 1.

A total of 20 samples were analyzed during investigations conducted at SS14. An on-site laboratory located on Shemya Island analyzed 14 of these samples. Analytical results collected from the on-site laboratory were used to focus the collection of the remaining samples that were shipped to an off-site laboratory to be analyzed for a wide variety of chemicals.

The on-site laboratory consisted of two portable gas chromatographs (GCs) and an infrared spectrophotometer (IR). The GCs quantitatively measured the following in soil: gasoline range organics (GRO) by United States Environmental Protection Agency (EPA) Solid Waste Method (SW) 8015M; diesel range organics (DRO) by SW8100M; trichloroethylene (TCE) and perchloroethylene (PCE) by SW8010; and benzene, toluene, ethylbenzene, and xylenes (BTEX) by SW8020. The IR quantitatively measured total petroleum hydrocarbons (TPH) by EPA Method 418.1 in soil and water matrices.

The on-site laboratory analyses were subjected to the same rigorous quality assessment/quality control procedures as those of a standard, off-site analytical laboratory. The decision to use an on-site laboratory was detailed in the RI Work Plan, which was reviewed and approved by ADEC prior to implementation. The on-site laboratory results were not used for evaluation of risk to human health or the environment.

The following sections provide a brief summary of the analytical results from all investigations. A more detailed analytical summary is provided in the RI/FS Report (USAF 1995, 1996a, 1996b).

2.1.1 On-site Laboratory Results

An on-site laboratory analyzed 14 samples collected in 1992 and 1994 at SS14. The number of relevant samples collected for each matrix, according to each sampling year, is listed in Table 1. Surface soil samples were collected to pinpoint the areas with the highest soil contamination; the areas with the highest contamination were then re-sampled for off-site laboratory analysis. On-site laboratory results are summarized in Table 2. Cleanup levels are presented in Tables 3, 4, and 5. A discussion of how cleanup levels were selected is presented in Section 3 of this ROD.

On-site surface soil sample analysis in 1992 identified several areas of elevated TPH levels near the southern portion of the aircraft apron. TPH was detected in all four of the soil samples. The TPH concentrations ranged from 4,617 to 16,683 milligrams per kilogram (mg/Kg). The highest TPH result in surface soil (16,683 mg/Kg) was measured at sample location P10-004, which is located near the southwest corner of the SS14 spill area. TPH results can include interference from natural organic constituents in the soil, such as peat material, which is abundant on Shemya Island.

In 1994, subsurface soil samples were collected during drilling activities associated with the site assessment. The samples were analyzed at the on-site laboratory for BTEX, GRO, DRO, TCE, and PCE. All six subsurface soil samples were non-detect for all parameters.

In 1994, groundwater samples were also collected for on-site analysis, and analyzed for BTEX, GRO, DRO, TCE, and PCE. On October 8, 1994, a groundwater sample was collected from the drilling auger during Monitoring Well SS14-MW01 installation. The sample contained 1.1 and 5.2 milligrams per liter (mg/L) of GRO and DRO, respectively. The well was completed and resampled on October 16, 1994. The sample collected from the completed monitoring well was non-detect for BTEX, GRO, DRO, TCE, and PCE. The presence of GRO and DRO in the initial sample was likely due to contamination associated with the drilling auger.

In addition, two groundwater samples were collected from well points associated with soil Borings SS14-SB01 and SS14-SB03 and analyzed for BTEX, GRO, DRO, TCE, and PCE. The groundwater sample collected from Boring SS14-SB01 contained 0.0013 mg/L of benzene, and the sample from collected from Boring SS14-SB03 contained 0.0026 mg/L benzene and 0.016 mg/L ethylbenzene. The reported concentrations for groundwater samples collected from the soil borings are below ADEC Alaska Administrative Code (AAC) 75.345, Table C, Groundwater Cleanup Levels.

2.1.2 Off-Site Laboratory Results

Historical off-site laboratory results of samples collected at SS14 during the RI/FS period (1988 to 1994) are listed in Table 6 for constituents detected above cleanup levels. SS14 sample locations and the analytes that exceeded cleanup levels are depicted on Figure 2. The following sections discuss the off-site laboratory results. Human health and ecological risk assessments were previously prepared for SS14, as documented in the *Eareckson Air Station Remedial Investigation/Feasibility Study*, and the *Eareckson Air Station Basewide Monitoring Report*. The Air Force is updating the risk assessments in response to comments received from the ADEC on the draft Decision Document for SS14, and to provide consistency with current Alaska regulations (e.g., 18 AAC 75) and risk assessment methods described in ADEC's *Risk Assessment Procedures Manual*. The results of the updated Tier I screening risk assessment conducted for SS14 are presented in Appendix A, with contaminant of potential concern (COPCs), and discussed in the following sections.

2.1.2.1 Soil (Surface and Subsurface)

In 1994, four surface soil samples and one subsurface soil sample were collected for off-site laboratory analysis and analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). One surface soil sample, SS14-SB02, was collected adjacent to the 1992 sample area to provide confirmation data concerning elevated TPH levels. VOCs and SVOCs were not detected in the sample, which indicates the TPH detected in 1992 consist primarily of heavier range hydrocarbons, and/or naturally organic constituents in the soil – such as peat material, which is abundant on Shemya Island. The heavier range hydrocarbons are likely attributable to the asphalt runway and are probably not source-related.

The remaining soil samples collected in 1994 for off-site analysis did not contain VOCs. Two surface soil samples collected south of the parking apron contained several SVOCs above the detection limit; however, only the polynuclear aromatic hydrocarbons (PAHs) benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene were detected above applicable ADEC 18 AAC 75.341, Method Two, Table B1, Soil Cleanup Levels. The following discusses each of the detected PAHs, the contaminant concentration, and the sample location.

