*DOE/ID-10898*
*September 2001*
*Revision 0*

# HWMA/RCRA Closure Plan for the TRA-731B and C Caustic and the TRA-731D and E Acid Storage Tank System

## 1997 Notice of Violation Consent Order

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# ABSTRACT

This Hazardous Waste Management Act /Resource Conservation and Recovery Act closure plan was developed in response to the 1999 Consent Order resolving the 1997 Notice of Violation between the Idaho Department of Environmental Quality and the United States Department of Energy Idaho Operations Office. This closure plan specifies the closure activities to be performed for the TRA-731B and C Caustic and TRA-731D and E Acid Storage Tank System at the Test Reactor Area, Idaho National Engineering and Environmental Laboratory. The TRA-731 caustic and acid storage tank system is an inactive product system that was taken out of service in Fall 1992. However, process material remained in the tanks for more than 90 days and Hazardous Waste Management Act/Resource Conservation and Recovery Act closure of the tank system is required. This closure plan presents the closure performance standards and methods of achieving those standards for the tank system.

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# ACRONYMS

| | |
|---|---|
| ACM | asbestos-containing material |
| ATR | Advanced Test Reactor |
| CO | Consent Order |
| COC | contaminants of concern |
| DOE | United States Department of Energy |
| DOE-ID | United States Department of Energy Idaho Operations Office |
| DOT | United States Department of Transportation |
| EC | environmental checklist |
| ENU | elementary neutralization unit |
| EPA | United States Environmental Protection Agency |
| ETR | Engineering Test Reactor |
| FFA/CO | Federal Facility Agreement and Consent Order |
| HWMA | Hazardous Waste Management Act |
| IDAPA | Idaho Administrative Procedures Act |
| IDEQ | Idaho Department of Environmental Quality |
| INEEL | Idaho National Engineering and Environmental Laboratory |
| MTR | Materials Test Reactor |
| NEPA | National Environmental Policy Act |
| NOV | Notice of Violation |
| PRG | preliminary remediation goal |
| RCRA | Resource Conservation and Recovery Act |
| TRA | Test Reactor Area |
| UTS | Universal Treatment Standards |
| WGS | Waste Generator Services |

# HWMA/RCRA Closure Plan for the TRA-731B and C Caustic and TRA-731D and E Acid Storage Tank System

## 1. INTRODUCTION

This Hazardous Waste Management Act (HWMA)/Resource Conservation and Recovery Act (RCRA) closure plan has been prepared for the TRA-731B and C Caustic and TRA-731D and E Acid Storage Tank System (TRA-731), located at the Test Reactor Area (TRA), Idaho National Engineering and Environmental Laboratory (INEEL). This HWMA/RCRA closure plan for the TRA-731 caustic and acid storage tank system is required by the 1999 Consent Order (CO) resolving the 1997 Notice of Violation (NOV) (Pisarski 1999) between the State of Idaho Department of Environmental Quality (IDEQ)[a] and the United States Department of Energy Idaho Operations Office (DOE-ID).

The TRA-731 tanks were installed in May 1952 to provide product solution to the water treatment systems at the TRA. Tanks TRA-731B and C contained the caustic solution and tanks TRA-731D and E the acid necessary for demineralizer system operations, provided caustic and acid for use in elementary neutralization activities associated with demineralizer operations, and supplied acid for use in secondary coolant systems at the Advanced Test Reactor (ATR) and the Engineering Test Reactor (ETR). In Fall 1992 the TRA-731 caustic and acid storage tanks were taken out of service and a new caustic and a new acid tank were placed in service in the Acid and Caustic Storage Building (TRA-677), replacing the TRA-731 caustic and acid storage tanks. The caustic and acid product was not removed from the TRA-731 caustic and acid storage tanks within 90 days after the tanks were removed from service; therefore, the caustic and acid in the tanks became a waste subject to HWMA/RCRA regulation.

In September 1997, the United States Department of Energy (DOE) received a NOV from the IDEQ. The NOV included 36 violations related to the TRA-731 caustic and acid storage tanks. On May 6, 1999, the DOE and the IDEQ entered into a consent order resolving the 1997 NOV (1997 NOV/CO) (Pisarski 1999). Item number 5.4 of the 1997 NOV/CO required the DOE to submit to the IDEQ for review and approval a date for submittal of a draft closure plan for the TRA-731 caustic and acid storage tanks. In accordance with the 1997 NOV/CO, the INEEL identified that a draft closure plan complying with Idaho Administrative Procedures Act (IDAPA) 16.01.05.009[b] (40 CFR 265 Subparts G and J) would be submitted on or before September 30, 2001 (Guymon 1999).

The performance standards in Section 4.1 of this closure plan are the standards for tank systems specified in IDAPA 58.01.05.009 (40 CFR 265.111 and 265.197). The proposed closure strategy is designed to achieve performance-based closure of the TRA-731 caustic and acid storage tank system by removing all waste and/or waste residues, minimizing the need for further maintenance of the system, controlling, minimizing, or eliminating the post-closure escape of hazardous waste and hazardous decomposition products to the environment, and minimizing the amount of hazardous waste generated during closure activities. The TRA-731 caustic and acid storage tanks will be further decontaminated to

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[a] On July 1, 2000, the Division of Environmental Quality, a division within the Idaho Department of Health and Welfare, was elevated to the Idaho Department of Environmental Quality. This department now oversees the implementation of this consent order.

[b] The Idaho Administrative Rules for the Department of Environmental Quality were changed from the original IDAPA 16 docket numbers to IDAPA 58 July 1, 2000 when the Division of Environmental Quality was elevated to the Idaho Department of Environmental Quality.

the action levels specified in this closure plan. Piping associated with the tank system has been previously removed or will be removed as part of activities to be performed. This piping will be managed as RCRA-contaminated debris. Soils associated with the tank system will be evaluated and managed under the FFA/CO.

The TRA-731 caustic and acid storage tank system will be considered HWMA/RCRA closed when the closure performance standards have been met as certified by an independent registered professional engineer and accepted by the IDEQ.

# 2. FACILITY DESCRIPTION

## 2.1 Site Description

The INEEL encompasses approximately 890 square miles (569,135 acres) on the northern edge of the Eastern Snake River Plain in southeastern Idaho. Formerly named the National Reactor Testing Station, the INEEL was established as a site where the DOE could safely build, test, and operate various types of nuclear reactor facilities. Strict security is maintained for all INEEL facilities in accordance with the INEEL's nuclear and defense missions. The INEEL topography and hydrology are described extensively in the *Comprehensive Remedial Investigation/Feasibility Study for the Test Reactor Area Operable Unit 2-13 at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 1997).

The TRA was established in the 1950s for studying the effects of radiation on materials, nuclear fuels, and equipment. Three major reactors have been built at TRA, including the ATR, the ETR, and the Materials Test Reactor (MTR). The TRA is located in the south central portion of the INEEL (see Figure 2-1).

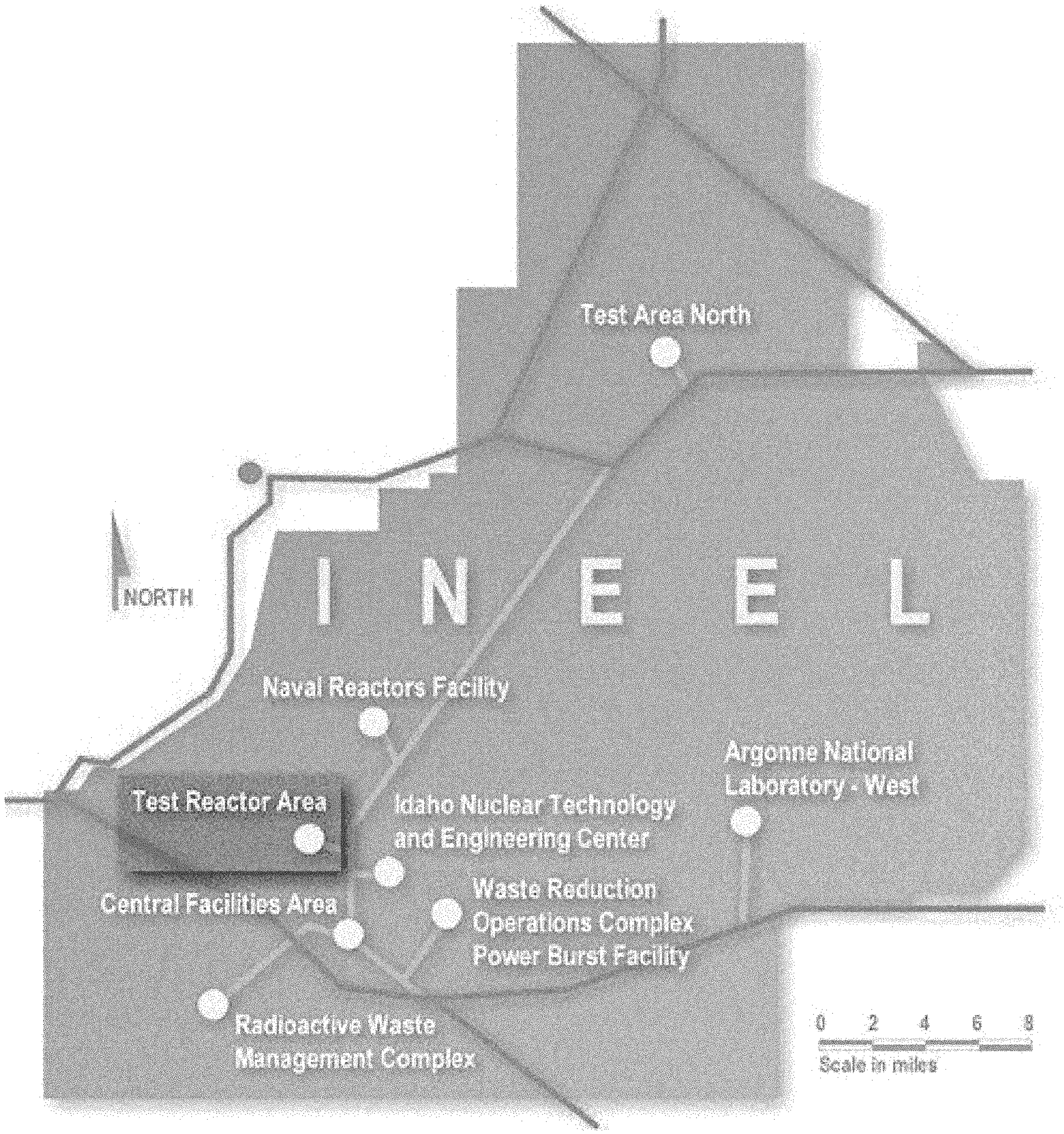


Figure 2-1. Map of the INEEL showing the Test Reactor Area.

## 2.2 TRA-731 Caustic and Acid Storage Tank System Description

### 2.2.1 System Description

The TRA functions as a facility in support of nuclear research and development at the INEEL. To accomplish the TRA mission, pure demineralized water is needed in large volumes. Caustic and acid solutions were used to regenerate the exchange columns in the demineralizer building, neutralize spent regenerant solutions in the elementary neutralization units (ENUs) (Brine Pit [TRA-731A] and the Regenerant Neutralization Tank [TRA-708C]), and supply acid to the secondary coolant systems at the ATR and the ETR. The TRA-731 caustic and acid storage tanks supplied the sodium hydroxide and sulfuric acid to these processes from 1952 until 1992, at which time new bulk storage tanks located in TRA-677 were put into service.

Caustic and acid from the TRA-731 caustic and acid storage tanks was pumped from the tanks via pumps located in the Acid and Caustic Pump House (TRA-631) (see Schematics P-CLOS-TRA-731-1 and -2; Appendix A). From TRA-631, the caustic and acid was transferred to the various processes described above or returned to the TRA-731 caustic and acid storage tanks.

#### *2.2.1.1 Caustic Storage Tanks (TRA-731B and TRA-731C)*

Caustic storage tanks TRA-731B and TRA-731C are two inactive, product storage tanks constructed in 1952 that supplied caustic solution (50% sodium hydroxide) to the demineralizer and neutralization processes at the TRA through Fall 1992. Each tank has a 10,798-gal capacity and is constructed of carbon steel. The tanks are covered with approximately 6-in. of asbestos insulation.

The TRA-731 caustic storage tanks are aboveground storage tanks, located directly east of TRA-631. The tanks rest on concrete supports above a utility trench (East/West Trench) that contained the piping runs to and from TRA-631. Two segments of the trench run under the west end of the tanks where the transfer lines and valves were located. In 1998, transfer piping and piping components from the tanks to TRA-631 were removed; a common supply line used to fill the two tanks from a chemical vender supply truck remains attached (see Schematics P-CLOS-TRA-731-1 and -2; Appendix A).

#### *2.2.1.2 Acid Storage Tanks (TRA-731D and TRA-731E)*

Acid storage tanks TRA-731D and TRA-731E are two inactive, product storage tanks constructed in 1952 that supplied acid (93.6% sulfuric acid) to the demineralizer and neutralization processes at the TRA through Fall 1992. Acid from the TRA-731 acid storage tanks was also supplied to the secondary coolant systems at the ATR (through operational life of the TRA-731 tanks) and the ETR (through 1981). Each tank has a 10,798-gal capacity and is constructed of carbon steel. The tanks are covered with approximately 6 in. of asbestos insulation.

The TRA-731 acid storage tanks are aboveground storage tanks, located directly east of the two caustic storage tanks (TRA-731B and TRA-731C). The tanks rest on concrete supports above a utility trench (East/West Trench) that contained the piping runs to and from TRA-631. Two segments of the trench run under the west end of the tanks where the transfer lines and valves were located. In 1998, transfer piping and piping components from the tanks to TRA-631 were removed; a common supply line used to fill the two tanks from a chemical vender supply truck remains attached (see Schematics P-CLOS-TRA-731-1 and -2; Appendix A).

#### 2.2.1.3 *Piping and Ancillary Equipment*

Piping used to transfer caustic/acid product solution from the TRA-731 caustic and acid storage tanks was located in the East/West Trench that runs between the two sets of tanks to the east side of TRA-631 (see Schematic P-CLOS-TRA-731-2; Appendix A). The East/West Trench is a utility access trench that provided access to the piping runs. Two concrete weirs are located in the trench. Both the caustic storage tanks and the acid storage tanks had a transfer and return line, which were used to transfer liquids to and from TRA-631.

When the new caustic/acid storage tanks (TRA-677-M-7 and -8) were placed in service in September 1992, the TRA-631 pumps were relocated to the Acid and Caustic Storage Building (TRA-677) to be used with the newly installed tanks. The TRA-731 caustic and acid storage tanks were isolated from the active system by cutting and capping the supply lines to TRA-631 and by valving control of the return lines from TRA-631. In 1998, all transfer piping, heat tracers, steam supply lines, and ancillary equipment located in the East/West Trench were removed as part of deactivation (INEEL 1998b). Piping and ancillary equipment located inside TRA-631 was removed in Spring 2000 as part of the NEW-TRA-006 Voluntary Consent Order (VCO) Action Plan (INEEL 2000).

### 2.2.2 Tank System Operating History

The four tanks were originally installed in May 1952 and routinely operated until Fall 1992, when they were taken out of service and replaced by the acid and caustic tanks in TRA-677. Until the time the TRA-731 caustic and acid storage tanks were taken out of service, the caustic and acid in the storage tanks was a product material, not subject to HWMA/RCRA regulation. The product tanks were not emptied within 90 days as required by IDAPA 58.01.05.005 [40 CFR 261.4(c)] and the tank contents subsequently became a waste subject to HWMA/RCRA regulation.

From May 22, 1995, to July 6, 1995, a process was implemented to empty the storage tanks where water was added to the TRA-731D and E acid storage tanks. This acidified water was then pumped from an acid storage tank to a caustic storage tank via temporary piping for elementary neutralization. The neutralized wastewater was then pumped to the TRA-731A brine pit via temporary piping to verify that it met the waste acceptance criteria for the TRA Chemical Waste Pond, a pH $\geq$ 3.0 and $\leq$ 11.0. Most of the neutralized wastewater received from either of the caustic storage tanks had a pH $\leq$ 2.0 and required further neutralization in the brine pit before it could be discharged to the TRA Chemical Waste Pond. In June 1995, the acid storage tanks were flushed directly to the brine pit, as neutralization in the caustic storage tanks was unsuccessful (INEL 1996a).

Activities associated with the tanks were interrupted on June 22, 1995, when the south acid storage tank (TRA-731E) began to leak. Approximately 1,000 gal of acidic solution (pH = 1.6) was recovered from the East/West Trench, transferred to the brine pit for neutralization, and then transferred to the TRA Chemical Waste Pond. On June 28, 1995, the north acid storage tank (TRA-731D) began to leak; approximately 500 gal of liquid was captured, neutralized, sampled, and transferred to the TRA Chemical Waste Pond. From this point forward, all work on the tanks was suspended pending analytical results of leakage collected from TRA-731D. After the leaks were discovered, plastic drum liners were placed beneath the tanks to collect the leakage (INEL 1996a).