- Benzo(a)anthracene was detected in two out of four surface soil samples at concentrations of 1.4 and 10.2 mg/Kg. The latter result exceeds the ADEC 18 AAC 75.341, Method Two, Table B1, Migration-to-Groundwater Soil Cleanup Level of 6 mg/Kg. Benzo(a)anthracene was detected at 10.2 mg/Kg from sample location SS14-SS02. The proximity of SS14-SS02 to the parking pavement, and distance from the JP-4 spill, indicate that the benzo(a)anthracene level detected is the result of residual asphalt paving operations and not the JP-4 spill at SS14.
- Benzo(a)pyrene was detected in two out of four surface soil samples at concentrations of 1.22 and 7.94 mg/Kg. Both results exceed the ADEC 18 AAC 75.341, Method Two, Table B1, Migration-to-Groundwater Soil Cleanup Level of 1.0 mg/Kg. Benzo(a)pyrene was detected at 7.94 mg/Kg from sample location SS14-SS02. The proximity of SS14-SS02 to the parking pavement, and distance from the JP-4 spill, indicate that the benzo(a)pyrene level detected is the result of residual asphalt paving operations and not the JP-4 spill at SS14. Benzo(a)

pyrene was detected at 1.22 mg/Kg from sample location SS14-SS01, which is downgradient from the JP-4 spill and not adjacent to the parking pavement.

- Benzo(b)fluoranthene was detected in two out of four surface soil samples at concentrations of 2.65 and 12.2 mg/Kg. The latter result exceeds the ADEC 18 AAC 75.341, Method Two, Table B1, Migration-to-Groundwater Soil Cleanup Level of 11 mg/Kg. Benzo(b) fluoranthene was detected at 12.2 mg/Kg from sample location SS14-SS02. The proximity of SS14-SS02 to the parking pavement, and distance from the JP-4 spill, indicate that the benzo(b)fluoranthene level detected is the result of residual asphalt paving operations and not the JP-4 spill at SS14.

Screening level human health Tier I risk estimates for direct exposures to soils exceeded risk criteria. The following COPCs contribute to an exceedence of screening risk criteria (Appendix A, Table A-1):

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene

The screening level cancer risk estimate for soil of 9.4×10^{-5} exceeds the cancer risk criterion of 1.0×10^{-5}. However, the excess risk was entirely due to PAHs detected in one surface soil sample (SS14-SS02). This sample was collected immediately adjacent to the runway, and the presence of PAHs in soil is believed to be the result of coal tar used in construction of the runway rather than from the JP-4 spill. The COPCs listed above pose no unacceptable risk based on the updated risk assessment in Appendix A.

Ecological hazard estimates for soils exceeded the ecological Tier I cumulative screening criterion. The following contaminant of potential ecological concern (COPECs) contributes to an exceedence of screening risk criteria (Appendix A, Table A-1).

- Di-n-butyl phthalate
- Fluoranthene
- Phenanthrene
- Pyrene

Excess risk was primarily due to the presence of di-n-butyl phthalate and PAHs detected in one surface soil sample (SS14-SS02). However, di-n-butyl phthalate was also detected in laboratory blanks and is believed to represent laboratory contamination. As previously described, the presence of PAHs in Sample SS14-SS02 is believed due to the coal tar that was used in the construction of the runway. Based on the above, SS14 soil COPECs are not anticipated to result in significant ecological impacts.

Overall, risks to human health and the environment due to COPCs and COPECs detected in soils at SS14 pose no unacceptable risk based on the updated risk assessment (Appendix A) and the current site conditions.

2.1.2.2 Groundwater

A groundwater sample was collected in 1994 for off-site laboratory analysis. The sample was analyzed for VOCs, SVOCs, total metals, and major ions. The sample was collected from Monitoring Well SS14-MW01 and did not contain any VOCs or SVOCs. Aluminum was the only metal detected above cleanup levels. Aluminum was detected at a concentration of 75 mg/L, which exceeds the ADEC 18 AAC 75.345 Table C, Groundwater Cleanup Level of 36.5 mg/L.

In 1994, nitrate was also detected in Monitoring Well SS14-MW01 at 6.54 mg/L. Currently, there are no applicable cleanup levels for nitrate in groundwater. For reference, the Alaska Maximum Contaminant Level for nitrate in drinking water is 10 mg/L. The nitrate detection is likely due to natural concentrations.

The screening level human health Tier I risk estimate for direct exposure to groundwater exceeds the screening risk criterion. The following COPCs contribute to an exceedence of screening risk criteria (Appendix A, Table A-1):

- Aluminum
- Vanadium

There is no cancer risk for groundwater at Site SS14. However, the total noncancer estimate exceeds screening criteria primarily due to the presence of aluminum and vanadium. Aluminum is responsible for 88 percent of the total noncancer hazard index of 2.4. Aluminum is found in one monitoring well (WG-SS14-MW01) at 75 mg/L. This is less than two times the maximum apparent background concentration of 41.7 mg/L and below the maximum observed concentration in unbiased samples of 95.2 mg/L (USAF, 1996c). Vanadium was also detected in this same monitoring well at 0.062 mg/L. This is below the background level of 0.2028 for the 97.5 percent upper control limit and the ADEC 18 AAC 75.345, Table C, Groundwater Cleanup Level of 0.26 mg/L for vanadium. Therefore, COPCs detected in the groundwater at Site SS14 pose no unacceptable risk to human health.

A total ecological hazard was not evaluated for direct exposures to groundwater, because there is no exposure to groundwater at Site SS14.

There is no unacceptable risk in the associated groundwater based on the updated risk assessment and the current site conditions.

3.0 SELECTION OF CLEANUP LEVELS

Specific standards for petroleum hydrocarbons, VOCs, SVOCs, PAHs, polychlorinated biphenyls, pesticides, and metals exist per ADEC regulations for soil and groundwater. These criteria are specified for all analytes detected at SS14 in Tables 3, 4, and 5. Identification of chemicals that exceed cleanup levels is based on the comparison of site concentrations to current cleanup levels. Constituents that exceed a cleanup levels are presented in Table 6 and discussed

in the previous section.

To complete risk assessments for human health and ecological receptors at Eareckson AS, estimates of ambient concentrations in several environmental media were required. Ambient background concentrations were derived for inorganic constituents only. For each medium for which sufficient data were available, an estimate was given of the maximum observed background concentration and of the maximum observed concentration in samples collected from unbiased locations. The background samples representing unbiased sampling locations were: 10 surface soil, 10 subsurface soil, 24 freshwater sediments, 6 marine sediments, 28 fresh surface water, 4 marine surface water, and 65 groundwater.

For surface soil, subsurface soil, groundwater, surface water, and sediment, the development of the statistical properties of the apparent background distributions proceeded as follows:

- The background data set was defined by excluding all values greater than the maximum from the total data set for a given medium. For surface soil, subsurface soil, and marine surface water, the background data sets consisted of the entire data sets considered.
- The background data set was examined, using SYSTAT and SYGRAPH, to determine whether it was more nearly normal or lognormal. This step was accomplished by comparing the coefficients of skewness and kurtosis of the raw and log-transformed data sets to see which approach produced the smaller values of these parameters. Skewness and kurtosis measure, respectively, the asymmetry and "peakedness" of a distribution relative to the normal distributions. In general, data were assumed to have been drawn from a normal distribution, unless the skewness and kurtosis were less than for the log-transformed than for the untransformed data. In addition, for the log-transformed data, the absolute value of the coefficient of skewness had to be less than or equal to 0.5 and the absolute value of the coefficient of kurtosis had to be less than or equal to 1.0 (USAF, 1996a).

For each parameter in each medium considered, an estimate is given of the mean and the 0.025 to 0.975 interquantile range. This interquantile range is the range of values expected to encompass the central 95 percent of the apparent background data. The maximum of the apparent background data set is also given (USAF, 1996c).

To provide a certain degree of confirmation of the inferred background data for Eareckson AS, those data have been compared with the background data collected at Adak Island (USAF, 1996a). In general, the soil and groundwater data from Adak and Shemya Islands compare quite favorably for most parameters.

In summary, the means and ranges of apparent background distributions of inorganic constituent concentrations in the environmental media are appropriate for use in the risk assessment process. For a detailed discussion of the background concentrations please refer to Appendix H in the March 1996 RI/FS (USAF, 1996c). For this ROD, Shemya Island maximum background concentration (97.5 percentile) were used as the cleanup level for inorganics, if the maximum value was found to be greater than the selected cleanup level (Table 6).

Since investigations at SS14 were conducted, ADEC regulations for the cleanup of Petroleum, Oil, and Lubricant (POL)-contaminated media have changed. In 1995, the Alaska Method (AK)

101 for GRO, AK102 for DRO, and AK103 for residual range organics were introduced in the ADEC Underground Storage Tank Regulations (18 AAC 78) to replace EPA Methods 418.1, SW8015M, and SW8100M. Concentrations of petroleum hydrocarbon constituents are compared to soil and groundwater cleanup criteria in 18 AAC 75.341 and 18 AAC 75.345, respectively, in this ROD.

It is important to recognize the differences among the methods employed for analysis of petroleum hydrocarbons. For example, TPH by EPA Method 418.1 is non-definitive and measures TPHs, as well as hydrocarbons derived from natural sources such as peat, roots, and waxes, and are believed to overestimate petroleum hydrocarbon levels. For evaluation of data collected at SS14, results from EPA Method 418.1 are only useful for indicating the presence of petroleum hydrocarbons.

In contrast, DRO by SW8100M definitively measures organic compounds within the hydrocarbon range of C10 to C28. This range includes primarily diesel fuel and heating oil. Heavier petroleum hydrocarbons, such as lubricating oils, are not included in SW8100M. SW8015M was a method used to detect gasoline at SS14. This method measures petroleum hydrocarbons in the C6 to C10 or gasoline range.

An important distinction between GRO/DRO by SW8015M/SW8100M and AK101/AK102 is the application of narrower hydrocarbon ranges for the ADEC AK101/AK102 methods. The range for GRO by SW8015M is C6 to C12, compared to C6 to C10 by AK101. The range of C6 to C12 results in a high bias for GRO by SW8015M. The range of C10 to C28 for DRO by SW8100M, compared C10 to C24 by AK102, results in a high bias for DRO by SW8100M.

Petroleum hydrocarbons as GRO and DRO are regulated under ADEC Method Two, Tables B2 and C for soil and groundwater, respectively, and specify ADEC Methods AK101 for GRO and AK102 for DRO. However, SS14 GRO results from SW8015M and DRO results from SW8100M are useable, and considered comparable to AK101 and AK102, respectively, for this ROD.

The selection of cleanup levels is discussed further for each media in the following sections.

3.1 SELECTION OF GROUNDWATER CLEANUP LEVELS

The following criteria are applicable as groundwater cleanup levels:

a. ADEC 18 AAC 75.345 Method Two, Table C, Groundwater Cleanup Levels, or

b. Shemya Island maximum background concentration (97.5 percentile), whichever is greater (Appendix H, 1996 RI/FS).

c. For aluminum, groundwater cleanup levels were calculated as outlined in ADEC's 1999 *Guidance on Cleanup Levels Equations and Input Parameters,* and are discussed in Appendix B.

3.2 SELECTION OF SOIL CLEANUP LEVELS

The following soil cleanup levels are applicable at SS14:

a. ADEC 18 AAC 75.341 Method 2, Tables B1 and B2, Soil Cleanup Levels for the Under 40-Inch Zone, migration-to-groundwater, inhalation, or ingestion, whichever is more stringent, or

b. Shemya Island maximum background concentration (97.5 percentile), if greater than a) above (Appendix H, 1996 RI/FS).

4.0 REMEDIAL ALTERNATIVES

The following remedial alternatives were evaluated to address site risks at SS14.

Alternative 1 – No Further Remedial Action Planned with Site Closure

Under no further remedial action planned with site closure, SS14 would be left in its current state, without any activities to monitor, control, or mitigate exposure to contaminants. Natural processes of attenuation might decrease contaminant concentrations at SS14. No further sampling would be conducted at the site to monitor the movement of contaminants, or the rate at which contaminant concentrations are decreasing.