Analytical results of the samples collected on June 28, 1995, from TRA-731D reported the concentration of mercury at 1.81 ppm (Tellez 1996a). This value exceeded the toxicity characteristic limit for mercury of 0.20 ppm, meaning that the wastewater leaking from TRA-731D was not only corrosive (United States Environmental Protection Agency [EPA] hazardous waste number D002), but also characteristically hazardous for mercury (EPA hazardous waste number D009). Samples of the residues remaining in TRA-731E were collected on November 7, 1995 and the analytical results showed that the samples contained total chromium of 3.93 ppm. No other hazardous waste constituents were found above Universal Treatment Standard levels for that sample.

Tank cleaning with 3,000-psi steam started on September 30, 1996, and was completed on October 2, 1996. Analytical results for the rinsate samples from TRA-731B, C, and D showed that the rinsates failed for mercury. Rinsates from TRA-731E were below toxicity characteristic limits for mercury; however, visible contamination in the form of crystalline residues remained on the bottom of the tank. Sampling results also indicated that rinsates from caustic storage tank TRA-731C also exceeded the toxicity characteristic limits for selenium and that the rinsates from acid storage tank TRA-731D exceeded the toxicity characteristic limits for cadmium. On December 5, 1996, a second cleaning of the TRA-731 caustic and acid storage tanks was completed using 10,000-psi steam. Analytical results from the second rinsate confirmed that the rinsates were not HWMA/RCRA hazardous. Hazardous constituents were found in concentrations below the Universal Treatment Standards (UTS) limits for land disposal restricted wastes.[c]

In 1998, the piping associated with the TRA-731 caustic and acid storage tanks (INEEL 1998b) located in the East/West Trench was removed as part of deactivation activities. Piping was cut and flanged inside TRA-631; piping inside TRA-631 was left in place. The removed piping and piping components were characterized as RCRA-contaminated debris and sent to the Onyx Environmental Landfill in Arlington, Oregon, for macroencapsulation and subsequent disposal. Remaining piping inside TRA-631 was removed in Spring 2000 under the NEW-TRA-006 VCO Action Plan. The piping and piping components were characterized as RCRA-contaminated debris and sent to the Onyx Environmental Landfill in Arlington, Oregon, for macroencapsulation and subsequent disposal.

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[c] Swaney, G. P. INEL, e-mail communication to S. K. Collins, "Acid/caustic," February 27, 1997.

# 3. TRA-731 TANK SYSTEM CURRENT AND MAXIMUM WASTE INVENTORIES AND CHARACTERISTICS

## 3.1 Current and Maximum Waste Inventories

During operation, the TRA-731 caustic and acid storage tanks were maintained with sodium hydroxide and sulfuric acid product solution, respectively. This inventory, at times, approached capacity (10,798 gal per tank). It was determined that following cessation of operations and prior to the flushing activities conducted in 1995, the maximum waste inventories were as follows:

| | |
|---|---|
| TRA-731B | Approximately 350 gal |
| TRA-731C | Approximately 350 gal |
| TRA-731D | Approximately 350 gal |
| TRA-731E | Approximately 350 gal |

These inventory estimates were based on calculations utilizing tank dimensions and the location of the service line (INEEL 1998a). As of December 5, 1996, all hazardous waste inventory was removed from the TRA-731 caustic and acid storage tanks (see Section 5.2.1.1). Piping from the tanks in the East/West Trench was subsequently removed in 1998. The tanks are no longer capable of storing liquids as transfer piping has been cut (not capped, allowing no accumulation of liquids within the tanks), access holes have been cut in the end bells of the tanks, and the tanks are covered with a herculite cover.

No other waste inventory exists in the TRA-731 caustic and acid storage tank system.

## 3.2 Waste Sources and Characteristics

Material stored in the TRA-731 caustic and acid storage tanks was a product material used in the water treatment operations at the TRA. Subsequent to the tanks being removed from service, the caustic and acid product in the tanks became a waste subject to HWMA/RCRA regulation (EPA hazardous waste number D002 – corrosivity). Subsequent to the tanks being removed from service, additional EPA hazardous waste numbers (see Table 3-1) were identified. During their operational life, the tanks were only used to store product solution (sodium hydroxide and sulfuric acid) and were not used for any other purpose. Residual contamination associated with the TRA-731 caustic and acid storage tank system (e.g., mercury) is the result of contamination of the product material received from the vendors and concentration of these contaminants in the tank heel over the operational life of the system.

The TRA-731 caustic and acid storage tanks were sampled in 1995 and 1996. Based on the sampling results, the EPA characteristic hazardous waste numbers applicable to the tank system are presented in Table 3-1. There are no EPA-listed hazardous waste numbers associated with the TRA-731 caustic and acid storage tank system.

Table 3-1. Applicable EPA characteristic hazardous waste numbers.

| | Tank Number | | | |
|---|---|---|---|---|
| | TRA-731B (Caustic) | TRA-731C (Caustic) | TRA-731D (Acid) | TRA-731E (Acid) |
| Applicable EPA Hazardous Waste Numbers | D002 (Corrosivity)<br>D009 (Mercury) | D002 (Corrosivity)<br>D009 (Mercury)<br>D010 (Selenium) | D002 (Corrosivity)<br>D006 (Cadmium)<br>D009 (Mercury) | D002 (Corrosivity)<br>D009 (Mercury)[a] |

The constituents of concern (COCs) for the tank system, based on sampling results of the tank liquids/solids (all constituents detected during analysis), are arsenic, barium, cadmium, chromium, lead, mercury, nickel, and selenium.

# 4. CLOSURE PERFORMANCE STANDARDS

The following sections describe the closure performance standards for the TRA-731 caustic and acid storage tank system (IDAPA 58.01.05.009 [40 CFR 265.111 and 265.197]) and the procedures for meeting the closure performance standards.

## 4.1 Regulatory Closure Performance Standards

The closure performance standards identified in IDAPA 58.01.05.009 (40 CFR 265.111 and 265.197) applicable to the TRA-731 caustic and acid storage tank system are:

- Minimizing the need for further maintenance [40 CFR 265.111(a)]

- Controlling, minimizing, or eliminating the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere [40 CFR 265.111(b)]

- Removing or decontaminating all waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with waste, and properly managing all hazardous wastes generated during closure activities [40 CFR 265.197(a)].

## 4.2 Procedures for Achieving the Closure Performance Standards

HWMA/RCRA closure and waste management activities are described in detail in Section 5 of this closure plan. The closure performance standards will be achieved by the following measures:

Standard 1. The owner or operator must close the facility in a manner that minimizes the need for further maintenance [40 CFR 265.111(a)].

- Previous closure activities rendered the TRA-731 caustic and acid storage tanks incapable of accumulating liquids and the tank are covered with a herculite cover preventing liquids from entering the tanks, thereby minimizing the post-closure movement of hazardous constituents.

- Piping and piping components directly associated with the caustic and acid storage tanks have been or will be removed from the site, minimizing the need for further maintenance of the system.

- Decontamination of the tanks to the action levels specified in Section 5.2.2.1 of this closure plan will prevent the need for further maintenance of the system.

Standard 2. The owner or operator must close the facility in a manner that controls, minimizes or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere [40 CFR 265.111(b)].

- Previous closure activities rendered the TRA-731 caustic and acid storage tanks incapable of accumulating liquids and the tanks are covered with a herculite cover, thereby minimizing the post-closure movement of hazardous constituents.

- Piping and piping components directly associated with the caustic and acid storage tanks either have been or will be removed from the site, minimizing the post-closure movement of hazardous constituents.

- Decontamination of the tanks to the action levels specified in Section 5.2.2.1 of this closure plan will eliminate the post-closure movement of hazardous constituents.

Before commencing with the TRA-731 caustic and acid storage tank system closure project, the INEEL is required to complete an Environmental Checklist (EC) that defines the type, location, and potential environmental impacts associated with a proposed project. One purpose of the EC is to determine the level of National Environmental Policy Act (NEPA) review necessary for determining and analyzing the environmental impacts of a proposed project. Based upon review of the EC for the proposed action (HWMA/RCRA closure of the TRA-731 caustic and acid storage tank system), the action is categorically excluded from further NEPA review. The DOE has determined that the environmental impacts associated with the TRA-731 caustic and acid storage tank system closure project do not individually or cumulatively have a significant effect on the environment and further NEPA review is not warranted. This action requires no further NEPA review because the proposed action would not:

1. Threaten a violation of applicable statutory, regulatory, or permit requirements for environmental safety and health, including requirements of DOE orders

2. Require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities

3. Disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases

4. Adversely affect environmentally sensitive resources.

In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action, and the action is not “connected” nor “related” [40 CFR 1508.25(a)(1) and (2), respectively] to other actions with potentially or cumulatively significant impacts (INEL 1996b). Therefore, the TRA-731 caustic and acid storage tank system closure activities and system remaining following closure pose no environmental risk and, coupled with achieving the action levels specified in this closure plan, serves to meet the closure performance standard of protecting human health and the environment.

Standard 3. At closure of a tank system, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with waste, and manage them as hazardous waste. The closure plan, closure activities, cost estimates for closure, and financial responsibility for tank systems must meet all of the requirements specified in Subparts G and H of 40 CFR 265 [40 CFR 265.197(a)].

- Previous flushing of the TRA-731 caustic and acid storage tanks removed all hazardous waste from the tanks. The tanks will be further decontaminated to the action levels specified in Section 5.2.2.1 of this closure plan.

- All piping and piping components directly associated with the caustic and acid tanks either have been or will be removed from the site and managed as RCRA-contaminated debris.

- The East/West Trench and soils associated with the TRA-731 caustic and acid storage tank system will be addressed under the Federal Facility Agreement and Consent Order (FFA/CO), (Waste Area Group 2, Operable Unit (OU) 2-13, "Fenced Area North of TRA-608, Environmental Media [TRA-60]" [INEEL 1999]).

The TRA-731 caustic and acid storage tank system will be closed in accordance with the requirements of the performance standard at 40 CFR 265.111 and 265.197. Soils associated with the system components are addressed as potentially contaminated media under the FFA/CO (Site TRA-60). The concrete in the East/West Trench will also be evaluated under the FFA/CO (Site TRA-60) in the same manner as the soils. Excavation and disposal of contaminated soils and concrete as part of Site TRA-60, if required, will be addressed under the FFA/CO.

All ancillary equipment will be removed as part of closure activities and the tanks will be decontaminated to the action levels specified in this closure plan. A contingent landfill closure and post-closure plan as required under 40 CFR 265.197 (b) and 265.197 (c) is not applicable under this scenario because there is no scenario under which a HWMA/RCRA landfill closure of the TRA-731 caustic and acid storage tank system would be implemented. Therefore, a contingent landfill closure and post-closure plan has not been prepared for the TRA-731 caustic and acid storage tank system. EPA guidance provides that on-site CERCLA remedial activities are not subject to administrative requirements of other laws as applicable or relevant and appropriate requirements (ARARs). Preparation of a contingent landfill closure plan is specifically listed as an administrative requirement that is not required to be applied as an ARAR to CERCLA remedial activities (EPA 1989).

# 5. CLOSURE ACTIVITIES

This closure plan describes the methods for closing the TRA-731 caustic and acid storage tank system per the requirements at IDAPA 58.01.05.009 (40 CFR 265 Subparts G and J). The TRA-731 caustic and acid storage tank system will be closed based on closure activities completed previously, rinsate sample results from further decontamination of the caustic and acid storage tanks, and disposition of remaining system piping.

## 5.1 Tank System Boundaries

The tank system to be closed includes the TRA-731B and C caustic storage tanks, the TRA-731D and E acid storage tanks, associated fill piping, and associated transfer piping. The system to be closed (see Schematics P-CLOS-TRA-731-1 and -2; Appendix A) includes those units and ancillary equipment that managed/potentially managed HWMA/RCRA-regulated waste from the TRA-731 caustic and acid storage tanks. Material stored in the TRA-731 caustic and acid storage tanks was a product material used in the demineralizer and elementary neutralization operations at the TRA. Subsequent to the tanks being removed from service in Fall 1992, the caustic and acid product in the tanks became a waste subject to HWMA/RCRA regulation. The following tank system boundaries define the extent of the tank system to be HWMA/RCRA closed (see Schematics P-CLOS-TRA-731-1 and -2; Appendix A):

- The 2-in. caustic supply line and the 2-in. acid supply line are included in the TRA-731 caustic and acid storage tank system in their entirety. These lines were used to transfer product solution from tank trucks to the caustic and acid storage tanks.

- Temporary piping used to transfer waste and flush solutions from the TRA-731 caustic and acid storage tanks to the brine pit in Summer 1995 is included in the TRA-731 caustic and acid storage tank system in its entirety.

- Piping and ancillary equipment that remained active after the TRA-731 caustic and acid storage tanks were taken out of service in Fall 1992 is not included in the TRA-731 caustic and acid storage tank system. This piping and ancillary equipment supported active process/product systems and did not manage RCRA-hazardous waste associated with the TRA-731 caustic and acid storage tanks. Therefore, transfer piping from the TRA-731 caustic and acid storage tanks is included in the tank system to the point where it was cut and capped in TRA-631 when the transfer pumps were relocated and from the valves in the return lines.

The TRA-731 caustic and acid storage tank system interfaces, directly or indirectly, with several units/components that are addressed under separate regulatory actions (see Schematic P-CLOS-TRA-731-3; Appendix A). These sites have been or are in the process of being evaluated under the FFA/CO or VCO and are not included in the TRA-731 caustic and acid storage tank system.

The brine pit (TRA-731A) is not included in the TRA-731 caustic and acid storage tank system. The brine pit was used from 1952 through 1984 as a storage tank for sodium chloride demineralizer solutions. From 1984 through Spring/Summer 1997, the brine pit was used as an elementary neutralization unit, neutralizing spent regenerant solutions from the demineralizer process prior to discharge to the TRA Chemical Waste Pond. The brine pit was closed as a less than 90-day accumulation tank pursuant to the applicable requirements of IDAPA 16.01.05.009 (40 CFR 265 Subparts G and J) in October 1996 (Carlson 1997). Releases from the brine pit were resolved under the 1997 NOV/CO, Violation No. 91 (Pisarski 1999).

All soils in the fenced area north of TRA-608, including those associated with the TRA-731 caustic and acid storage tank system, are covered under the FFA/CO (Waste Area Group 2, Operable Unit (OU) 2-13, "Fenced Area North of TRA-608, Environmental Media [TRA-60]" [INEEL 1999]). Any contamination associated with this FFA/CO site is the result of releases that occurred during the operational history of the system and is not the result of any release from the TRA-731 caustic and acid storage tank system when it was subject to HWMA/RCRA regulation. This HWMA/RCRA closure plan does not address any soil contamination associated with the TRA-731 caustic and acid storage tank system as it will be addressed under the FFA/CO. Completion of activities under the FFA/CO is not a criteria for HWMA/RCRA closure certification of the tank system.

Additionally, the East/West Trench and associated soils are not included in the TRA-731 caustic and acid storage tank system as the soils are included as part of Site TRA-60 and the concrete in the East/West Trench will be evaluated in the same manner as the soils. The trench and soils will be addressed under the FFA/CO (Waste Area Group 2, Operable Unit (OU) 2-13, "Fenced Area North of TRA-608, Environmental Media [TRA-60]" [INEEL 1999]). Sampling and analysis of concrete in the East/West Trench and associated soils will be evaluated under the FFA/CO in accordance with appropriate HWMA/RCRA requirements.

If concentrations in concrete samples exceed INEEL background values, a risk-based assessment of the concrete will be conducted at a risk level of 1E-06 and a hazard quotient of 1. Additionally, if soil contamination associated with the East/West Trench is identified, a risk-based assessment of these soils will be conducted. Follow-on activities will be conducted under the FFA/CO, if warranted, to meet HWMA/RCRA requirements. Completion of activities under the FFA/CO is not a criteria for HWMA/RCRA closure certification of the tank system.

## 5.2 Closure Activities

The activities that will be performed to complete closure of the TRA-731 caustic and acid storage tank system in accordance with the tank system performance standards (see Section 4.1) are described below. Section 5.2.1 describes activities that have been completed previously and Section 5.2.2 describes the activities that will be conducted to complete HWMA/RCRA closure of the TRA-731 caustic and acid storage tank system.