Alternative 2 – Institutional Controls

Under this alternative, several tasks would be conducted to further delineate and control access to the site. The purpose of these tasks would be to clearly identify the boundaries of SS14, limit site access to properly trained personnel, and ensure the viability of the soil cover.

Alternative 3 – Institutional Controls and Monitoring

Under this alternative, institutional controls would be implemented, and the site would be monitored for contaminant in soil, subsurface soil, and groundwater.

5.0 DESCRIPTION OF SELECTED REMEDY

The selected remedy for SS14 is no further remedial action planned with site closure. Contaminants at SS14 are at low levels, appear to be decreasing, and pose no unacceptable risk to human health or the environment. The reported 50-gallon fuel spill on the parking apron has been sufficiently remediated through soil removal and natural attenuation, and no further monitoring is needed. This remedy is cost-effective in its approach to control exposures to human and ecological receptors.

Table 1 Summary of Samples Collected and Analyses Performed at SS14, Eareckson Air Station

Media	Year	Laboratory[1]	Number of Samples[2]	BTEX (SW8020)	TPH (E418.1)	VOCs (SW8260)	TCE/PCE (SW8010)	SVOCs (SW8270)	Metals (SW6010/ SW7131)	GRO/DRO (SW8015M)	Major Ions (E300.1)
Surface Soil	1992	On-site	4		✓						
	1994	Off-site	4					✓			
Subsurface Soil	1994	On-site	6	✓			✓			✓	
		Off-site	1					✓			
Groundwater	1994	On-site	4	✓			✓			✓	
		Off-site	1			✓		✓	✓		✓

Key:

✓ – analysis performed
1 – On-site laboratories consisted of portable gas chromatographs and an infrared spectrophotometer located on Shemya Island. Off-site laboratories were NVLAP accredited laboratories.
2 – Number of samples includes subsurface soil samples collected from well points, trenches, and pits.
BTEX – benzene, toluene, ethylbenzene, and xylenes
DRO – diesel range organics
E – EPA Method
EPA – United States Environmental Protection Agency
GRO – gasoline range organics
NVLAP – National Voluntary Lab Accreditation Process
PCE – perchloroethylene
SVOCs – semi-volatile organic compounds
SW – EPA Solid Waste Method
TCE – trichloroethylene
TPH – total petroleum hydrocarbons
VOCs – volatile organic compounds

Table 2 Summary of 1992 – 1994 Sampling Results from the On-site Laboratory

Constituent	Surface Soil Samples (mg/Kg)	Subsurface Soil Samples (mg/Kg)	Groundwater (mg/L)
	1992	1994	1994
Total Petroleum Hydrocarbons	4,617 to 16,683	--	--
Benzene	--	ND	ND to 0.0026
Toluene	--	ND	ND
Ethylbenzene	--	ND	ND to 0.016
Xylenes	--	ND	ND
Gasoline Range Organics	--	ND	ND to 1.1
Diesel Range Organics	--	ND	ND to 5.2
Perchloroethylene	--	ND	ND
Trichloroethylene	--	ND	ND

Key:
-- – not analyzed
mg/Kg – milligrams per kilogram
mg/L – milligrams per liter
ND – non-detect

Table 3 Cleanup Levels for Surface Soil at Site SS14, Eareckson Air Station

Constituent	Concentration [a] (mg/Kg)
Semi-volatile Organic Compounds	
Acenapthene	210[a]
Anthracene	4,300[a]
Benzo(a)anthracene	6[a]
Benzo(a)pyrene	1[b]
Benzo(b)fluoranthene	11[b]
Benzo(g,h,i)perylene	1,500[a]
Benzo(k)fluoranthene	110[b]
Chrysene	620[a]
Dibenzofuran	15.6[a]
Di-n-butyl Phthalate	1,700[a]
Fluorene	270[a]
Fluoranthene	2,100[a]
Indeno(1,2,3-c,d)pyrene	11[b]
Phenanthrene	4,300[a]
Pyrene	1,500[a]

Key:

a – This value is the migration-to-groundwater level in 18 AAC 75.341, Table B1, Under 40-Inch Zone

b – This value is the ingestion level in 18 AAC 75.341, Table B1, Under 40-inch Zone.

AAC – Alaska Administrative Code

mg/Kg – milligrams per kilogram

Table 4 Cleanup Levels for Subsurface Soil at Site SS14, Eareckson Air Station

Constituent	Concentration (mg/Kg)
Semi-volatile Organic Compounds	
Di-n-butyl phthalate	1,700 [a]

Key:

a – This value is the migration to groundwater level in 18 Alaska Administrative Code 75.341, Table B1, Under 40-Inch Zone

mg/Kg- milligrams per kilogram

Table 5 Cleanup Levels for Groundwater at Site SS14, Eareckson Air Station

Constituent	Concentration (mg/L)
Metals	
Aluminum	36.5[a]
Barium	2.0[b]
Cadmium	0.005[b]
Calcium	151.96[c]
Iron	121.56[c]
Magnesium	63.38[c]
Manganese	3.64[c]
Sodium	125.45[c]
Vanadium	0.26[b]
Zinc	11.0[b]
Major Ions	
Chloride	294[c]
Nitrate	na
Sulfate	137.42[c]

Key:

a – This value is a calculated groundwater level in accordance with 18 AAC 75.345, Table C.
b – This value is the groundwater level in 18 AAC 75.345, Table C.
c – This value is the background level (97.5 percentile) that has been determined for Shemya Island.
AAC – Alaska Administrative Code
mg/L – milligrams per liter
na – no cleanup level available

Table 6 Constituents Detected Above Cleanup Levels

Matrix	Units	Constituent		Cleanup Levels	Highest Reported Concentration	Number of Samples Above Cleanup Levels
Surface Soil	mg/Kg	SVOC	Benzo(a)anthracene	6.0 [a]	10.2	1
			Benzo(a)pyrene	1.0 [b]	7.94	2
			Benzo(b)fluoranthene	11.0[b]	12.2	1
Groundwater	mg/L	Metals	Aluminum	36.5[c]	75	1

Key:

a – This value is the migration to groundwater level in 18 AAC 75.341, Table B1, Under 40-Inch Zone.
b – This value is the ingestion level in 18 AAC 75.341, Table B1, Under 40-Inch Zone.
c – This value is a calculated groundwater level in 18 AAC 75.345, Table C.
AAC – Alaska Administrative Code
mg/Kg – milligrams per kilogram
mg/L – milligrams per liter
SVOC – semi-volatile organic compound

Figure 1 Site Location Map

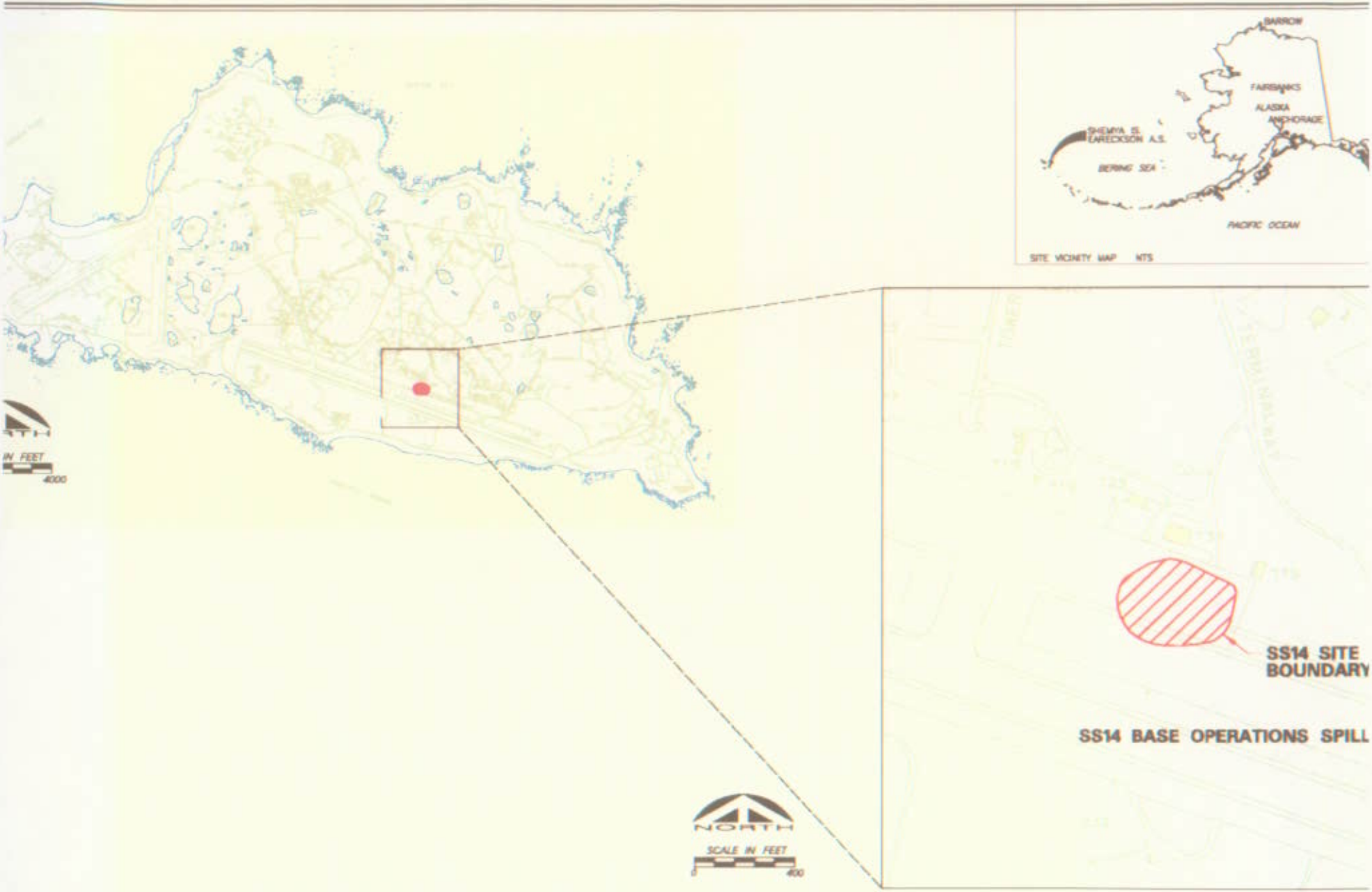

FIGURE 1-1

U.S. AIR FORCE, EARECKSON AIR STATION, ALASKA
SS14 BASE OPERATIONS SPILL RECORD OF DECI

SITE LOCATION MAP
(level = 5)