### 5.2.1 Previous Closure Activities

#### *5.2.1.1 Waste Removal*

The removal of waste inventory and tank decontamination process, as described below, was implemented in 1996, prior to the 1997 NOV. To effectively remove the waste inventory and decontaminate the interior of the TRA-731 caustic and acid storage tanks, asbestos was removed from the end bell of each tank and an access hole was cut in the end of each tank. Entry was gained to the tanks and the waste inventory was removed and containerized, utilizing physical techniques (i.e., pumps and shovels). Following the inventory removal, the tanks were decontaminated through iterative administration of decontamination techniques.

The first decontamination activities consisted of three iterations of cleaning the tank interiors with high-pressure water streams (i.e., 3,000 psi), scraping, scrubbing, and/or brushing the tank interior areas with visible sediments and/or suspect areas (e.g., welded seams), followed by rinsing with high pressure water streams, and removing and containerizing decontamination rinsates. Rinsates were managed in a satellite accumulation area, characterized, and disposed of based on characterization (INEEL 1998a). The analytical results for the rinsates collected following the initial decontamination activities for the

TRA-731 caustic and acid storage tanks indicated metal contamination (i.e., mercury) above regulated limits for three of the four storage tanks; waste residues (i.e., crystals) were visually identified in the fourth storage tank.

Based on the results described above, subsequent decontamination activities were implemented for the tanks. Follow-on decontamination activities included high-pressure steam spraying of the tank interior surfaces (i.e., 10,000 psi), sampling of the decontamination rinsates, and removing and containerizing the decontamination rinsates for appropriate disposal based on characterization (INEEL 1998a).

The analytical results from decontamination rinsate samples collected during the subsequent decontamination efforts indicated hazardous constituents found in the rinsates were below applicable UTS limits. Visual inspection of the tanks confirmed the absence of any remaining waste residues. Table 5-1 provides the summarized analytical results for the final decontamination rinsates. The decontamination activities described above were simultaneously administered to the interior surface of the section of tank removed from the end of each storage tank. Following completion of decontamination activities, a plastic ("Herculite") cover was placed on each of the storage tanks to contain the asbestos insulation (INEEL 1998a) and to minimize any water infiltration.

Table 5-1. Analytical results of decontamination rinsate samples collected in December 1996.

| | UTS[a] | Tank Number | | | |
|---|---|---|---|---|---|
| | | TRA-731B (Caustic) | TRA-731C (Caustic) | TRA-731D (Acid) | TRA-731E (Acid) |
| Antimony (ppm) | 1.9 | ND[b] | ND | ND | ND |
| Arsenic (ppm) | 1.4 | ND | ND | ND | ND |
| Barium (ppm) | 1.2 | ND | 0.010 | 0.039 | 0.027 |
| Beryllium (ppm) | 0.82 | ND | ND | ND | ND |
| Cadmium (ppm) | 0.69 | ND | ND | ND | ND |
| Chromium (ppm) | 2.77 | ND | ND | 0.02 | ND |
| Lead (ppm) | 0.69 | ND | ND | ND | ND |
| Mercury (ppm) | 0.15 | 0.032 | 0.11 | 0.04 | 0.005 |
| Nickel (ppm) | 3.98 | ND | ND | 1.5 | 0.20 |
| Selenium (ppm) | 0.82 | ND | ND | ND | ND |
| Silver (ppm) | 0.43 | ND | ND | ND | ND |
| Thallium (ppm) | 1.4 | ND | ND | ND | ND |
| Sulfide (ppm) | 14 | ND | 3.5 | 2.7 | 2.7 |
| pH | N/A | 8.88 | 8.76 | 6.11 | 6.80 |

a. Universal treatment standards for wastewater.
b. Analyte not detected.

#### 5.2.1.2 Transfer Piping to TRA-631

In 1998, piping and ancillary equipment located in the East/West Trench was removed. The supply and return lines were flanged inside TRA-631 and piping was removed from these flanges to the connection with the TRA-731 caustic and acid storage tanks (INEEL 1998b). Piping and ancillary equipment removed from the trench consisted of the 3-in. carbon steel caustic lines, the 2-in. plastic acid lines, raw water lines, steam supply lines, plant air lines, hot water feed and return lines, condensate return lines, heat tracers, electrical heaters, wiring, and conduit.

Much of the piping (caustic lines) was insulated with asbestos. All asbestos-containing materials (ACMs) and asbestos-contaminated debris was removed and disposed of appropriately. Acid poly lines were isolated, drained, and removed before the ACM and caustic lines were removed. Piping was cut into sizes that facilitated handling and removal from the trench. Liquid caustic and acid waste material was removed from the piping and placed in United States Department of Transportation (DOT)-approved waste shipping containers for disposal. All scrapped items (non-liquid) were managed and disposed as RCRA-contaminated debris and sent to the Onyx Environmental Landfill in Arlington, Oregon, for macroencapsulation and subsequent disposal (Uniform Hazardous Waste Manifest No. 01091). Transfer piping from the tanks was cut near the tanks (not capped); thereby leaving a draining point for the tanks to prevent accumulation of any liquids in the tanks. Disposition of piping removed previously during deactivation activities will be documented as part of the HWMA/RCRA closure of the TRA-731 caustic and acid storage tank system.

#### 5.2.1.3 Transfer Piping Inside TRA-631

Removal of transfer piping in the East/West Trench was conducted in 1998 by flanging the supply and return lines inside TRA-631. Remaining transfer piping located inside TRA-631 was removed in Spring 2000 under the NEW-TRA-006 VCO Action Plan (INEEL 2000). The piping was characterized as RCRA-contaminated debris and sent to the Onyx Environmental Landfill in Arlington, Oregon, for macroencapsulation and subsequent disposal (Uniform Hazardous Waste Manifest No. 01518). Disposition of this piping will be documented as part of the HWMA/RCRA closure of the TRA-731 caustic and acid storage tank system.

#### 5.2.1.4 Temporary Piping

Temporary piping was used to transfer waste and flush solutions from the TRA-731 caustic and acid storage tanks to the brine pit during waste removal activities conducted in Summer 1995. This piping was removed during deactivation activities in 1998 and characterized as RCRA-contaminated debris and sent to the Onyx Environmental Landfill in Arlington, Oregon, for macroencapsulation and subsequent disposal (Uniform Hazardous Waste Manifest No. 01091). Disposition of this piping will be documented as part of the HWMA/RCRA closure of the TRA-731 caustic and acid storage tank system.

### 5.2.2 Planned Closure Activities

#### 5.2.2.1 Caustic and Acid Storage Tanks

As described in Section 5.2.1.1, all hazardous waste was removed from the TRA-731 caustic and acid storage tanks (TRA-731B, C, D, and E) on December 5, 1996. A visual inspection of the tanks found them to be free of stains or visible residues and decontamination rinsate sample analysis indicated that concentrations of constituents were below UTS levels. The tanks will be further decontaminated to meet the action levels provided in Table 5-2 to evaluate compliance with the closure performance standard.

Table 5-2. Contaminants of concern, proposed action levels, and associated risk.

| Contaminant of Concern | Action Level (μg/L)[a] | Recommended Detection Limit (μg/L) | SW846 Method | Risk[b] | Hazard[c] |
|---|---|---|---|---|---|
| Arsenic | 85 | 10 | 6010B | 1.99E-07 | 4.43E-04 |
| Barium | 369 | 200 | 6010B | 0.00E+00 | 8.33E-06 |
| Cadmium | 369 | 5 | 6010B | 5.64E-11 | 1.16E-03 |
| Chromium | 369 | 10 | 6010B | 3.76E-10 | 3.86E-07 |
| Lead | 250 | 3 | 7421 | 0.00E+00 | 0.00E+00 |
| Mercury | 19 | 0.2 | 7470A | 0.00E+00 | 5.22E-09 |
| Nickel | 369 | 50 | 6010B | 0.00E+00 | 2.89E-05 |
| Selenium | 85 | 5 | 6010B | 0.00E+00 | 2.67E-05 |
| Total | | | | 2.00E-07 | 1.66E-03 |

a. The action level calculation methodology is outlined in Appendix B.

b. Total risk (soil ingestion and soil inhalation pathways).

c. Total hazard (soil ingestion and soil inhalation pathways).

Asbestos abatement will be required at the transfer outlets of each tank prior to installing plugs in each of the transfer stubs associated with each tank line. Plugs will be installed to allow cleaning of all the tank interior surfaces. The tanks will be iteratively decontaminated using high-pressure steam (i.e., 10,000 psi), such that all of the interior surfaces of the tanks are decontaminated to the action levels specified in this closure plan. Screening level samples will be collected following each rinse cycle. At such time that screening level sampling indicates that action levels have been achieved, final rinsate samples will be collected per the requirements and procedures specified in a field sampling plan and quality assurance project plan, to be developed for the TRA-731 caustic and acid storage tank system. Decontamination solutions will be collected in 55-gal drums and managed within the facility until such time that the liquids are characterized and a disposition pathway is identified.

#### *5.2.2.2 Fill Piping*

The caustic and acid supply lines and piping system components will be removed and disposed as RCRA-contaminated debris in accordance with the treatment standards of IDAPA 58.01.05.011 [40 CFR 268.45]. Piping will be removed, placed in DOT-approved waste shipping containers, and transported to the Onyx Environmental Landfill in Arlington, Oregon, for macroencapsulation and subsequent disposal.

Caustic and acid fill piping will be cut out of the system in lengths to allow convenient handling and packaging. Any waste caustic or acid material found in the piping will be removed and packaged in separate DOT-approved waste shipping containers. Piping and piping components insulated with asbestos will be handled appropriately.

## 5.3 Waste Management

Waste generated during TRA-731 caustic and acid storage tank system HWMA/RCRA closure activities will include asbestos, nonhazardous industrial waste, and HWMA/RCRA hazardous waste. The INEEL Waste Generator Services (WGS) will be responsible for storing, inspecting, characterizing and recording all wastes generated during closure activities.

Nonhazardous industrial wastes such as personal protective equipment and other miscellaneous wastes will be managed by WGS personnel and disposed of in the INEEL landfill complex. Industrial wastes may be accumulated within the facility being closed during closure activities and prior to disposal.

Hazardous waste will be placed in appropriate containers within the fenced area north of TRA-608 and characterized and managed by WGS personnel according to HWMA/RCRA requirements. Waste generated during closure activities and the packaged components awaiting shipment may be stored within the facility being closed as defined in this closure plan provided the following waste management controls are implemented:

- Wastes generated will be managed in containers within the facility
- Containers are compatible with the waste and the containers are closed unless being filled
- Containers are inspected regularly to ensure integrity, and an inspection log is maintained or inspections are logged in the closure logbook
- Containers are appropriately marked with hazardous waste labels or with labels identifying the waste as RCRA-closure generated waste to be shipped, or characterized, as appropriate
- Spill control equipment is provided adjacent to the container storage area.

For purposes of this closure, the facility will be the fenced area north of TRA-608 and the areas immediately adjacent to the fenced area as posted. All waste and waste containers may be stored within the facility the entire time of the closure activities. The 90-day timeframe stipulated in IDAPA 58.01.05.006 [40 CFR 262.349(a)(1), "Generator Standards: Accumulation Time"] will not apply to closure-generated waste. All waste and waste containers will be removed from the facility prior to closure certification. Information regarding waste management during closure activities will be provided to the independent professional engineer for closure certification.

Wastes managed as RCRA-contaminated debris will be sent to the Onyx Environmental Landfill in Arlington, Oregon, for macroencapsulation and subsequent disposal. Macroencapsulation involves the application of surface-coating materials such as polymeric organics (e.g., resins and plastics) or the use of a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. Documentation of the disposition of all HWMA/RCRA-regulated wastes and system components will be supplied to the independent professional engineer for closure certification.

## 5.4 Closure Documentation

Closure methods and attainment of the closure performance standards for the TRA-731 caustic and acid storage tank system will be documented by performing the following:

- Closure activities will be monitored and reviewed by an independent, professional engineer, registered in the State of Idaho. Following successful completion of the specified closure activities, the professional engineer will certify that closure was performed in accordance with the IDEQ-approved closure plan.

- Information related to previous closure activities and information gathered during closure activities will be recorded or documented, and provided to the professional engineer, as requested, to support closure certification. Successful demonstration of achieving the closure performance standards will require documentation of closure activities including the following:

  - Documentation of previous closure activities, including disposition of transfer piping in TRA-631 and the East/West Trench and disposition of temporary piping

  - Documentation of the removal, management, and disposition of fill piping

  - Validated sampling data showing that rinsates of each tank meet the action levels specified in this closure plan

  - Documentation of the removal, management, and disposition of all closure-derived waste.

# 6. CLOSURE SCHEDULE

Table 6-1 identifies the closure schedule that will be initiated following IDEQ approval of the closure plan. This schedule reflects the time required for conducting closure activities and submitting information to the professional engineer for certification.

Table 6-1. Schedule for closure of the TRA-731 caustic and acid storage tank system.

| Planned Work Tasks | Completion |
|---|---|
| IDEQ approval of closure plan | Day 0 |
| Removal of acid/caustic supply lines | Day 45 |
| Asbestos abatement to support closure | Day 90 |
| Complete cleaning of tanks | Day 240 |
| Validated analytical data for final rinsates | Day 330 |
| Hazardous waste inventory removed from facility | Day 360 |
| Closure activities complete | Day 360 |
| Professional engineer and owner/operator certification submitted to IDEQ | Day 420[a] |
| Final approval of the TRA-731 tank system closure plan implementation received from IDEQ | Day 480 |

a. If closure activities are completed ahead of the proposed schedule, the profession engineer's certification and owner/operator closure certification will be submitted to IDEQ within 60 days of the completion of closure activities.

IDAPA 58.01.05.009 (40 CFR 265.113) requires waste removal activities be complete 90 days from the approval of the closure plan and closure to be complete within 180 days from the initiation of closure activities. An extension to the time period for completion of closure activities and removing waste is being requested at this time, pursuant to IDAPA 58.01.05.009 (40 CFR 265.113). An extension is requested due to the following constraints:

- Safety concerns associated with ACMs
- The number of decontamination sequences required to meet the proposed action levels is not known
- The need for adequate time for analytical laboratories to complete analysis of samples and complete data validation.

# 7. CLOSURE PLAN AMENDMENTS

The conditions described in IDAPA 58.01.05.009 (40 CFR 265.112), "Closure Plan; Amendment of Plan," will be followed to implement changes to the approved closure plan. Should unexpected events during the closure period require modification of the approved closure activities or closure schedule, the closure plan will be amended within 30 days of the unexpected event. A written request detailing the proposed changes and the rationale for those changes and a copy of the amended closure plan will be submitted for IDEQ approval. Minor changes to the approved closure plan, which are equivalent to or do not compromise the closure requirements and performance standards identified in the approved closure plan, may be made without prior notification to IDEQ. Minor changes will be identified in the documentation supporting the independent professional engineer's certification.

# 8. CERTIFICATION OF CLOSURE

Within 60 days of completing the closure activities, a certification of closure of the TRA-731 caustic and acid storage tank system will be provided, in accordance with IDAPA 58.01.05.009 (40 CFR 265.115), by an independent professional engineer to the INEEL operating contractor and the DOE-ID. The professional engineer's and owner/operator signatures on the closure certification, which is submitted to the IDEQ, will document the completion of closure activities in accordance with the approved closure plan and State of Idaho HWMA/RCRA requirements. The closure certification may also identify any minor changes to the closure plan made without prior approval of the IDEQ. Closure of the TRA-731 caustic and acid storage tank system will be considered complete upon receipt of written acceptance issued by the IDEQ.

Copies of documentation supporting the closure of the TRA-731 caustic and acid storage tank system will remain in the project files and the INEEL Environmental Affairs Administrative Record in the event that this information is requested by IDEQ. The TRA-731 caustic and acid storage tank system is not a hazardous waste disposal facility and, therefore, a "Notice in Deed" and a survey plat are not required.

# 9. COST AND LIABILITY REQUIREMENTS

The federal government, as owner of the INEEL, is exempt from the requirements to provide cost estimates for closure, to provide a financial assurance mechanism for closure, and regarding state-required mechanism and state assumption of responsibility. The federal government, as owner of the INEEL, is also exempt from liability requirements.