Figure 2 Sample Locations and Analytical Results

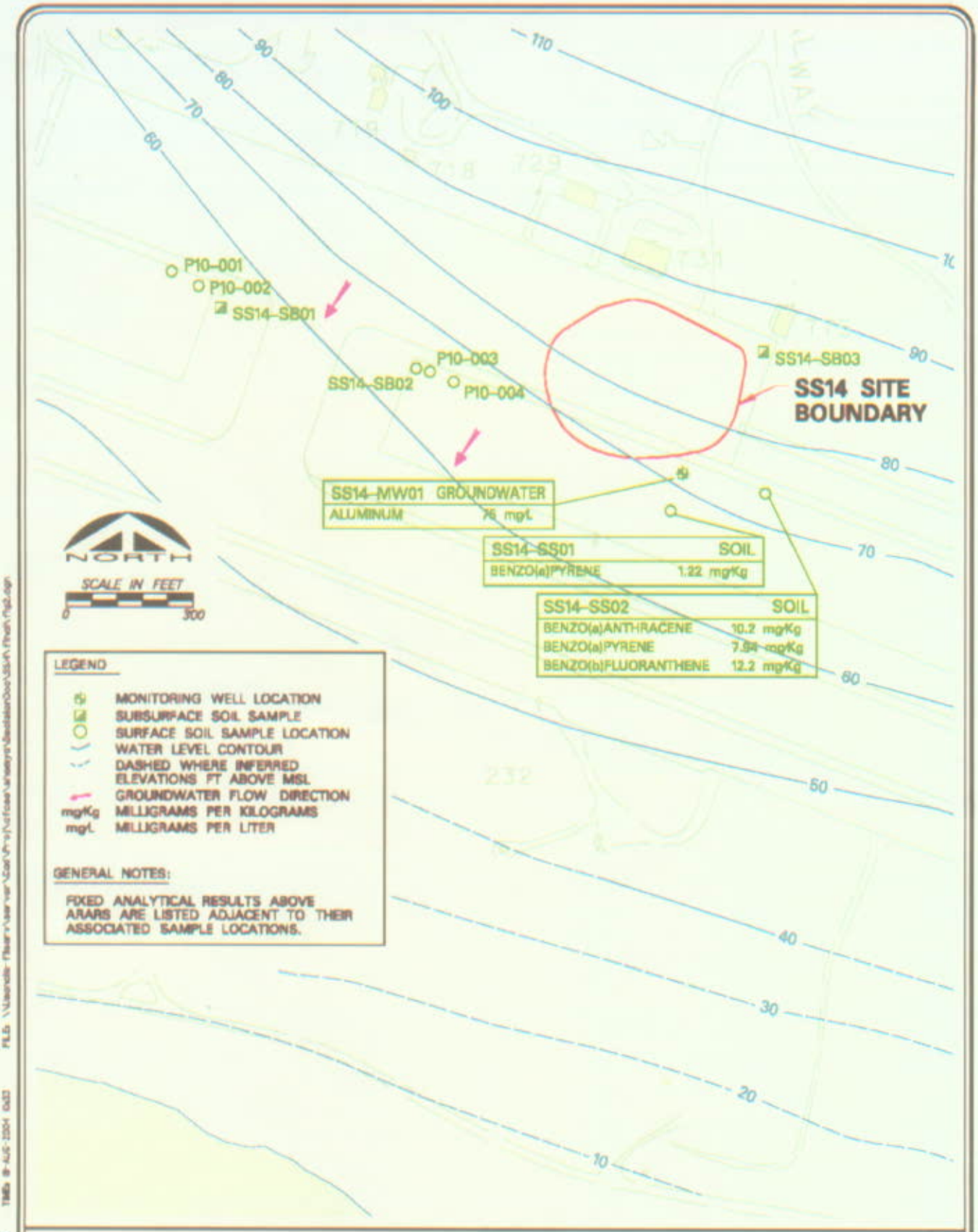

FIGURE 2

U.S. AIR FORCE, EARECKSON AIR STATION, ALASKA
SS14 BASE OPERATIONS SPILL RECORD OF DECISION

SAMPLE LOCATIONS & ANALYTICAL RESULTS

PART III

RESPONSIVENESS SUMMARY

Public comment period was from May 1 to May 31, 2002.

No comments were received from the public during this period.

APPENDIX A

IRP SITE SS14 – BASE OPERATIONS SPILL HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

1.0 INTRODUCTION

This Appendix summarizes the results of the updated Tier I screening risk assessment conducted for the United States Air Force (Air Force) Installation Restoration Program (IRP) Site SS14 (JP-4 Spill Site) at Eareckson Air Station, Shemya Island, Alaska. Human health and ecological risk assessments were previously prepared for IRP Site SS14, as documented in the *Eareckson Air Station Remedial Investigation/Feasibility Study* (USAF, 1996), and the *Eareckson Air Station Basewide Monitoring Report* (USAF, 1999). The Air Force is updating the risk assessments in response to comments received from the Alaska Department of Environmental Conservation (ADEC) on the draft Decision Document for Site SS14 (ADEC, 2000a), and to provide consistency with current Alaska regulations (e.g., 18 Alaska Administrative Code [AAC] 75) and risk assessment methods described in ADEC's *Risk Assessment Procedures Manual* (ADEC, 2000b). The results of the updated screening risk assessments are presented below.

2.0 METHODS

The specific methods and assumptions used in the revised Tier I screening risk assessment for Site SS14 are described in the *Technical Memorandum: Risk Assessment Assumptions for Decision Documents – Final* (USAF, 2001), hereafter referred to as the Risk Assessment Assumptions Technical Memorandum (RAATM). Briefly, analytes detected in sampled media were compared to one-tenth the ADEC Method Two Criteria, and/or appropriate ecological screening criteria, consistent with procedures described in the RAATM (USAF, 2001). Analytes detected at concentrations in excess of one-tenth the ADEC Method Two Criteria, and/or appropriate ecological screening criteria, were retained as contaminant of potential concern (COPCs) or contaminant of potential ecological concern (COPECs), respectively. Carcinogenic COPCs were included in Tier I cumulative cancer risk screening and compared to an acceptable risk criterion of 1.0×10^{-5}. Noncarcinogenic COPCs were included in an evaluation of cumulative noncancer hazard and compared to an acceptable hazard index (HI) of 1.0. Where ecological habitats and exposure pathways are present, COPECs were identified and included in an estimate of the total ecological HI. The Tier I ecological HI was compared to a screening HI criterion of 1.0.

3.0 RESULTS

A revised Tier I screening risk assessment was completed for Site SS14, based on the sampling investigation results describe Section 2 of the Record of Decision. Consistent with ADEC's *Guidance on Calculating Cumulative Risk* (ADEC, 2001), petroleum hydrocarbons were

excluded from the calculation of Tier I cumulative cancer risk and noncancer hazard estimates. Tier I cumulative risk estimates for analytes other than petroleum hydrocarbons are summarized in Section 3.1, and screening results for petroleum hydrocarbons are presented in Section 3.2.

3.1 Tier I Cumulative Risk Estimates

Tier I cumulative risk screening was conducted on COPCs identified in soil and groundwater at SS14. Summary results of the Tier I risk assessment for Site SS14 are presented in Tables A-1 and A-2. The COPC selection process for analytes detected in each media sampled at Site SS14 is presented in Tables A-3 through A-9. Cumulative risk screening results are presented in Tables A-10 through A-14.

3.1.1 Surface Soils

The Tier I cumulative cancer risk estimate for surface soil was 9.4×10^{-5} (Table A-1). Noncarcinogenic COPCs were not identified for surface soils; therefore, a noncancer HI was not calculated for this medium. The screening level cancer risk estimate for surface soil of 9.4×10^{-5} exceeds the cancer risk criterion of 1.0×10^{-5}. However, the excess risk was entirely due to polynuclear aromatic hydrocarbons (PAHs) detected in Sample SS14-SS02. This sample was collected immediately adjacent to the runway, and the presence of PAHs in soil is believed to be the result of coal tar used in construction of the runway rather than from the JP-4 spill. Concentrations of PAHs in Sample SS14-SS01, collected farther from the edge of the runway, were below ADEC 18 AAC 75.341, Table B1, Soil Cleanup Levels. Maximum concentrations of the PAHs, benzo(a)anthracene and benzo(a)pyrene, in surface soils exceeded the ADEC 18 AAC 75.341, Table B1, Soil Cleanup Levels for the Migration-to-Groundwater Pathway. Again, exceedences of the screening criteria, and any associated risks, at SS14 are not believed due to the historic JP-4 spill.

A total ecological HI of 13 was estimated for Site SS14 surface soils, due to the presence of di-n-butyl phthalate and PAHs in Sample SS14-SS02. However, di-n-butyl phthalate was also detected in laboratory blanks and is believed to represent laboratory contamination. As previously discussed, the presence of PAHs in Sample SS14-SS02 is believed due to the coal tar that was used in the construction of the runway.

Based on these results, impacts of surface soil on human health or the environment at SS14 are not anticipated.

3.1.2 Subsurface Soils

The only analyte detected in subsurface soil at Site SS14 was di-n-butyl phthalate. However, the concentration of di-n-butyl phthalate detected in subsurface soil was below the ADEC 18 AAC 75.341, Table B1, Soil Ingestion Cleanup Level and the Migration-to-Groundwater Pathway Cleanup Level. Therefore, a noncancer HI estimate was not calculated for subsurface soil (Table A-1).

A total ecological HI of 2.5 was estimated for Site SS14 subsurface soils, due to a single detection of di-n-butyl phthalate. However, di-n-butyl phthalate was also detected in laboratory blanks and is believed to represent laboratory contamination.

Based on these results, impacts of subsurface soil on human health or the environment at SS14 are not anticipated.

3.1.3 Fresh Groundwater

Carcinogenic COPCs were not detected in groundwater samples at SS14; therefore, a cancer risk estimate was not calculated for this medium. A total noncancer HI of 2.4 was estimated for Site SS14 groundwater, due primarily to the presence of aluminum and vanadium (Table A1). Aluminum was responsible for 88 percent of the total noncancer HI. It should be noted, however, that groundwater samples were not filtered prior to analysis, and *dissolved* aluminum concentrations are most likely lower than those measured. The single detection of vanadium in groundwater was only slightly higher than the mean background concentration of vanadium in fresh groundwater at Shemya Island (Table A-1), and this concentration was below the ADEC Table C Groundwater Cleanup Level for vanadium.

Based on the above, chemicals detected in Site SS14 groundwater are not likely to pose a significant risk to human health or the environment.

3.2 Petroleum Hydrocarbon Screening

Consistent with ADEC *Guidance on Calculating Cumulative Risk* (ADEC, 2001), petroleum hydrocarbons were not included in the above-described cumulative screening risk estimates. Groundwater monitoring for petroleum hydrocarbons indicated the presence of gasoline range organics (GRO), as measured by Uniated States Environmental Protection Agency Solid Waste Method (SW)8015, and diesel range organics (DRO), as measured by SW8100 (Table A-2). While the maximum concentration of GRO measured in groundwater (1.1 milligrams per liter [mg/L]) is below the ADEC 18 AAC 75.345 Table C, Groundwater Cleanup Level of 1.3 mg/L for GRO, the maximum concentration of DRO (5 mg/L) is slightly above its criterion (1.5 mg/L). However, four out of the five samples collected and analyzed were non-detect for DRO. Furthermore, Site SS14 falls outside of the designated watershed area for Shemya Island, and groundwater from this location is unlikely to be used as drinking water resource.

Consequently, petroleum hydrocarbons detected in groundwater at SS14 are not likely to pose a significant risk to human health or the environment.

4.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2000a. Comments on Eareckson Air Station Draft Decision Documents for 18 Sites. January/February.

ADEC. 2000b. Risk Assessment Procedures Manual. Alaska Department of Environmental Conservation, Division of Spill Prevention and Response, Contaminated Sites Remediation Program. June.

ADEC. 2001. Guidance on Calculating Cumulative Risk. Alaska Department of Environmental Conservation, Division of Spill Prevention and Response, Contaminated Sites Remediation Program. October.

United States Air Force (USAF). 1996. Eareckson Air Station Remedial Investigation/Feasibility Study Report, Final. Prepared for United States Air Force, 611th Air Support Group, 611th Civil Engineer Squadron. August.

USAF. 1999. Eareckson Air Station Basewide Monitoring Report. Prepared for United States Air Force, 611th Air Support Group, 611th Civil Engineer Squadron.

USAF. 2001. Technical Memorandum: Risk Assessment Assumptions for Record of Decision Documents - Final, Eareckson Air Station, Shemya Island, Alaska. Prepared for United States Air Force, 611th Air Support Group, 611th Civil Engineer Squadron. June.

APPENDIX B

CALCULATION OF ADEC 18 AAC 75 METHOD TWO GROUNDWATER CLEANUP LEVELS

The Alaska Department of Environmental Conservation (ADEC) 18 Alaska Administrative Code (AAC) 75, Method Two, Groundwater Cleanup Levels were calculated for chemicals in cases where there was no Method Two groundwater cleanup level listed under 18 AAC 75.345 Table C and where the chemicals reported concentration exceeded Shemya Island background levels.