# 10. REFERENCES

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# Appendix A

# SYSTEM SCHEMATICS

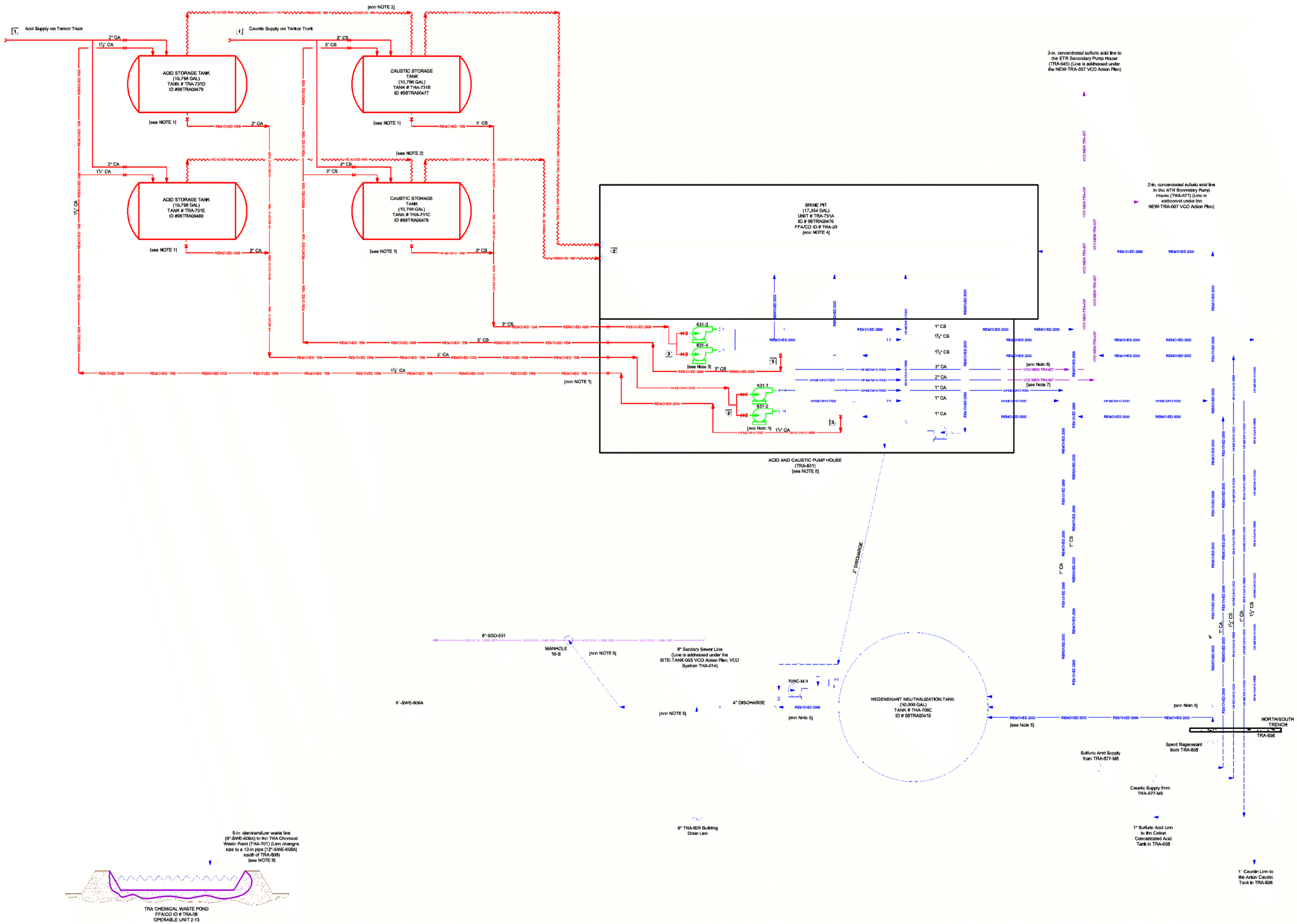
# Appendix A

# System Schematics

Appendix A includes piping schematics showing the piping that is included as part of this closure. The following schematics are included in this appendix:

- P-CLOS-TRA-731-1 Process Flow Schematic and Tank System Boundaries
- P-CLOS-TRA-731-2 Tank System Piping Plan
- P-CLOS-TRA-731-3 Site Plan Showing FFA/CO Sites

Insert Schematic P-CLOS-TRA-731-1 (Size D) here.




## LEGEND

- BUILDINGS
- UNITS THAT MANAGED HWMA/RCRA-REGULATED WASTE
- HWMA/RCRA-REGULATED PIPING TO BE ADDRESSED AS PART OF CLOSURE
- REMOVED 1998 — HWMA/RCRA-REGULATED PIPING ADDRESSED AS PART OF CLOSURE [REMOVED 1998]
- REMOVED 1998 — TEMPORARY PIPING USED TO TRANSFER HWMA/RCRA-REGULATED WASTES [REMOVED]
- PROCESS/PRODUCT LINES NOT INCLUDED IN CLOSURE
- REMOVED 2000 — PIPING AND ANCILLARY EQUIPMENT REMOVED UNDER THE NEW-TRA-006 VCO ACTION PLAN
- PIPING AND ANCILLARY EQUIPMENT - REMOVED 2000
- VCO NEW TRA 007 — PIPING COVERED UNDER THE NEW-TRA-007 VCO ACTION PLAN
- VCO SITE TANK 005 — PIPING COVERED UNDER THE SITE-TANK-005 VCO ACTION PLAN
- # — SYSTEM BOUNDARY
- CA — ACID LINE
- CS — CAUSTIC LINE

## UNITS INCLUDED IN CLOSURE

CAUSTIC STORAGE TANK (TRA-731B; 98TRA00477)
CAUSTIC STORAGE TANK (TRA-731C; 98TRA00478)
ACID STORAGE TANK (TRA-731D; 98TRA00479)
ACID STORAGE TANK (TRA-731E; 98TRA00480)

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| | | | |
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| 007527, REVISION R | 131137, REVISION 5 | 175567, REVISION 10 | 453286, REVISION 1 |
| 007527, REVISION 16 | 166413, REVISION A | 175770, REVISION 3 | 502060, REVISION 0 |
| 008564 | 166414, REVISION J | 416052, REVISION 0 | 842-MTR-207-1, REVISION 0 |
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## REFERENCE DOCUMENTS

## TANK SYSTEM BOUNDARIES

THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM HWMA/RCRA CLOSURE INCLUDES THOSE UNITS AND ANCILLARY EQUIPMENT THAT MANAGED/POTENTIALLY MANAGED HWMA/RCRA-REGULATED WASTE FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS. MATERIAL STORED IN THE TRA-731 CAUSTIC AND ACID STORAGE TANKS WAS A PRODUCT MATERIAL USED IN THE DEMINERALIZER AND ELEMENTARY NEUTRALIZATION OPERATIONS AT THE TRA. SUBSEQUENT TO THE TANKS BEING REMOVED FROM SERVICE IN FALL 1992, THE CAUSTIC AND ACID IN THE TANKS BECAME A WASTE SUBJECT TO HWMA/RCRA REGULATION. THE FOLLOWING TANK SYSTEM BOUNDARIES DEFINE THE EXTENTS OF THE TANK SYSTEM TO BE HWMA/RCRA CLOSED:

1. THE 2-IN. CAUSTIC SUPPLY LINE AND THE 2-IN. ACID SUPPLY LINE ARE INCLUDED IN THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM IN THEIR ENTIRETY. THESE LINES WERE USED TO TRANSFER PRODUCT SOLUTION FROM TANK TRUCKS TO THE CAUSTIC AND ACID STORAGE TANKS.

2. TEMPORARY PIPING USED TO TRANSFER WASTE AND FLUSH SOLUTIONS FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS TO THE BRINE PIT IN SUMMER 1995 IS INCLUDED IN THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM IN ITS ENTIRETY.

3. PIPING AND ANCILLARY EQUIPMENT THAT REMAINED ACTIVE AFTER THE TRA-731 CAUSTIC AND ACID STORAGE TANKS WERE TAKEN OUT OF SERVICE (FALL 1992) IS NOT INCLUDED IN THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM. THIS PIPING AND ANCILLARY EQUIPMENT SUPPORTED ACTIVE PROCESS/PRODUCT SYSTEMS AND DID NOT MANAGE RCRA-HAZARDOUS WASTE ASSOCIATED WITH THE TRA-731 CAUSTIC AND ACID STORAGE TANKS. THEREFORE, TRANSFER PIPING FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS IS INCLUDED IN THE TANK SYSTEM TO THE POINT WHERE IT WAS CUT AND CAPPED IN TRA-631 WHEN THE TRANSFER PUMPS WERE RELOCATED AND FROM THE VALVES IN THE RETURN LINES.

## NOTES

1. PIPING IN THE EAST/WEST TRENCH FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS WAS REMOVED IN 1998 AS PART OF DEACTIVATION OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM. PIPING WAS CUT AND FLANGED INSIDE TRA-631; PIPING INSIDE TRA-631 REMAINED IN PLACE. THE PIPING REMOVED FROM THE EAST/WEST TRENCH WAS CHARACTERIZED AS RCRA-CONTAMINATED DEBRIS AND SENT TO THE ONYX ENVIRONMENTAL LANDFILL IN ARLINGTON, OREGON FOR MACROENCAPSULATION AND SUBSEQUENT DISPOSAL (UNIFORM HAZARDOUS WASTE MANIFEST NO. 01091). DISPOSITION OF THIS PIPING WILL BE DOCUMENTED AS PART OF HWMA/RCRA CLOSURE OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM.

2. TEMPORARY PIPING WAS USED TO TRANSFER WASTE AND FLUSH SOLUTIONS FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS TO THE BRINE PIT IN SUMMER 1995. THIS PIPING WAS REMOVED DURING DEACTIVATION ACTIVITIES IN 1998 AND CHARACTERIZED AS RCRA-CONTAMINATED DEBRIS AND SENT TO THE ONYX ENVIRONMENTAL LANDFILL IN ARLINGTON, OREGON FOR MACROENCAPSULATION AND SUBSEQUENT DISPOSAL (UNIFORM HAZARDOUS WASTE MANIFEST NO. 01091). DISPOSITION OF THIS PIPING WILL BE DOCUMENTED AS PART OF HWMA/RCRA CLOSURE OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM.

3. THE CAUSTIC AND ACID TRANSFER PUMPS WERE REMOVED FROM THE ACID AND CAUSTIC PUMP HOUSE (TRA-631) IN FALL 1992 WHEN THE TRA-731 CAUSTIC AND ACID STORAGE TANKS WERE REMOVED FROM SERVICE. THE PUMPS WERE MOVED TO THE ACID AND CAUSTIC STORAGE BUILDING (TRA-677) FOR USE WITH THE NEW CAUSTIC AND ACID PRODUCT TANKS.

4. THE BRINE PIT WAS USED FROM 1952 THROUGH 1984 AS A STORAGE TANK FOR SODIUM CHLORIDE DEMINERALIZER SOLUTIONS. FROM 1984 THROUGH SPRING/SUMMER 1997 THE BRINE PIT WAS USED AS AN ELEMENTARY NEUTRALIZATION UNIT, NEUTRALIZING SPENT REGENERANT SOLUTIONS FROM THE DEMINERALIZER PROCESS PRIOR TO DISCHARGE TO THE TRA CHEMICAL WASTE POND. THE BRINE PIT WAS CLOSED AS A LESS THAN 90 DAY ACCUMULATION TANK PURSUANT TO THE APPLICABLE REQUIREMENTS OF IDAPA 16.01.05.009 [40 CFR 265 SUBPARTS G & J] IN OCTOBER 1996. RELEASES FROM THE BRINE PIT WERE RESOLVED UNDER THE 1997 NOTICE OF VIOLATION/CONSENT ORDER, VIOLATION NO. 91.

5. PIPING IN THE NORTH/SOUTH TRENCH WAS REMOVED UNDER THE NEW-TRA-006 VCO ACTION PLAN IN SPRING 2000. IN ADDITION TO PIPING IN THE NORTH/SOUTH TRENCH, REMAINING PIPING AND ANCILLARY EQUIPMENT IN TRA-631, THE TRA-708C UTILITY TRENCHES, AND THE TRA-708B UTILITY TRENCH WAS ALSO REMOVED. THE PIPING WAS CHARACTERIZED AS RCRA-CONTAMINATED DEBRIS AND SENT TO THE ONYX ENVIRONMENTAL LANDFILL IN ARLINGTON, OREGON FOR MACROENCAPSULATION AND SUBSEQUENT DISPOSAL (UNIFORM HAZARDOUS WASTE MANIFEST NO. 01516). THIS REMOVAL ACTION INCLUDED PIPING INCLUDED IN THE TRA-731 TANK SYSTEM TO BE HWMA/RCRA CLOSED. DISPOSITION OF THIS PIPING WILL BE DOCUMENTED AS PART OF HWMA/RCRA CLOSURE OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM.

6. THE 3-IN. CONCENTRATED SULFURIC ACID LINE TO THE ETR SECONDARY PUMP HOUSE (TRA-645) WAS USED TO TRANSFER PRODUCT SOLUTIONS FOR USE IN THE ETR SECONDARY COOLANT SYSTEMS. THE LINE WAS ABANDONED IN 1981 AND WAS CUT AND CAPPED IN THE ACID AND CAUSTIC PUMP HOUSE BETWEEN 1981 AND 1984. THIS PIPE NEVER MANAGED RCRA HAZARDOUS WASTE FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM AND IS ADDRESSED UNDER THE NEW-TRA-007 VCO ACTION PLAN

7. THE 2-IN. CONCENTRATED SULFURIC ACID LINE TO THE ATR SECONDARY PUMP HOUSE (TRA-671) WAS USED TO TRANSFER PRODUCT SOLUTIONS FOR USE IN THE ATR SECONDARY COOLANT SYSTEMS. THE LINE WAS TAKEN OUT OF SERVICE IN DECEMBER 1995. THE LINE WAS BLOWN DOWN TO THE BRINE PIT IN FEBRUARY/MARCH 1996 AND ISOLATED (CUT AND SEALED IN TRA-671; FLANGED SHUT IN TRA-631), AND ABANDONED. THIS PIPE NEVER MANAGED RCRA HAZARDOUS WASTE FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM AND IS ADDRESSED UNDER THE NEW-TRA-007 VCO ACTION PLAN.

8. THE BUILDING DRAIN LINE FROM THE DEMINERALIZER BUILDING (TRA-608) WAS REROUTED TO THE SANITARY SEWER SYSTEM IN SPRING/SUMMER 1999. THE 4-IN. DISCHARGE LINE FROM TRA-708C WAS CUT AND CAPPED AND THE 8" DEMINERALIZER WASTE LINE (8"-SWE-608A) CUT AND REROUTED TO THE SANITARY SEWER SYSTEM VIA MANHOLE 16-5.

9. THE TRA CHEMICAL WASTE POND RECEIVED WASTEWATER FROM DEMINERALIZER OPERATIONS FROM 1962 UNTIL 1999. THE CHEMICAL WASTE POND WAS CAPPED AS PART OF THE ACTIONS SPECIFIED BY THE FINAL OPERABLE UNIT 2-13 RECORD OF DECISION. DISCHARGE PIPING WAS SAMPLED AND THE DISCHARGE LINE ABANDONED BY CUTTING AND GROUTING THE PIPE AT THE POINT TO WHICH THE TOE OF THE ENGINEERED COVER EXTENDS.

## REVISIONS

| REV | DESCRIPTION | DATE | INIT |
|---|---|---|---|
| | | | |

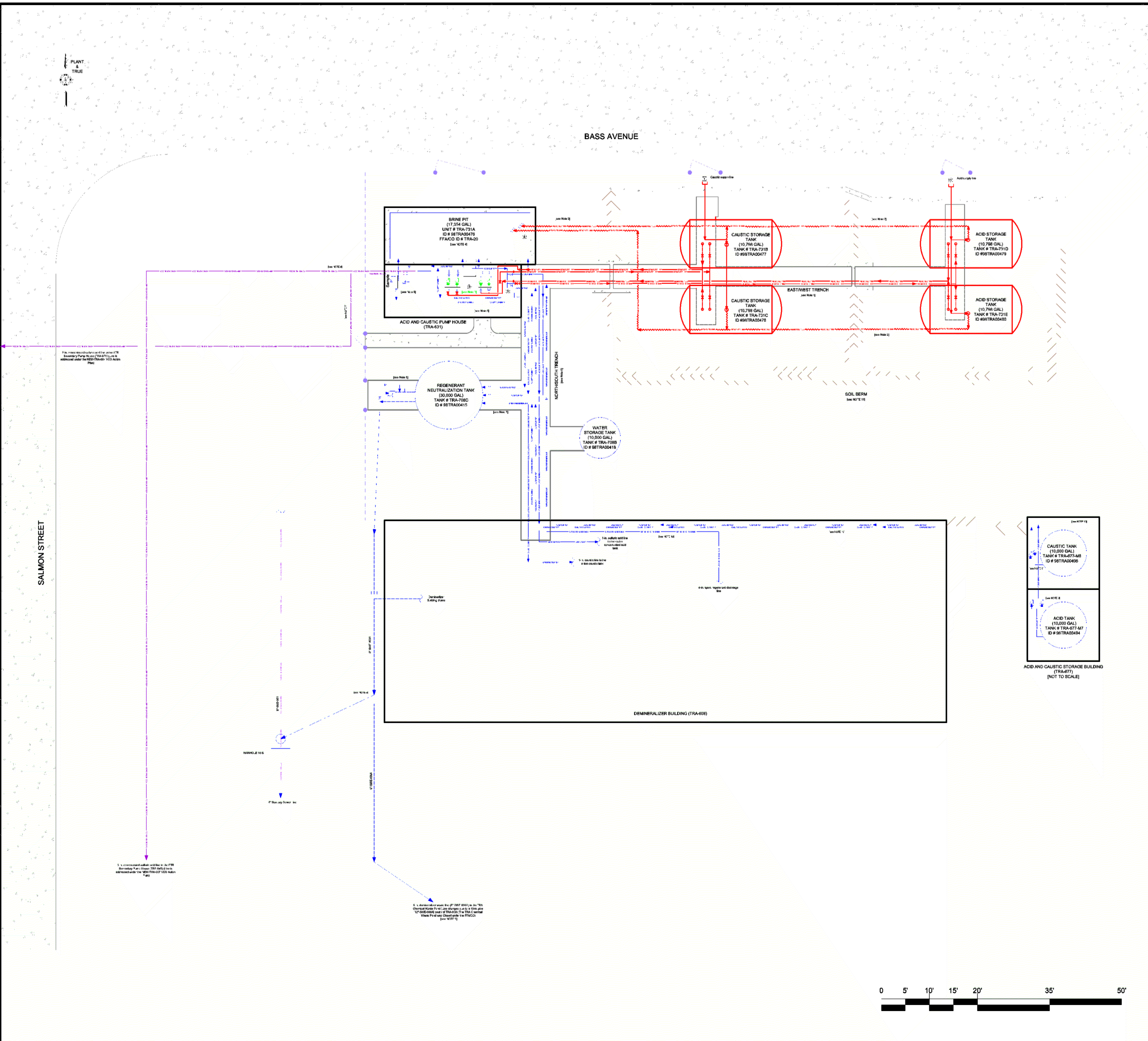
## ENVIRONMENTAL AFFAIRS - 1997 NOV/CO

THIS SCHEMATIC IS PROVIDED AS A SUPPLEMENT TO THE HWMA/RCRA CLOSURE PLAN FOR THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM. THIS SCHEMATIC IS NOT INTENDED TO BE USED AS A PIPING AND INSTRUMENTATION DIAGRAM NOR IS IT MANAGED BY INEEL CONFIGURATION CONTROL. THIS SCHEMATIC IS FOR ENVIRONMENTAL AFFAIRS USE ONLY.

IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY
TEST REACTOR AREA (TRA)
TRA-731 CAUSTIC/ACID STORAGE TANK SYSTEM HWMA/RCRA CLOSURE
PROCESS FLOW SCHEMATIC AND TANK SYSTEM BOUNDARIES

SCHEMATIC NUMBER: P-CLOS-TRA-731-1
REVISION: 0
SCALE: NONE
DATE: 09/18/01
RESEARCH: PORTAGE, INC.
DRAWING: PORTAGE, INC.

Insert schematic P-CLOS-TRA-731-2 (Size E) here.




## LEGEND

- BUILDINGS
- TRENCHES
- CONCRETE STRUCTURES
- ROADS
- FENCING
- UNITS INCLUDED IN HWMA/RCRA CLOSURE
- LINES AND COMPONENTS INCLUDED IN HWMA/RCRA CLOSURE
- LINES INCLUDED IN HWMA/RCRA CLOSURE [REMOVED 1998]
- TEMPORARY PIPING INCLUDED IN HWMA/RCRA CLOSURE [REMOVED 1998]
- UNITS AND COMPONENTS NOT INCLUDED IN HWMA/RCRA CLOSURE
- LINES NOT INCLUDED IN HWMA/RCRA CLOSURE
- ACID SUPPLY LINES NOT INCLUDED IN HWMA/RCRA CLOSURE
- CAUSTIC SUPPLY LINES NOT INCLUDED IN HWMA/RCRA CLOSURE
- SPENT REGENERANT LINES NOT INCLUDED IN HWMA/RCRA CLOSURE
- LINES ADDRESSED UNDER THE NEW-TRA-007 VCO ACTION PLAN
- LINES ADDRESSED UNDER THE SITE-TANK-005 VCO ACTION PLAN
- EQUIPMENT MOVED TO TRA-677 IN THE FALL OF 1992
- SOIL BERM
- SOIL BERM [REMOVED]
- SYSTEM BOUNDARY CONDITION

## UNITS INCLUDED IN CLOSURE

CAUSTIC STORAGE TANK (TRA-731B; 98TRA00477)
CAUSTIC STORAGE TANK (TRA-731C; 98TRA00478)
ACID STORAGE TANK (TRA-731D; 98TRA00479)
ACID STORAGE TANK (TRA-731E; 98TRA00480)

## REGULAROTY INTERFACES

**FFA/CO**
TRA-20 BRINE PIT (TRA-731A; 98TRA00476)
TRA-40 NORTH/SOUTH TRENCH
TRA-56 ACID LINE TO TRA-645
TRA-59 ACID LINE TO TRA-671
TRA-60 SOILS IN THE FENCED AREA NORTH OF TRA-608

**VCO**
NEW-TRA-007 VCO ACTION PLAN
SITE-TANK-005 VCO ACTION PLAN

## REFERENCE DRAWINGS

| | | | |
|---|---|---|---|
| 007527, REVISION N | 100491, REVISION 14 | 166421, REVISION A | 448546, REVISION 2 |
| 007527, REVISION P | 100908, REVISION 4 | 166426, REVISION A | 453286, REVISION 0 |
| 007527, REVISION R | 131137, REVISION 5 | 175567, REVISION 10 | 453286, REVISION 1 |
| 007527, REVISION 16 | 166413, REVISION 3 | 175778, REVISION A | 453286, REVISION 2 |
| 008564 | 166414, REVISION J | 416052, REVISION 0 | 502580, REVISION 0 |
| 100015, REVISION 12 | 166415, REVISION C | 422684, REVISION 2 | 842-MTR-207-1, REVISION 0 |
| 100421, REVISION 11 | 166416, REVISION D | 441377, SHEET 2 OF 2 | 842-MTR-305-1, REVISION 0 |
| 100487, REVISION 28 | 166417, REVISION C | 441379, REVISION 2 | |
| 100490, REVISION M | 166420, REVISION A | 441380, REVISION 2 | |

## TANK SYSTEM BOUNDARIES

THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM HWMA/RCRA CLOSURE INCLUDES THOSE UNITS AND ANCILLARY EQUIPMENT THAT MANAGED/POTENTIALLY MANAGED HWMA/RCRA-REGULATED WASTE FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS. MATERIAL STORED IN THE TRA-731 CAUSTIC AND ACID STORAGE TANKS WAS A PRODUCT MATERIAL USED IN THE DEMINERALIZER AND ELEMENTARY NEUTRALIZATION OPERATIONS AT THE TRA. SUBSEQUENT TO THE TANKS BEING REMOVED FROM SERVICE IN FALL 1992, THE CAUSTIC AND ACID IN THE TANKS BECAME A WASTE SUBJECT TO HWMA/RCRA REGULATION. THE FOLLOWING TANK SYSTEM BOUNDARIES DEFINE THE EXTENTS OF THE TANK SYSTEM TO BE HWMA/RCRA CLOSED:

1. THE 2-IN. CAUSTIC SUPPLY LINE AND THE 2-IN. ACID SUPPLY LINE ARE INCLUDED IN THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM IN THEIR ENTIRETY. THESE LINES WERE USED TO TRANSFER PRODUCT SOLUTION FROM TANK TRUCKS TO THE CAUSTIC AND ACID STORAGE TANKS.

2. TEMPORARY PIPING USED TO TRANSFER WASTE AND FLUSH SOLUTIONS FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS TO THE BRINE PIT IN SUMMER 1995 IS INCLUDED IN THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM IN ITS ENTIRETY.

3. PIPING AND ANCILLARY EQUIPMENT THAT REMAINED ACTIVE AFTER THE TRA-731 CAUSTIC AND ACID STORAGE TANKS WERE TAKEN OUT OF SERVICE (FALL 1992) IS NOT INCLUDED IN THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM. THIS PIPING AND ANCILLARY EQUIPMENT SUPPORTED ACTIVE PROCESS/PRODUCT SYSTEMS AND DID NOT MANAGE HWMA/RCRA-HAZARDOUS WASTE ASSOCIATED WITH THE TRA-731 CAUSTIC AND ACID STORAGE TANKS. THEREFORE, TRANSFER PIPING FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS IS INCLUDED IN THE TANK SYSTEM TO THE POINT WHERE IT WAS CUT AND CAPPED IN TRA-631 WHEN THE TRANSFER PUMPS WERE RELOCATED AND FROM THE VALVES IN THE RETURN LINES.

## NOTES

1. PIPING IN THE EAST/WEST TRENCH FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS WAS REMOVED IN 1998 AS PART OF DEACTIVATION OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM. PIPING WAS CUT AND FLANGED INSIDE TRA-631; PIPING INSIDE TRA-631 REMAINED IN PLACE. THE PIPING REMOVED FROM THE EAST/WEST TRENCH WAS CHARACTERIZED AS RCRA-CONTAMINATED DEBRIS AND SENT TO THE ONYX ENVIRONMENTAL LANDFILL IN ARLINGTON, OREGON FOR MACROENCAPSULATION AND SUBSEQUENT DISPOSAL (UNIFORM HAZARDOUS WASTE MANIFEST NO. 01091). DISPOSITION OF THIS PIPING WILL BE DOCUMENTED AS PART OF HWMA/RCRA CLOSURE OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM.

2. TEMPORARY PIPING WAS USED TO TRANSFER WASTE AND FLUSH SOLUTIONS FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANKS TO THE BRINE PIT IN SUMMER 1995. THIS PIPING WAS REMOVED DURING DEACTIVATION ACTIVITIES IN 1998 AND CHARACTERIZED AS RCRA-CONTAMINATED DEBRIS AND SENT TO THE ONYX ENVIRONMENTAL LANDFILL IN ARLINGTON, OREGON FOR MACROENCAPSULATION AND SUBSEQUENT DISPOSAL (UNIFORM HAZARDOUS WASTE MANIFEST NO. 01091). DISPOSITION OF THIS PIPING WILL BE DOCUMENTED AS PART OF HWMA/RCRA CLOSURE OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM.

3. THE CAUSTIC AND ACID TRANSFER PUMPS WERE REMOVED FROM THE ACID AND CAUSTIC PUMP HOUSE (TRA-631) IN FALL 1992 WHEN THE TRA-731 CAUSTIC AND ACID STORAGE TANKS WERE REMOVED FROM SERVICE. THE PUMPS WERE MOVED TO THE ACID AND CAUSTIC STORAGE BUILDING (TRA-677) FOR USE WITH THE NEW CAUSTIC AND ACID PRODUCT TANKS.

4. THE BRINE PIT WAS USED FROM 1952 THROUGH 1984 AS A STORAGE TANK FOR SODIUM CHLORIDE DEMINERALIZER SOLUTIONS. FROM 1984 THROUGH SPRING/SUMMER 1997 THE BRINE PIT WAS USED AS AN ELEMENTARY NEUTRALIZATION UNIT. NEUTRALIZING SPENT REGENERANT SOLUTIONS FROM THE DERMINERALIZER PROCESS PRIOR TO DISCHARGE TO THE TRA CHEMICAL WASTE POND. THE BRINE PIT WAS CLOSED AS A LESS THAN 90 DAY ACCUMULATION TANK PURSUANT TO THE APPLICABLE REQUIREMENTS OF IDAPA 16.01.05.009 [40 CFR 265 SUBPARTS G & J] IN OCTOBER 1996. RELEASES FROM THE BRINE PIT WERE RESOLVED UNDER THE 1997 NOTICE OF VIOLATION/CONSENT ORDER, VIOLATION NO. 91.

5. PIPING IN THE NORTH/SOUTH TRENCH WAS REMOVED UNDER THE NEW-TRA-006 VCO ACTION PLAN IN SPRING 2000. IN ADDITION TO PIPING IN THE NORTH/SOUTH TRENCH, REMAINING PIPING AND ANCILLARY EQUIPMENT IN TRA-631, THE TRA-708C UTILITY TRENCHES, AND THE TRA-708B UTILITY TRENCH WAS ALSO REMOVED. THE PIPING WAS CHARACTERIZED AS RCRA-CONTAMINATED DEBRIS AND SENT TO THE ONYX ENVIRONMENTAL LANDFILL IN ARLINGTON, OREGON FOR MACROENCAPSULATION AND SUBSEQUENT DISPOSAL (UNIFORM HAZARDOUS WASTE MANIFEST NO. 01518). THIS REMOVAL ACTION INCLUDED PIPING INCLUDED IN THE TRA-731 TANK SYSTEM TO BE HWMA/RCRA CLOSED. DISPOSITION OF THIS PIPING WILL BE DOCUMENTED AS PART OF HWMA/RCRA CLOSURE OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM.

6. THE 3-IN. CONCENTRATED SULFURIC ACID LINE TO THE ETR SECONDARY PUMP HOUSE (TRA-645) WAS USED TO TRANSFER PRODUCT SOLUTIONS FOR USE IN THE ETR SECONDARY COOLANT SYSTEMS. THE LINE WAS ABANDONED IN 1981 AND WAS CUT AND CAPPED IN THE ACID AND CAUSTIC PUMP HOUSE BETWEEN 1981 AND 1984. THIS PIPE NEVER MANAGED RCRA HAZARDOUS WASTE FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM AND IS ADDRESSED UNDER THE NEW-TRA-007 VCO ACTION PLAN.

7. THE 2-IN. CONCENTRATED SULFURIC ACID LINE TO THE ATR SECONDARY PUMP HOUSE (TRA-671) WAS USED TO TRANSFER PRODUCT SOLUTIONS FOR USE IN THE ATR SECONDARY COOLANT SYSTEMS. THE LINE WAS TAKEN OUT OF SERVICE IN DECEMBER 1995. THE LINE WAS BLOWN DOWN TO THE BRINE PIT IN FEBRUARY/MARCH 1996 AND ISOLATED (CUT AND SEALED IN TRA-671; FLANGED SHUT IN TRA-631), AND ABANDONED. THIS PIPE NEVER MANAGED RCRA HAZARDOUS WASTE FROM THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM AND IS ADDRESSED UNDER THE NEW-TRA-007 VCO ACTION PLAN.

8. THE BUILDING DRAIN LINE FROM THE DEMINERALIZER BUILDING (TRA-608) WAS REROUTED TO THE SANITARY SEWER SYSTEM IN SPRING/SUMMER 1999. THE 4-IN. DISCHARGE LINE FROM TRA-708C WAS CUT AND CAPPED AND THE 8-IN. DEMINERALIZER WASTE LINE (8"-SWE-608A) CUT AND REROUTED TO THE SANITARY SEWER SYSTEM VIA MANHOLE 16-S.

9. THE TRA CHEMICAL WASTE POND RECEIVED WASTEWATER FROM DEMINERALIZER OPERATIONS FROM 1962 UNTIL 1999. THE CHEMICAL WASTE POND WAS CAPPED AS PART OF THE ACTIONS SPECIFIED BY THE FINAL OPERABLE UNIT 2-13 RECORD OF DECISION. DISCHARGE PIPING WAS SAMPLED AND THE DISCHARGE LINE ABANDONED BY CUTTING AND GROUTING THE PIPE AT THE POINT TO WHICH THE TOE OF THE ENGINEERED COVER EXTENDS.

10. ACID AND CAUSTIC PIPING AND COMPONENTS IN TRA-608 AND TRA-677 WAS FLUSHED, SAMPLED, AND REMOVED AS PART OF THE DEMINERALIZER PROCESS UPGRADES IN 1999. PIPING REMAINS IN PLACE BETWEEN TRA-677 AND TRA-608 (BERM). THIS ABANDONED PIPING WAS FLUSHED AND SAMPLED ALONG WITH THE PIPING IN TRA-608 AND TRA-677.

11. PORTIONS OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM SOIL BERM WERE REMOVED IN 1998 DURING DEACTIVATION ACTIVITIES TO GAIN ACCESS TO THE TANKS. THE SOILS SHOWED NO VISIBLE SIGNS OF STAINING AND WERE SPREAD EVENLY ACROSS THE FENCED AREA NORTH OF TRA-608.

## REVISIONS

| REV | DESCRIPTION | DATE | INIT |
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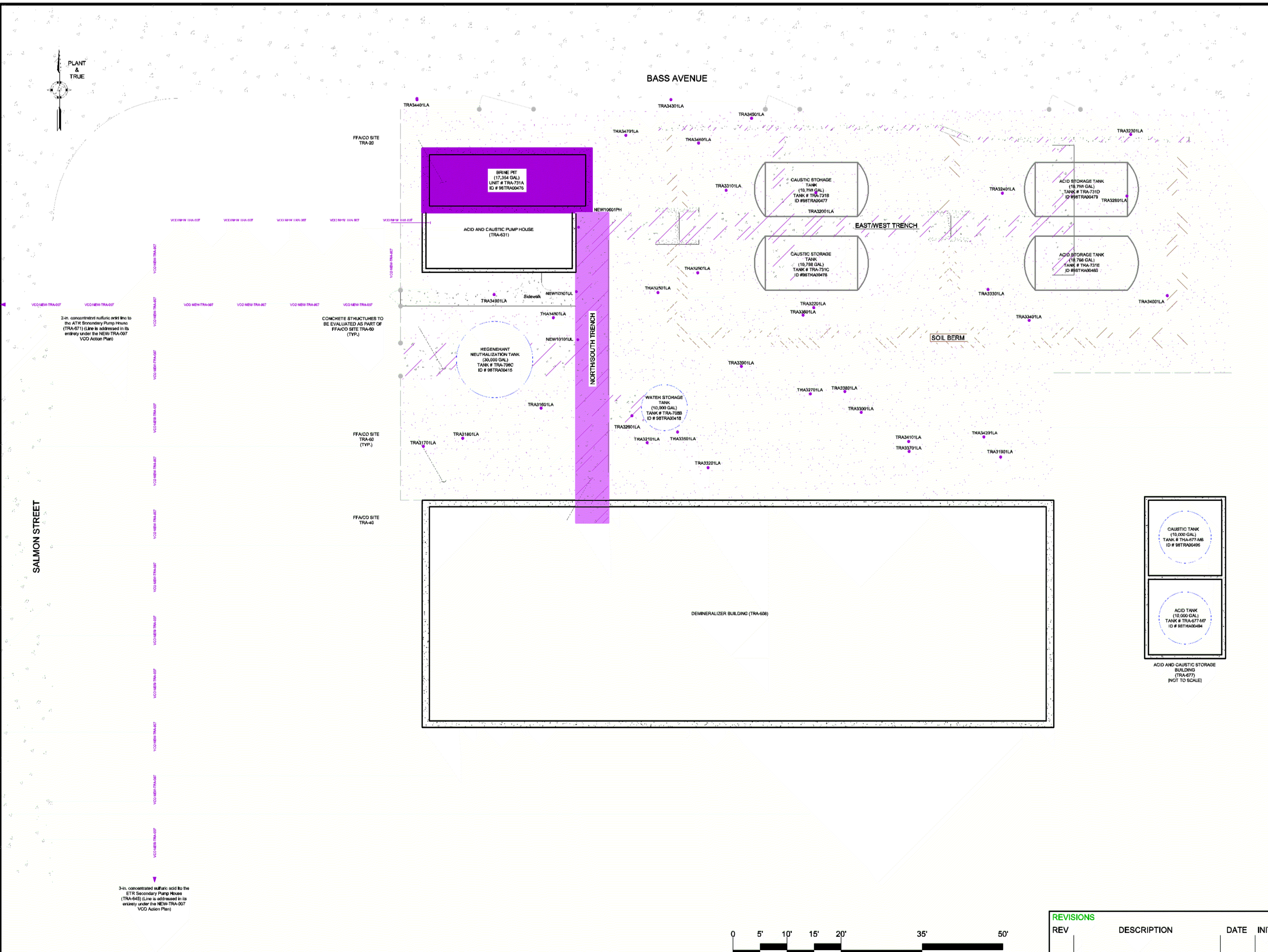
## ENVIRONMENTAL AFFAIRS - 1997 NOV/CO

THIS SCHEMATIC IS PROVIDED AS A SUPPLEMENT TO THE VOLUNTARY CONSENT ORDER PROGRAM'S SYSTEM IDENTIFICATION EFFORT. THIS SCHEMATIC IS NOT INTENDED TO BE USED AS A PIPING AND INSTRUMENTATION DIAGRAM NOR IS IT MANAGED BY INEEL CONFIGURATION CONTROL. THIS SCHEMATIC IS FOR VCO PROGRAM USE ONLY.

IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY
TEST REACTOR AREA (TRA)
TRA-731 CAUSTIC/ACID STORAGE TANK SYSTEM HWMA/RCRA CLOSURE
TANK SYSTEM PIPING PLAN

SCHEMATIC NUMBER: P-CLOS-TRA-731-2
REVISION: 0
SCALE: SHOWN
DATE: 09/17/01
RESEARCH: PORTAGE, INC.
DRAWING: PORTAGE, INC.

Insert Schematic P-CLOS-TRA-731-3 (Size D) here.




| REVISIONS | | | |
|---|---|---|---|
| REV | DESCRIPTION | DATE | INIT |
| | | | |

## LEGEND

- BUILDINGS
- CONCRETE STRUCTURES
- ROADS
- FENCING
- TRA-731 ACID/CAUSTIC TANKS
- ABOVEGROUND UNITS NOT ADDRESSED UNDER THE FFA/CO OR THE HWMA/RCRA CLOSURE OF THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM
- VCO NEW-TRA-007 — NEW-TRA-007 VCO ACTION PLAN
- FFA/CO SITE TRA-20
- FFA/CO SITE TRA-40
- FFA/CO SITE TRA-60
- CONCRETE STRUCTURES TO BE EVALUATED AS PART OF FFA/CO SITE TRA-60
- SOIL BERM
- FFA/CO SITE-60 SOIL SAMPLING LOCATION
- SOIL BERM [REMOVED]

## REFERENCE DRAWINGS

842-MTR-207-1, REVISION 0

## REGULARORY INTERFACES

### FFA/CO

**SITE TRA-20 -** SITE TRA-20 INCLUDES THE 17,354-GAL STEEL-REINFORCED CONCRETE TANK (BRINE PIT; TRA-731A), WHICH IS LOCATED IMMEDIATELY NORTH OF THE ACID AND CAUSTIC PUMP HOUSE (TRA-631). THE TANK WAS OPERATED FROM 1952 THROUGH 1984 AS A STORAGE TANK FOR SODIUM CHLORIDE DEMINERALIZER SOLUTIONS. FROM 1984 THROUGH SPRING/SUMMER 1997 THE BRINE PIT WAS USED AS AN ELEMENTARY NEUTRALIZATION UNIT, NEUTRALIZING SPENT REGENERANT SOLUTIONS FROM THE DEMINERALIZER PROCESS PRIOR TO DISCHARGE TO THE TRA CHEMICAL WASTE POND (FFA/CO SITE TRA-06, OU 2-13).

THE BRINE PIT WAS CLOSED UNDER HWMA/RCRA AS A LESS THAN 90-DAY ACCUMULATION TANK IN OCTOBER 1996 AND WAS RETURNED TO SERVICE AS AN ELEMENTARY NEUTRALIZATION UNIT IN NOVEMBER 1996 FOLLOWING FAILURE OF THE REGENERANT NEUTRALIZATION TANK (TRA-708C). THE BRINE PIT CONTINUED OPERATION AS AN ELEMENTARY NEUTRALIZATION UNIT UNTIL THE SPRING/SUMMER OF 1997.

UNDER THE TRACK 2 ASSESSMENT, COMPLETED IN 1993, A VISUAL INSPECTION OF THE INNER SURFACE OF THE TANK WAS CONDUCTED IN 1992 AND AT THAT TIME THE SEAL ON THE WALLS WAS INTACT. FURTHER INVESTIGATION CONDUCTED DURING THE TRACK 2 ASSESSMENT DID NOT REVEAL ANY DOCUMENTATION OF RELEASES FROM THIS TANK. BASED UPON THE RESULTS OF THE TRACK 2 ASSESSMENT FOR THIS SITE, THE SITE WAS DESIGNATED AS A NO ACTION SITE UNDER THE OU 2-13 ROD IN DECEMBER 1997.

**SITE TRA-40 -** SITE TRA-40 INCLUDES A 45-FT LONG REINFORCED CONCRETE UTILITY TRENCH (NORTH/SOUTH TRENCH) FOR PIPING RUNS FROM TRA-631 TO THE DEMINERALIZER BUILDING (TRA-608). PIPING IN THE TRENCH WAS USED TO SUPPLY ACID AND CAUSTIC SOLUTIONS TO THE DEMINERALIZER PROCESS IN TRA-608, THE ELEMENTARY NEUTRALIZATION PROCESSES IN TRA-708C AND TRA-731, AND TO CONVEY SPENT REGENERANT SOLUTIONS TO TRA-708C OR TRA-731A FOR NEUTRALIZATION PRIOR TO DISCHARGE TO THE TRA CHEMICAL WASTE POND.

IN DECEMBER 1991, THE TRENCH WAS IDENTIFIED AND ACCEPTED UNDER THE FFA/CO AS SITE TRA-40. BASED UPON AN EVALUATION OF THE DATA COLLECTED DURING THE TRACK 2 ASSESSMENT, THE SITE WAS DESIGNATED AS A NO FURTHER ACTION SITE UNDER THE OU 2-13 ROD IN DECEMBER 1997.

PIPING IN THE NORTH/SOUTH TRENCH WAS REMOVED UNDER THE NEW-TRA-006 VOLUNTARY CONSENT ORDER (VCO) ACTION PLAN IN SPRING 2000 AND WAS CHARACTERIZED AS HWMA/RCRA-CONTAMINATED DEBRIS. THE DEBRIS WAS TRANSPORTED TO THE ONYX ENVIRONMENTAL LANDFILL IN ARLINGTON, OREGON FOR MACROENCAPSULATION AND SUBSEQUENT DISPOSAL.

**SITE TRA-60 -** SITE TRA-60 INCLUDES THE SOILS INSIDE THE FENCED AREA NORTH OF TRA-608. IN NOVEMBER 1999 A NEW SITE IDENTIFICATION WAS IDENTIFIED AND ACCEPTED UNDER THE FFA/CO. SITE TRA-60 HAS BEEN INVESTIGATED FOR LEAD AND MERCURY SURFACE CONTAMINATION AND DATA ARE CURRENTLY BEING EVALUATED. ADDITIONAL ACTIVITIES TO BE INCORPORATED INTO SITE TRA-60 INCLUDE THE INVESTIGATION OF SOILS BENEATH THE NORTH/SOUTH TRENCH (FFA/CO SITE TRA-40), THE EAST/WEST TRENCH, THE TRA-708C TRENCHES, AND THE BRINE PIT (FFA/CO SITE TRA-20). ADDITIONALLY, THE NORTH/SOUTH AND EAST/WEST UTILITY TRENCHES (I.E., CONCRETE) WILL BE EVALUATED UNDER SITE TRA-60.

ACTIVITIES ASSOCIATED WITH THE ASSESSMENT OF THE TRA-708C TRENCHES, THE NORTH/SOUTH TRENCH, THE EAST/WEST TRENCH, AND THE BRINE PIT WILL CONSIST OF COLLECTING CONCRETE AND SOIL SAMPLES IN THOSE AREAS MOST LIKELY TO HAVE RECEIVED RELEASES FROM THE ASSOCIATED PROCESSES, BASED UPON A VISUAL INSPECTION OF THE CONCRETE. SAMPLING AND ANALYSIS OF CONCRETE IN THE EAST/WEST TRENCH AND ASSOCIATED SOILS WILL BE EVALUATED IN ACCORDANCE WITH THE APPROPRIATE HWMA/RCRA REQUIREMENTS; ALL OTHER CONCRETE AND SOILS WILL BE EVALUATED IN ACCORDANCE WITH APPROPRIATE CERCLA REQUIREMENTS.

IF CONCENTRATIONS IN CONCRETE SAMPLES EXCEED INEEL BACKGROUND VALUES, A RISK-BASED ASSESSMENT OF THE CONCRETE WILL BE CONDUCTED AT A RISK LEVEL OF 1E-06 AND A HAZARD QUOTIENT OF 1. ADDITIONALLY, IF SOIL CONTAMINATION ASSOCIATED WITH THE EAST/WEST TRENCH IS IDENTIFIED, A RISK-BASED ASSESSMENT OF THESE SOILS WILL BE CONDUCTED. FOLLOW-ON ACTIVITIES WILL BE CONDUCTED UNDER THE FFA/CO, IF WARRANTED, TO MEET THE HWMA/RCRA REQUIREMENTS.

### NEW-TRA-007 VCO ACTION PLAN

**FFA/CO SITE TRA-56 -** SITE TRA-56 INCLUDES AN ABANDONED 3-IN. DIAMETER PIPELINE THAT WAS USED TO TRANSFER CONCENTRATED SULFURIC ACID FROM TRA-631 TO THE ETR SECONDARY PUMP HOUSE (TRA-645). THE PIPING WAS ABANDONED-IN-PLACE IN CONJUNCTION WITH THE SHUTDOWN OF THE ETR IN 1981. DURING D&D OF TRA-645, LIQUID AND SOLID SULFURIC ACID RESIDUES WERE IDENTIFIED IN THE INACTIVE, ABANDONED PIPING.

THE PIPELINE WAS ADDRESSED UNDER THE NEW-TRA-007 VCO ACTION PLAN. THE ACTION AGREED TO UNDER THE VCO WAS TO SUBMIT A NEW SITE IDENTIFICATION FORM UNDER THE FFA/CO FOR THIS ABANDONED PIPING. IN MARCH 1999, THE PIPING WAS IDENTIFIED AND ACCEPTED UNDER THE FFA/CO AS SITE TRA-56. FOLLOWING IDENTIFICATION AS A NEW SITE, THE NEW-TRA-007 VCO ACTION PLAN WAS MOVED TO APPENDIX C, "COVERED MATTERS THAT ARE CLOSED."

UNDER THE FFA/CO A TRACK 1 INVESTIGATION OF THE SITE WAS INITIATED AND COMPLETED. AN EVALUATION OF THE CARBON STEEL PIPING WAS PERFORMED AND THE STRUCTURAL INTEGRITY OF THE PIPING WAS ESTIMATED TO BE IN EXCESS OF 100 YEARS, ASSUMING NO WATER IS INTRODUCED INTO THE LINE. THE RESULTS OF THE TRACK 1 INVESTIGATION WERE TRANSMITTED TO IDEQ ON MARCH 20, 2001 AND BASED ON AVAILABLE DATA, IN CONJUNCTION WITH THE STRUCTURAL COMPLEXITIES OF THE TRA FACILITY (I.E., THE PORTION OF THE PIPELINE UNDER THE MTR CANAL IS INACCESSIBLE), SITE TRA-56 WAS DESIGNATED AS A NO FURTHER ACTION SITE. TO DATE, THERE ARE NO KNOWN RELEASES TO THE ENVIRONMENT FROM THIS LINE; HOWEVER, INSTITUTIONAL CONTROLS WILL BE IMPLEMENTED AND MAINTAINED AT THE TRA FACILITY AND THE SITE WILL BE RE-EVALUATED UNDER A FUTURE ROD.

**FFA/CO SITE TRA-59 -** SITE TRA-59 INCLUDES AN ABANDONED 2-IN. DIAMETER PIPELINE THAT WAS USED TO TRANSFER CONCENTRATED SULFURIC ACID FROM TRA-631 TO THE ATR SECONDARY PUMP HOUSE (TRA-671). THE PIPING WAS ABANDONED-IN-PLACE IN CONJUNCTION WITH THE TRA-671 UPGRADE IN 1995. IN 1996 THE PIPING WAS BLOWN DOWN TO TRA-731A, FORCING ANY RESIDUAL ACID FROM THE PIPELINE. THE PIPING CONNECTION AT TRA-631 WAS DISCONNECTED AND FLANGED; THE PIPING CONNECTION AT TRA-671 WAS DISCONNECTED, CAPPED, AND SEALED WITH CONCRETE AT FLOOR LEVEL.

THE PIPELINE WAS ADDRESSED UNDER THE NEW-TRA-007 VCO ACTION PLAN. THE ACTION AGREED TO UNDER THE VCO WAS TO SUBMIT A NEW SITE IDENTIFICATION FORM UNDER THE FFA/CO FOR THIS ABANDONED PIPING. IN MARCH 1999, THE PIPING WAS IDENTIFIED AND ACCEPTED UNDER THE FFA/CO AS SITE TRA-56. FOLLOWING IDENTIFICATION AS A NEW SITE, THE NEW-TRA-007 VCO ACTION PLAN WAS MOVED TO APPENDIX C, "COVERED MATTERS THAT ARE CLOSED."

A TRACK 1 INVESTIGATION OF THE SITE WAS INITIATED AND COMPLETED. AN EVALUATION OF THE CARBON STEEL PIPING WAS PERFORMED AND THE STRUCTURAL INTEGRITY OF THE PIPING WAS ESTIMATED TO BE IN EXCESS OF 100 YEARS, ASSUMING THAT NO WATER IS INTRODUCED INTO THE LINE. THE RESULTS OF THE TRACK 1 INVESTIGATION WERE TRANSMITTED TO IDEQ ON MARCH 20, 2001 AND BASED ON AVAILABLE DATA, IN CONJUNCTION WITH THE STRUCTURAL COMPLEXITIES OF THE TRA FACILITY, SITE TRA-59 WAS DESIGNATED AS A NO FURTHER ACTION SITE. TO DATE, THERE ARE NO KNOWN RELEASES TO THE ENVIRONMENT FROM THIS LINE; HOWEVER, INSTITUTIONAL CONTROLS WILL BE IMPLEMENTED AND MAINTAINED AT THE TRA FACILITY AND THE SITE WILL BE RE-EVALUATED UNDER A FUTURE ROD.

## ENVIRONMENTAL AFFAIRS - 1997 NOV/CO

THIS SCHEMATIC IS PROVIDED AS A SUPPLEMENT TO THE HWMA/RCRA CLOSURE PLAN FOR THE TRA-731 CAUSTIC AND ACID STORAGE TANK SYSTEM. THIS SCHEMATIC IS NOT INTENDED TO BE USED AS A PIPING AND INSTRUMENTATION DIAGRAM NOR IS IT MANAGED BY INEEL CONFIGURATION CONTROL. THIS SCHEMATIC IS FOR ENVIRONMENTAL AFFAIRS USE ONLY.

IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY
TEST REACTOR AREA (TRA)
TRA-731 CAUSTIC/ACID STORAGE TANK SYSTEM HWMA/RCRA CLOSURE
SITE PLAN SHOWING REGULATORY INTERFACES

| SCHEMATIC NUMBER: | | | REVISION: |
|---|---|---|---|
| P-CLOS-TRA-731-3 | | | 0 |
| SCALE: SHOWN | DATE: 09/18/01 | RESEARCH: PORTAGE, INC.<br>DRAWING: PORTAGE, INC. | |

# Appendix B

# Determination of TRA-731 Action Levels

# Appendix B

# Determination of TRA-731 Action Levels

## DEVELOPMENT OF ACTION LEVELS FOR THE TRA-731 CAUSTIC/ACID TANK SYSTEM

The TRA-731 caustic and acid storage tanks are to be closed under HWMA/RCRA by decontamination of the internal tank surfaces. Compliance with the performance standard for closure of tank systems (IDAPA 58.01.05.009 [40 CFR 265.111 and 265.197]) is to be demonstrated by sampling the final rinsate solutions from the decontamination efforts and comparing the resulting analytical data with action levels developed in this appendix. The action levels for the HWMA/RCRA closure of the TRA-731 caustic and acid storage tank system have been developed to ensure that the tank system, subsequent to completion of closure activities, will be left in a state that is protective of human health and the environment.

This appendix was prepared to present the calculational methodology used to develop the action levels specific to the HWMA/RCRA closure of the TRA-731 caustic and acid storage tank system. Action levels were developed by defining the acceptable excess cancer risk and hazard quotient thresholds and calculating corresponding action levels based upon these risk and hazard thresholds. Excess cancer risk and hazard to a future residential receptor via the soil ingestion and inhalation pathways were used to develop the action levels. The excess cancer risk and hazard for all pathways and contaminants at the developed action levels are presented. Finally, the action levels are compared to established INEEL soil background concentrations and preliminary remediation goals developed by EPA.

This analysis considers two pathways: soil inhalation and soil ingestion by a residential receptor. In developing the conceptual site model for this risk assessment, the following conservative assumptions were made:

1. The tank system is completely breached and has no capacity to retain liquid that may contact the closed tank system

2. All contacting liquid exits the system at the action level concentration

3. Each liter of contaminated liquid contaminates one kilogram of soil (thus each part per million of contaminant in the liquid is equivalent to one part per million of contaminant in the soil).

The technique for calculation of action levels will be applied to any additional contaminants of concern (COCs) identified during the course of closure activities for the TRA-731 caustic and acid storage tank system.

## Step 1: Define the Total Allowable Excess Cancer Risk and Hazard Quotient to the Future Residential Receptor

As stated in the assumptions above, the liquid that may come into contact with the closed tank system and subsequently contaminate surrounding soil is assumed to exit the tank system and enter the surrounding soil at the action level concentration. The surrounding soil is then assumed to be contaminated at equivalent parts per million concentrations. Consequently, risk-based media cleanup standards are appropriate to establish the allowable excess cancer risk and hazard quotient. Protective media cleanup standards for human health means constituent concentrations that result in the total residual risk from a medium to an individual exposed over a lifetime falling within a range from $10^{-4}$ to $10^{-6}$, with a cumulative carcinogenic risk range. For noncarcinogenic effects, the EPA generally interprets protective cleanup standards to mean constituent concentration that an individual could be exposed to on a daily basis without appreciable risk of deleterious effect during a lifetime; the hazard index generally should not exceed 1 (The National Contingency Plan [55 FR 46, 1990], the 1990 Subpart S Proposal [55 FR 145, 1990], and the 1996 Subpart S ANPR [61 FR 85, 1996]). To assure protectiveness of human health, the most conservative threshold for excess cancer risk, 1.0E-06 will be used.

- Total Allowable Risk Threshold = 1.0 E-06.
- Total Allowable Hazard Quotient Threshold = 1.0.

Because there is potential to discover new COCs when the rinsates are analyzed, and to assure that the developed action levels are conservative, the total allowable risk thresholds for excess cancer risk and hazard quotient will be reduced by a safety factor of 80% and 99.0%, respectively.

- Total allowable risk = 2.0E-7
- Total allowable hazard quotient = 0.01.

## Step 2: Define Receptors and Pathways

The pathways considered for development of action levels include:

- Soil ingestion of contaminated soil by a future residential receptor
- Soil inhalation of contaminated soil by a future residential receptor.

## Step 3: Define the Intake Factor for Each Pathway for a General Contaminant Concentration of *C*

The equations for calculating intake factors for the soil ingestion and soil inhalation pathways are provided in Figures B-1 though B-4 (see Step 9). The equations and input parameters used to calculate the intake factors were obtained from EPA guidance (EPA 1989). The intake factors for general contaminant concentration (*C)* are:

- Soil Ingestion Intake Factor = 1.57E-06*C* (mg/Kg-day)
- Soil Inhalation Intake Factor = 2.43E-11*C* (mg/Kg-day).

## Step 4: Define Contaminants of Concern and Toxicity Parameters

Contaminants of concern were defined for purposes of closure, as all contaminants for which true detections were noted during sampling of the tank solids/liquids in 1995/1996. The COCs are provided in Table B-1. Reference doses and slope factors for each of the contaminants of concern specified in Table B-1 were obtained from the United States EPA Region IX preliminary remediation goal table (EPA 2001a). To ensure the derived action levels are protective of human health and the environment, if a reference dose was available for only one of the two pathways (soil ingestion or soil inhalation), that reference dose was applied to the pathway for which no reference dose was specified in the EPA Region IX table. Slope factors and reference doses for each of the COCs are included in Table B-1.

Table B-1. Contaminants of concern and associated toxicity parameters.

| Contaminants of Concern | Soil Ingestion | | Soil Inhalation | |
|---|---|---|---|---|
| | Slope Factor (Kg-day/mg) | Reference Dose (mg/Kg-day) | Slope Factor (Kg-day/mg) | Reference Dose (mg/Kg-day) |
| Arsenic | 1.50E+00 | 3.00E-04 | 1.50E+01 | 3.00E-04 |
| Barium | - | 7.00E-02 | - | 1.40E-04 |
| Cadmium | - | 5.00E-04 | 6.30E+00 | 5.00E-04 |
| Chromium | - | 1.50E+00 | 4.20E+01 | 1.50E+00 |
| Lead | - | - | - | - |
| Nickel | - | 2.00E-02 | - | 2.00E-02 |
| Mercury | - | 8.60E-05 | - | 8.60E-05 |
| Selenium | - | 5.00E-03 | - | 5.00E-03 |

## Step 5: Define Percentage of Total Allowable Risk and Hazard to be Applied to the Ingestion and Inhalation Pathways

The total allowable excess cancer risk and hazard quotient must be split into the fraction that is allowable for the ingestion pathway and the fraction that is allowable for the inhalation pathway. Experience indicates that the ingestion pathway will drive the risk and hazard for the future residential receptor. Consequently, the majority (99.7%) of the allowable risk and hazard defined in Step 1, above, was assigned to the ingestion pathway as follows:

- Allowable Ingestion Risk = 1.99E-07
- Allowable Inhalation Risk = 6.00 E-10
- Allowable Ingestion Hazard = 2.99E-03
- Allowable Inhalation Hazard = 9.00E-06.

## Step 6: Calculate COC-Specific Allowable Risk and Hazard Quotients for Each Pathway

Allowable risk and hazard quotients for each COC and each pathway were normalized against their expected percent contribution to the overall risk and hazard for each pathway. The percent contribution of the risk of each COC to the allowable total risk for each pathway was calculated by summing the slope factors for each carcinogenic COC and calculating the slope factor percentage for each carcinogenic COC. The COC-specific allowable risk for each pathway were then determined by multiplying this percentage by the pathway-specific allowable risk calculated in Step 5, above. The resulting COC and pathway-specific allowable risks for ingestion and inhalation are presented in Tables B-2 and B-3, respectively.

Table B-2. COC-specific allowable risk for the soil ingestion pathway.

| Contaminant of Concern | Slope Factor (Kg-day/mg) | Slope Factor Percentage | COC-Specific Allowable Risk |
|---|---|---|---|
| Arsenic | 1.50E+00 | 100.00% | 1.99E-07 |
| Barium | - | 0.00% | - |
| Cadmium | - | 0.00% | - |
| Chromium | - | 0.00% | - |
| Lead | - | 0.00% | - |
| Nickel | - | 0.00% | - |
| Mercury | - | 0.00% | - |
| Selenium | - | 0.00% | - |
| Total | 1.50E+00 | 100.00% | 1.99E-07 |

Table B-3. COC-specific allowable risk for the soil inhalation pathway.

| Contaminant of Concern | Slope Factor (Kg-day/mg) | Slope Factor Percentage | COC-Specific Allowable Risk |
|---|---|---|---|
| Arsenic | 1.50E+01 | 23.70% | 1.42E-10 |
| Barium | - | 0.00% | - |
| Cadmium | 6.30E+00 | 9.95% | 5.97E-11 |
| Chromium | 4.20E+01 | 66.35% | 3.98E-10 |
| Lead | - | 0.00% | - |
| Nickel | - | 0.00% | - |
| Mercury | - | 0.00% | - |
| Selenium | - | 0.00% | - |
| Total | 6.33E+01 | 100.00% | 6.00E-10 |

The percent contribution of the hazard quotient of each COC to the allowable total hazard quotient for each pathway was calculated by summing the inverse of the reference doses for each COC and calculating the inverse reference dose percentage for each COC. The COC-specific allowable hazard quotient for each pathway was then determined by multiplying this percentage by the pathway-specific allowable hazard quotient calculated in Step 5, above. The resulting COC and pathway-specific allowable hazard quotients for ingestion and inhalation are presented in Tables B-4 and B-5, respectively.

Table B-4. COC-specific allowable hazard quotient for the soil ingestion pathway.

| Contaminant of Concern | Reference Dose (mg/Kg-day) | Inverse Reference Dose $(mg/Kg\text{-}day)^{-1}$ | Hazard Percentage | COC-Specific Allowable HQ |
|---|---|---|---|---|
| Arsenic | 3.00E-04 | 3.33E+03 | 19.35% | 1.93E-03 |
| Barium | 7.00E-02 | 1.43E+01 | 0.08% | 8.27E-06 |
| Cadmium | 5.00E-04 | 2.00E+03 | 11.61% | 1.16E-03 |
| Chromium | 1.50E+00 | 6.67E-01 | 0.00% | 3.86E-07 |
| Lead | - | - | 0.00% | - |
| Nickel | 2.00E-02 | 5.00E+01 | 0.29% | 2.89E-05 |
| Mercury | 8.60E-05 | 1.16E+04 | 67.50% | 6.73E-03 |
| Selenium | 5.00E-03 | 2.00E+02 | 1.16% | 1.16E-04 |
| Total | | 1.72E+04 | 100.00% | 9.97E-03 |

Table B-5. COC-specific allowable hazard quotient for the soil inhalation pathway.

| Contaminant of Concern | Reference Dose (mg/Kg-day) | Inverse Reference Dose $(mg/Kg\text{-}day)^{-1}$ | Hazard Percentage | COC-Specific Allowable HQ |
|---|---|---|---|---|
| Arsenic | 3.00E-04 | 3.33E+03 | 13.69% | 4.11E-06 |
| Barium | 1.40E-04 | 7.14E+03 | 29.33% | 8.80E-06 |
| Cadmium | 5.00E-04 | 2.00E+03 | 8.21% | 2.46E-06 |
| Chromium | 1.50E+00 | 6.67E-01 | 0.00% | 8.21E-10 |
| Lead | - | - | 0.00% | - |
| Nickel | 2.00E-02 | 5.00E+01 | 0.21% | 6.16E-08 |
| Mercury | 8.60E-05 | 1.16E+04 | 47.74% | 1.43E-05 |
| Selenium | 5.00E-03 | 2.00E+02 | 0.82% | 2.46E-07 |
| Total | | 2.44E+04 | 100.00% | 3.00E-05 |

## Step 7: Calculate the COC and Pathway-Specific Action Levels Based on COC and Pathway-Specific Allowable Risk and Hazard Quotients Calculated in Step 6

The equations that are used to relate risk, intake factor, and slope factor or reference dose to excess cancer risk or hazard quotient are provided in Figures B-1 through B-4 (see Step 9). These equations were obtained from EPA guidance (EPA 1989). The COC-specific action level was calculated from COC-specific risk by dividing the COC-specific allowable risk by the intake factor coefficient developed in Step 3 and the COC-specific slope factor provided in Tables B-2 and B-3. The COC-specific action levels for the ingestion and inhalation pathways resulting from COC-specific allowable risk are provided in Tables B-6 and B-7, respectively. The COC-specific action levels were calculated from COC-specific hazard quotients by dividing the COC-specific allowable hazard quotient by the intake factor coefficient developed in Step 3 and multiplying by the reference dose provided in Tables B-4 and B-5. The COC-specific action levels for the ingestion and inhalation pathways resulting from COC-specific allowable hazard quotients are provided in Tables B-8 and B-9, respectively.

Table B-6. COC-specific action levels calculated from COC-specific allowable risk for the soil ingestion pathway.

| Contaminant of Concern | Slope Factor (Kg-day/mg) | COC-Specific Allowable Risk | Calculated Action Level (mg/Kg) |
|---|---|---|---|
| Arsenic | 1.50E+00 | 1.99E-07 | 8.47E-02 |
| Barium | - | - | - |
| Cadmium | - | - | - |
| Chromium | - | - | - |
| Lead | - | - | - |
| Nickel | - | - | - |
| Mercury | - | - | - |
| Selenium | - | - | - |

Table B-7. COC-specific action levels calculated from COC-specific allowable risk for the soil inhalation pathway

| Contaminant of Concern | Slope Factor (Kg-day/mg) | COC-Specific Allowable Risk | Calculated Action Level (mg/Kg) |
|---|---|---|---|
| Arsenic | 1.50E+01 | 1.42E-10 | 3.90E-01 |
| Barium | - | - | - |
| Cadmium | 6.30E+00 | 5.97156E-11 | 3.90E-01 |
| Chromium | 4.20E+01 | 3.98104E-10 | 3.90E-01 |
| Lead | - | - | - |
| Nickel | - | - | - |
| Mercury | - | - | - |
| Selenium | - | - | - |

Table B-8. COC-specific action levels calculated from COC-specific allowable hazard quotient for the soil ingestion pathway.

| Contaminant of Concern | Reference Dose (mg/Kg-day) | COC-Specific Allowable HQ | Calculated Action Level (mg/Kg) |
|---|---|---|---|
| Arsenic | 3.00E-04 | 1.93E-03 | 3.69E-01 |
| Barium | 7.00E-02 | 8.27E-06 | 3.69E-01 |
| Cadmium | 5.00E-04 | 1.16E-03 | 3.69E-01 |
| Chromium | 1.50E+00 | 3.86E-07 | 3.69E-01 |
| Lead | - | - | - |
| Nickel | 2.00E-02 | 2.89E-05 | 3.69E-01 |
| Mercury | 8.60E-05 | 6.73E-03 | 3.69E-01 |
| Selenium | 5.00E-03 | 1.16E-04 | 3.69E-01 |

Table B-9. COC-specific action levels calculated from COC-specific allowable hazard quotient for the soil inhalation pathway.

| Contaminant of Concern | Reference Dose (mg/Kg-day) | COC-Specific Allowable HQ | Calculated Action Level (mg/Kg) |
|---|---|---|---|
| Arsenic | 3.00E-04 | 4.11E-06 | 5.07E+01 |
| Barium | 1.40E-04 | 8.80E-06 | 5.07E+01 |
| Cadmium | 5.00E-04 | 2.46E-06 | 5.07E+01 |
| Chromium | 1.50E+00 | 8.21E-10 | 5.07E+01 |
| Lead | - | - | - |
| Nickel | 2.00E-02 | 6.16E-08 | 5.07E+01 |
| Mercury | 8.60E-05 | 1.43E-05 | 5.07E+01 |
| Selenium | 5.00E-03 | 2.46E-07 | 5.07E+01 |

## Step 8: Determine Overall COC-Specific Action Levels

Four sets of action levels were calculated in Step 7, above. Action levels were calculated based upon both risk and hazard quotient for the soil ingestion and soil inhalation pathways. To ensure that the action levels are conservative, the minimum of these four calculated action levels will be used as the overall action level. In two cases (mercury and selenium) the calculated action level was either above or near the established soil background concentration. To ensure that the action levels are not only conservative, but also significantly less than soil background concentrations, the established soil background concentration was reduced by 75% and compared to the calculated action levels. This number, if lower than the minimum of the action levels calculated in Step 7, above, was used in place of these values. The overall action level for each constituent was determined to the minimum of the following:

- The COC-specific action level calculated from COC-specific allowable risk for the soil ingestion pathway (Table B-6)
- The COC-specific action level calculated from COC-specific allowable risk for the soil inhalation pathway (Table B-7)
- The COC-specific action level calculated from COC-specific allowable hazard quotient for the soil ingestion pathway (Table B-8)
- The COC-specific action level calculated from COC-specific allowable hazard quotient for the soil inhalation pathway (Table B-9)
- Established soil background concentration divided by a safety factor of four (applicable to inorganic COCs only; INEEL soil background concentrations are provided in Table B-13).

The overall COC-specific action levels determined by making the above comparisons are provided in Table B-10.

Table B-10. Overall COC-specific action levels for the TRA-731 caustic and acid storage tank system HWMA/RCRA closure.

| Contaminant of Concern | Action Level (mg/Kg) |
|---|---|
| Arsenic | 8.47E-02 |
| Barium | 3.69E-01 |
| Cadmium | 3.69E-01 |
| Chromium | 3.69E-01 |
| Lead | - |
| Nickel | 3.69E-01 |
| Mercury | 1.85E-02 |
| Selenium | 8.50E-02 |

## Step 9: Determine the True Excess Cancer Risk and Hazard Quotient Resulting from the Action Levels Calculated in Step 8

Soil concentrations resulting from the calculated action levels were used as a starting point to assess the risk and hazard to the residential receptor via the soil ingestion and inhalation pathways. The results of this analysis are provided in Tables B-11 and B-12 below, for risk and hazard, respectively. The tables also include the cumulative risk and hazard posed by both pathways. The calculation spreadsheets are shown in Figures B-1 through B-4.

Table B-11. Cumulative excess cancer risk resulting from soil ingestion and soil inhalation pathways to a residential receptor from contaminated soil at the action levels presented in Table B-10.

| Contaminant of Concern | Soil Ingestion | Soil Inhalation | Total |
|---|---|---|---|
| Arsenic | 1.99E-07 | 3.09E-11 | 1.99E-07 |
| Barium | - | - | - |
| Cadmium | - | 5.64E-11 | 5.64E-11 |
| Chromium | - | 3.76E-10 | 3.76E-10 |
| Lead | - | - | - |
| Nickel | - | - | - |
| Mercury | - | - | - |
| Selenium | - | - | - |
| | | | 2.00E-07 |

Table B-12. Cumulative hazard quotient resulting from soil ingestion and soil inhalation pathways to a residential receptor from contaminated soil at the action levels presented in Table B-10.

| Contaminant of Concern | Soil Ingestion | Soil Inhalation | Total |
|---|---|---|---|
| Arsenic | 4.43E-04 | 6.86E-09 | 4.43E-04 |
| Barium | 8.27E-06 | 6.40E-08 | 8.33E-06 |
| Cadmium | 1.16E-03 | 1.79E-08 | 1.16E-03 |
| Chromium | 3.86E-07 | 5.97E-12 | 3.86E-07 |
| Lead | - | - | - |
| Nickel | 2.89E-05 | 4.48E-10 | 2.89E-05 |
| Mercury | 3.37E-04 | 5.22E-09 | 3.37E-04 |
| Selenium | 2.67E-05 | 4.13E-10 | 2.67E-05 |
| | | | 2.00E-03 |

## Residential Ingestion Scenario

**Carcinogenic Risk**

Intake Factor:

$$Intake\ Factor = \left(\frac{C \times FI \times EF \times CF}{AT}\right) * \left(\frac{IR_{Adult} * ED_{Adult}}{BW_{Adult}} + \frac{IR_{Child} * ED_{Child}}{BW_{Child}}\right)$$

Where:

| | | | | Value | |
|---|---|---|---|---|---|
| | | | | Adult | Child |
| C | = | Contaminant Concentration | (mg/Kg) | Contaminant Dependent | |
| FI | = | Fraction Ingested from Source | --- | 1 | 1 |
| EF | = | Exposure Frequency | (day/year) | 350 | 350 |
| ED | = | Exposure Duration | (year) | 24 | 6 |
| CF | = | Conversion Factor | (Kg/mg) | 1.00E-06 | 1.00E-06 |
| AT | = | Averaging Time | (day) | 2.55E+04 | 2.55E+04 |
| IR | = | Ingestion Rate | (mg/day) | 100 | 200 |
| BW | = | Body Weight | (Kg) | 70 | 15 |

**Assumption: Each liter of leachate contaminates one kilogram of soil**

Risk:

$$Risk = Intake\ Factor \times Slope\ Factor$$

| Constituent | C (mg/Kg) | Intake Factor (mg/Kg-day) | Slope Factor (Kg-day/mg) | Risk | Risk Percentage |
|---|---|---|---|---|---|
| Arsenic | 8.47E-02 | 1.33E-07 | 1.50E+00 | 1.99E-07 | 100.00% |
| Barium | 3.69E-01 | 5.79E-07 | 0 | 0.00E+00 | 0.00% |
| Cadmium | 3.69E-01 | 5.79E-07 | 0 | 0.00E+00 | 0.00% |
| Chromium | 3.69E-01 | 5.79E-07 | 0 | 0.00E+00 | 0.00% |
| Lead | 0 | 0 | 0 | 0.00E+00 | 0.00% |
| Nickel | 3.69E-01 | 5.79E-07 | 0 | 0.00E+00 | 0.00% |
| Mercury | 1.85E-02 | 2.90E-08 | 0 | 0.00E+00 | 0.00% |
| Selenium | 8.50E-02 | 1.33E-07 | 0 | 0.00E+00 | 0.00% |
| | | | | 1.99E-07 | 100.00% |

Figure B-1. Calculation of excess cancer risk for a residential soil ingestion scenario using the action levels provided in Table B-10.

## Residential Inhalation Scenario

**Carcinogenic Risk**

Intake Factor:

$$Intake \quad Factor = \left( \frac{C \times IR \times EF \times ET \times ED}{BW \times AT \times PEF} \right)$$

Where:

| | | | | Value |
|---|---|---|---|---|
| C | = | Soil Contaminant Concentration | (mg/Kg) | Contaminant Dependent |
| IR | = | Inhalation Rate | ($m^3$/day) | 0.83 |
| EF | = | Exposure Frequency | (day/year) | 350 |
| ET | = | Exposure Time | (hour/day) | 24 |
| ED | = | Exposure Duration | (year) | 30 |
| BW | = | Body Weight | (Kg) | 70 |
| AT | = | Averaging Time | (day) | 2.55E+04 |

$$PEF = \frac{LS \times 5.8E10}{A} \quad \frac{m^4}{kg}$$

| | | | | Value |
|---|---|---|---|---|
| PEF | = | Particulate Emission Factor | ($m^3$/Kg) | Calculated |
| LS | = | Prevailing wind Field Dimension | (m) | 32.7 |
| A | = | Area of Contamination | ($m^2$) | 393 |

**Assumption: Each liter of leachate contaminates one kilogram of soil**

Risk:

$$Risk = Intake \quad Factor \times Slope \quad Factor$$

| Constituent | C (mg/Kg) | Intake Factor (mg/Kg-day) | Slope Factor (Kg-day/mg) | Risk | Risk Percentage |
|---|---|---|---|---|---|
| Arsenic | 8.47E-02 | 2.06E-12 | 1.50E+01 | 3.09E-11 | 6.66% |
| Barium | 3.69E-01 | 8.96E-12 | 0 | 0 | 0.00% |
| Cadmium | 3.69E-01 | 8.96E-12 | 6.30E+00 | 5.64E-11 | 12.18% |
| Chromium | 3.69E-01 | 8.96E-12 | 4.20E+01 | 3.76E-10 | 81.17% |
| Lead | 0 | 0 | 0 | 0 | 0.00% |
| Nickel | 3.69E-01 | 8.96E-12 | 0 | 0 | 0.00% |
| Mercury | 1.85E-02 | 4.49E-13 | 0 | 0 | 0.00% |
| Selenium | 8.50E-02 | 2.06E-12 | 0 | 0 | 0.00% |
| | | | | 4.64E-10 | 100.00% |

Figure B-2. Calculation of excess cancer risk for a residential soil inhalation scenario using the action levels provided in Table B-10.

## Residential Ingestion Scenario

**Non-Carcinogenic Hazard**

Intake Factor:

$$Intake\ \ Factor = \left(\frac{C \times FI \times EF \times CF}{AT}\right) * \left(\frac{IR_{Adult} * ED_{Adult}}{BW_{Adult}} + \frac{IR_{Child} * ED_{Child}}{BW_{Child}}\right)$$

Where:

| | | | | Value | |
|---|---|---|---|---|---|
| | | | | Adult | Child |
| C | = | Contaminant Concentration | (mg/Kg) | Contaminant Dependent | |
| FI | = | Fraction Ingested from Source | --- | 1 | 1 |
| EF | = | Exposure Frequency | (day/year) | 350 | 350 |
| ED | = | Exposure Duration | (year) | 24 | 6 |
| CF | = | Conversion Factor | (Kg/mg) | 1.00E-06 | 1.00E-06 |
| AT | = | Averaging Time | (day) | 2.55E+04 | 2.55E+04 |
| IR | = | Ingestion Rate | (mg/day) | 100 | 200 |
| BW | = | Body Weight | (Kg) | 70 | 15 |

**Assumption: Each liter of leachate contaminates one kilogram of soil**

Hazard:

$$HAZARD = INTAKE\ \ FACTOR\ \ /\ \ REFERENCE\ \ DOSE$$

| Constituent | C (mg/Kg) | Intake Factor (mg/Kg/day) | Reference Dose (mg/Kg/day) | HQ | HQ Percentage |
|---|---|---|---|---|---|
| Arsenic | 8.47E-02 | 1.33E-07 | 3.00E-04 | 4.43E-04 | 22.13% |
| Barium | 3.69E-01 | 5.79E-07 | 7.00E-02 | 8.27E-06 | 0.41% |
| Cadmium | 3.69E-01 | 5.79E-07 | 5.00E-04 | 1.16E-03 | 57.81% |
| Chromium | 3.69E-01 | 5.79E-07 | 1.50E+00 | 3.86E-07 | 0.02% |
| Lead | 0 | 0 | 0 | 0 | 0.00% |
| Nickel | 3.69E-01 | 5.79E-07 | 2.00E-02 | 2.89E-05 | 1.45% |
| Mercury | 1.85E-02 | 2.90E-08 | 8.60E-05 | 3.37E-04 | 16.85% |
| Selenium | 8.50E-02 | 1.33E-07 | 5.00E-03 | 2.67E-05 | 1.33% |
| | | | | 2.00E-03 | 100.00% |

Figure B-3. Calculation of hazard quotient for a residential soil ingestion scenario using the action levels provided in Table B-10.

## Residential Inhalation Scenario

**Non-Carcinogenic Hazard**

Intake Factor:

$$Intake\ Factor = \left( \frac{C \times IR \times EF \times ET \times ED}{BW \times AT \times PEF} \right)$$

Where:

| | | | | Value |
|---|---|---|---|---|
| C | = | Soil Contaminant Concentration | (mg/Kg) | Contaminant Dependent |
| IR | = | Inhalation Rate | ($m^3$/day) | 0.83 |
| EF | = | Exposure Frequency | (day/year) | 350 |
| ET | = | Exposure Time | (hour/day) | 24 |
| ED | = | Exposure Duration | (year) | 30 |
| BW | = | Body Weight | (Kg) | 70 |
| AT | = | Averaging Time | (day) | 2.55E+04 |

$$PEF = \frac{LS \times 5.8E10}{A} \frac{m^4}{kg}$$

| | | | | Value |
|---|---|---|---|---|
| PEF | = | Particulate Emission Factor | ($m^3$/Kg) | Calculated |
| LS | = | Prevailing wind Field Dimension | (m) | 32.7 |
| A | = | Area of Contamination | ($m^2$) | 393 |

**Assumption: Each liter of leachate contaminates one kilogram of soil**

Hazard:

$$HAZARD = INTAKE\ FACTOR \ / \ REFERENCE\ DOSE$$

| Constituent | C (mg/Kg) | Intake Factor (mg/Kg-day) | Reference Dose (mg/Kg/day) | HQ | HQ Percentage |
|---|---|---|---|---|---|
| Arsenic | 8.47E-02 | 2.06E-12 | 3.00E-04 | 6.86E-09 | 7.23% |
| Barium | 3.69E-01 | 8.96E-12 | 1.40E-04 | 6.40E-08 | 67.46% |
| Cadmium | 3.69E-01 | 8.96E-12 | 5.00E-04 | 1.79E-08 | 18.89% |
| Chromium | 3.69E-01 | 8.96E-12 | 1.50E+00 | 5.97E-12 | 0.01% |
| Lead | 0 | 0 | 0 | 0 | 0.00% |
| Nickel | 3.69E-01 | 8.96E-12 | 2.00E-02 | 4.48E-10 | 0.47% |
| Mercury | 1.85E-02 | 4.49E-13 | 8.60E-05 | 5.22E-09 | 5.51% |
| Selenium | 8.50E-02 | 2.06E-12 | 5.00E-03 | 4.13E-10 | 0.44% |
| | | | | 9.49E-08 | 100.00% |

Figure B-4. Calculation of hazard quotient for a residential soil inhalation scenario using the action levels provided in Table B-10.

## Step 10. Determine an Action Level for Lead

Of the COCs currently identified for the TRA-731 caustic and acid storage tank system, only lead does not have a reference dose or a slope factor. The following discussion offers an approach for establishing an action level for lead.

Soil screening guidance (EPA 2001b) suggests a lead soil concentration of 400 mg/kg based on the EPA document, *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (EPA 1994). The liquid lead concentration is calculated using the definition of Kd. The Kd is the ratio of the soil concentration to the liquid concentration. Thus, the action level is calculated by dividing the suggested soil concentration for lead by the Kd (100 $cm^3/g$) (EPA 1996). With these values, the lead action level is calculated at 4 mg/L. Reducing this value by 93.75% to ensure protectiveness results in an action level for lead of 0.25 mg/L.

## Step 11: Compare Action Levels Derived in Step 8 to Established INEEL Soil Background Concentrations and EPA Preliminary Remediation Goals

The action levels derived in Step 8, above are provided in Table B-13. The established INEEL soil background concentrations are provided for comparison. In every case for which background data is available, the proposed action level is significantly less than the established soil background. The EPA Region IX preliminary remediation goals (PRG) for both residential and industrial scenarios are also presented in Table B-13. The calculated action levels are significantly less than these preliminary remediation goals.

Table B-13. Comparison of derived action levels to INEEL established background concentrations and EPA Region IX preliminary remediation goals.

| Contaminant of Concern | Action Level (mg/Kg) [mg/L rinsate] | INEEL Background (mg/kg)[a] | Region IX PRG (Residential Soil) (mg/Kg)[b] | Region IX PRG (Industrial Soil) (mg/Kg)[b] |
|---|---|---|---|---|
| Arsenic | 0.085 | 7.40 | 0.39 | 2.70 |
| Barium | 0.369 | 440.00 | 5,400.00 | 100,000.00 |
| Cadmium | 0.369 | 3.70 | 37.00 | 810.00 |
| Chromium | 0.369 | 50.00 | 30.00 | 64.00 |
| Lead | 0.250 | 23.00 | 400.00 | 750.00 |
| Nickel | 0.369 | 55.00 | 1,600.00 | 4,400.00 |
| Mercury | 0.019 | 0.07 | - | - |
| Selenium | 0.085 | 0.34 | 390.00 | 10,000.00 |

a. Source: *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (INEL 1994).

b. Source: *EPA Region IX Preliminary Remediation Goal (PRG) Table* (EPA 2001a).

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