The method utilized to calculate ADEC Method Two Groundwater Cleanup Levels for noncarcinogens is outlined in ADEC's *Guidance on Cleanup Levels Equations and Input Parameters* (ADEC, 1999) and is as follows:

$$\text{Groundwater Cleanup Level for Noncarcinogens in milligrams per liter (mg/L)} = \frac{THQ \times RfD_O \times BW \times AT \times 365\ days/year}{IR \times EF \times ED \times A}$$

Parameter/Definition (units)	Default
THQ/target hazard quotient (unitless)	1
BW/body weigh (kilogram)	70
AT/averaging time (year)	30
RfD_O/oral reference dose (milligrams/kilogram-day)	chemical specific
EF/exposure frequency (day/year)	350
ED/exposure duration (year)	30
IR/ingestion rate (liter/day)	2
A/absorption factor (unitless)	1

Groundwater cleanup levels were calculated for several noncarcinogens. Aside from the oral reference dose, default values where used for all parameters in the calculations. Table B-1 summarizes the results of each calculation.

Table B-1 Summary of Calculated ADEC Method Two Groundwater Cleanup Levels for Noncarcinogens

Analyte	CAS Number	RfDo (mg/kg-d)	RfDo Reference	Cleanup Level (mg/L)
Aluminum	7429905	1	a	36.5

Key:

a – United States Environmental Protection Agency Region 3 Risk Based Concentration Table (9/25/01)
mg/kg-d- milligrams per kilogram-day
mg/L – milligrams per liter
RfDo – Oral Reference Dose

References

ADEC. 1999. Guidance on Cleanup Levels Equations and Input Parameters. Developed by the Division of Spill Prevention and Response Contaminated Sites Remediation Program. July 28.

APPENDIX C

REFERENCES AND ADMINISTRATIVE RECORD FOR SS14

The following list includes selected United States Air Force Installation Restoration Program reports completed to date for SS14 at Eareckson Air Station, and the references used in the Record of Decision. A comprehensive Administrative Record for Eareckson Air Station is available at the 611 CES/CEVR, Elmendorf Air Force Base, Alaska.

Air Force Center for Environmental Excellence (AFCEE). 1997. Environmental Baseline Survey Report. Prepared by HQ AFCEE. 12 June.

CH2M Hill. 1990. Remedial Investigation/Feasibility Study, Stage 1, Final Technical Report and Appendices. Prepared for the United States Air Force. 10 August.

CH2M Hill. 1992. Site Investigation, Technical Memorandum Report on Field Operation, 1992. Prepared for the United States Air Force. 31 March.

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USAF. 1990. Installation Restoration Programs – Stage 1, Final Technical Report for Shemya Air Force Base.

USAF. 1991. Preliminary Assessment Report. Prepared by 11ACW/DEV. 04 October.

USAF. 1993a. Remedial Investigation, General Stockpiling Plan for Contaminated Soils. Prepared by the 11 CEOS/CEOR. June.

USAF. 1993b. Shemya Air Force Base, Alaska 1992 Installation Restoration Program Field Investigation Report. Prepared by CH2M Hill for the United States Air Force. 1 February.

USAF. 1993c. Site Investigation, Work Plan Basewide and Limited Source Investigation, 1993. Prepared for the United States Air Force. December.

USAF. 1994a. Final Community Relations Plan. Prepared for the United States Air Force. August.

USAF. 1994b. Ecological Risk Assessment Process Report. Prepared by the 611 CES/CEVR. January.

USAF. 1995. Remedial Investigation/Feasibility Study, Volumes I and II. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. August.

USAF. 1996a. Remedial Investigation/Feasibility Study, Volume III of IV. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. January.

USAF. 1996b. Remedial Investigation/Feasibility Study, Volume IV of IV and Appendices M through Y. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. March.

USAF. 1996c. Remedial Investigation/Feasibility Study, Appendix H. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. March.

USAF. 1997a. Record of Decision, Draft Final Decision Document Report, Volume III of IV, Multiple Sites. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. April.

USAF. 1997b. Remedial Investigation/Feasibility Study, Draft Post Monitoring Plan. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. June.

USAF. 1998. Management Action Plan. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. December.

USAF. 1999. Remedial Investigation, Basewide Groundwater Monitoring Report, Aug – Sep 98. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. 19 June.

USAF. 2000a. Comprehensive Basewide Monitoring Report, Jun 99. Prepared by Jacobs Engineering Group, Inc., for the United States Air Force. 31 January.

USAF. 2000b. Drinking Water Quality Management Plan for Shemya Island, Alaska. December.

USAF. 2001a. Technical Memorandum Final Risk Assessment Assumptions Report. Prepared by Montgomery Watson for the United States Air Force. 08 June.

USAF. 2001b. Final Basewide Monitoring Program Report, 2000. Prepared by Montgomery Watson for the United States Air Force. 27 July.

USAF. 2002. Final Proposed Plan for Remedial Action, Eareckson Air Station, Shemya Island, Alaska. Prepared by Montgomery Watson for the United States Air Force. March.

Woodward-Clyde Consultants (WCC). 1993. Site Investigation, Report, Appendices, and Data Validation Reports. Prepared for the United States Air Force. July.

APPENDIX D

ACRONYM LIST

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
Air Force	United States Air Force
AK	Alaska Method (ADEC)
Army	United States Army
AS	Air Station
bgs	below ground surface
BMP	Comprehensive Basewide Monitoring Program
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	contaminant of potential concern
COPEC	contaminant of potential ecological concern
DRO	diesel range organic
EPA	United States Environmental Protection Agency
FS	Feasibility Study
GC	gas chromatograph
GRO	gasoline range organic
HI	hazard index
IR	infrared spectrophotometer
IRP	Installation Restoration Program
mg/Kg	milligram per kilogram
mg/L	milligram per liter
PAHs	polynuclear aromatic hydrocarbons
PCE	perchloroethylene
RAATM	Risk Assessment Assumptions Technical Memorandum
RI	Remedial Investigation
ROD	Record of Decision
SVOCs	semi-volatile organic compounds
SW	Solid Waste Method (EPA)
TCE	trichloroethylene
TPH	total petroleum hydrocarbons
USC	United States Code
VOCs	volatile organic compounds

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE