

# Proposed Plan for Final Remedial Action

## Reynolds Metals Superfund Site Troutdale, Oregon

August 2006

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## INTRODUCTION

This Proposed Plan identifies the Preferred Remedial Alternative for completing the clean up of contaminated waste, soil and groundwater at the Reynolds Metals Site located in Troutdale, Oregon. This Proposed Plan is required to fulfill the requirements of Section 117(a) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP) 40CFR 300.430(f)(2).

The Reynolds Metals Company (RMC), currently owned by Alcoa Inc., produced aluminum from the raw material alumina at the facility. The production facility was permanently closed in July 2002, and the closure was followed by demolition of the plant structures. The decision to demolish the plant was made by Alcoa based on its own business consideration and was not a part of the cleanup activities conducted under CERCLA.

This cleanup plan proposes the final action for the Site. Extensive soil and groundwater cleanup has been completed by RMC, with EPA oversight, during the past ten years. These cleanup actions included early CERCLA removal actions implemented through an administrative order on consent (AOC) as well as CERCLA remedial actions selected in the 2002 Interim Record of Decision (ROD) and implemented through unilateral administrative orders (UAOs). The demolition provided the opportunity for additional evaluation and cleanup by exposing contaminated areas formerly

inaccessible underneath the plant.

This Proposed Plan summarizes the previous cleanup work and explains how these previous actions have achieved remedial action objectives (RAO) for soil at the site. Actions to achieve groundwater RAO's are currently underway. This plan also identifies the Preferred Remedial Alternative based on current site conditions resulting from the previous cleanup work and RMC's demolition activities.

EPA's Preferred Remedial Alternative includes the following components:

- Using institutional controls to ensure protection of future users of the Site and that future uses of the Site and its associated groundwater are compatible with the cleanup levels achieved
- Continued operation of the groundwater focused extraction/production well optimization (FE/PWO) system until groundwater cleanup levels are achieved
- Monitoring groundwater to evaluate the effectiveness of the completed and ongoing cleanup actions.

This Proposed Plan provides the rationale for selecting the Preferred Alternative. It also summarizes information that can be found in greater detail in the Post-Demolition Remedial Investigation and Risk Assessment reports and other documents that are available for review on EPA's web site, in information repositories described below, and in the Administrative Record for Reynolds Metals.

This document is issued by EPA in consultation with the Oregon Department of Environmental Quality (DEQ). EPA will select a final remedy after reviewing and considering information submitted during the 30-day public comment period. EPA may modify the Preferred Alternative based on new information or public comments.

### **COMMUNITY PARTICIPATION**

**How You Can Participate:** We invite you to participate in the decision-making process by commenting on this Proposed Plan. EPA will accept written comments during the public comment period from **August 3 to September 4, 2006**. Written comments should be addressed to:

Chip Humphrey  
U.S. Environmental Protection Agency  
811 SW Sixth Avenue, 3rd Floor  
Portland, OR 97204  
E-mail: [humphrey.chip@epa.gov](mailto:humphrey.chip@epa.gov)

EPA will host a public meeting if sufficient interest is expressed. To request a public meeting, contact Chip Humphrey at (503) 326-2678 before August 15, 2006.

The Administrative Record, which contains documents that provide the basis for selecting the final cleanup alternative, is available at the following locations:

US EPA Region 10 Records Center  
1200 6th Avenue, 7th Floor  
Seattle, WA 98101  
(206) 553-4494

Gresham Regional Library  
385 NW Miller  
Gresham, OR 97030  
(503) 248-5387

EPA will respond to public comments in a document called a Responsiveness Summary. A final Record of Decision will then be prepared by EPA. The Responsiveness Summary will be part of the Record of Decision and will be available for review at the locations listed above.

## **SITE LOCATION AND HISTORY**

The Reynolds Metals Company facility was a primary aluminum production plant where aluminum was made from the raw material alumina. The plant was located about 20 miles east of Portland, Oregon, and 1.25 miles north of the City of Troutdale, Oregon (Figure 1). The Reynolds Metals Site consists of the 108 acre former plant area and approximately 693 acres of surrounding rural land. A US Army Corp of Engineers (COE) dike runs through the northern and eastern portions of the site.

The plant was constructed for the US Government in 1941 to produce aluminum for wartime operations. RMC first leased the plant from the government in 1946 and purchased it in 1949. Alcoa Inc. acquired Reynolds Metals Company, including the Troutdale aluminum reduction facility, in 2000 and operations at the Troutdale plant were suspended. The plant was permanently closed in 2002 and demolished from 2003 through January 2006. All of the plant structures and most of the foundations were removed as part of the demolition. RMC anticipates selling the property for industrial use by the end of 2006.

The Site was placed on the Superfund National Priorities List (NPL) in 1994. On September 29, 1995, EPA and RMC signed an Administrative Order on Consent (AOC), under which RMC agreed to complete a Remedial Investigation and Feasibility Study (RI/FS) for the site and perform early cleanup actions under EPA's oversight. On September 30, 2002, EPA issued a Record of Decision (ROD) for interim remedial action, which required cleanup of several waste areas and fluoride-contaminated groundwater. Cleanup of the waste areas under the Interim ROD was carried out under a Unilateral Order (UAO) issued by EPA in 2003. Groundwater cleanup is being accomplished under a second UAO issued by EPA in 2005.

A post-demolition Remedial Investigation (RI) was conducted during plant demolition and completed after post-demolition sampling of the plant area. The Risk Assessment for the RMC site was updated in June 2006 to reflect post-demolition site conditions.

## **SITE CHARACTERISTICS**

Several waste disposal areas, soils and groundwater were contaminated as a result of past waste handling practices at the plant. The primary contaminants identified in waste and soils at the Site include fluoride, cyanide, polynuclear aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). Waste and soils have been cleaned up with actions described later in this document. There are also significant plumes of fluoride contamination in groundwater beneath the plant site. The groundwater remedy is fully operational and its continued operation is described later in this document.

The Columbia and Sandy Rivers border the Site to the north and east and represent regional groundwater discharge points. When the plant was operating, treated process and sanitary wastewater and storm water runoff from the plant flowed through south ditch to Company Lake prior to discharge to the Columbia River. Discharge to the Columbia River was regulated by an NPDES wastewater permit. Wastewater from facility operations has not been produced or discharged since the plant ceased operations in the fall of 2000.

The RMC site has been divided into four distinct areas for investigation and evaluation: outside the dike, the east (former plant) area, Fairview Farms, and the south wetlands (Figure 2).

The northern portion of the RMC site is located outside of the US Army Corps of Engineers dike within the flood plain of the Columbia River. This area (Figure 3) includes Company Lake and East

Lake. The western portion of the north landfill, which was capped as part of the work performed under the Interim ROD, is also located in this area.

The East Area (Figure 4) is approximately 254 acres and includes the area where the former RMC plant was located. The area is generally flat, and currently has no structures or aboveground improvements except for groundwater monitoring and extraction wellheads and a small building that houses equipment needed for the operation of the groundwater system. All other facility structures, paved areas, and most foundations to approximately 8 feet below the ground have been demolished and removed from the site. This area is also the former location of the south landfill, scrap yard, and east potliner areas that were cleaned up through previous removal and remedial actions.

The Fairview Farms area is located to the west of Sundial Road, across from the former plant location. This area was not used as part of the historical plant operations, although there were some stormwater overflows to an adjacent ditch. Some portions have been used for cultivated crops and cattle grazing in the past. It is approximately 227 acres.

The south wetlands area is located south of the former plant. This area was used as a settling pond for wastewater discharges during the early years of plant operations. It is a low-lying area of approximately 28 acres with areas of thick vegetation and some standing water.

Two regional aquifer systems are located under the site. The Unconsolidated Sedimentary Aquifer (USA) is the uppermost aquifer, and the Sand and Gravel Aquifer (SGA) is the deeper unit. The unconsolidated sediments within the uppermost regional groundwater system beneath the facility have been subdivided into four water-bearing zones for purposes of investigation. The four zones are the silt unit (generally 0 - 30 feet deep), the upper grey sand (up to 50 feet deep), the intermediate sand (up to 100 feet

deep), and the deep sand/gravel. The silt unit exists in the southern portion of the site but generally does not occur in northern portion of the site. In general, groundwater discharges to the Columbia River in the northern portion of the site and the Sandy River in the eastern portion of the site.

Onsite deep production wells supplied process water and drinking water for the aluminum reduction facility. Groundwater is also a source of water for drinking and industrial uses in the areas next to the RMC facility.

### **SCOPE AND ROLE OF THIS RESPONSE ACTION**

This Plan proposes the final action to complete the overall Site cleanup. Since 1995, several removal actions have cleaned up immediate threats and high priority areas of contamination. In September 2002, EPA issued a ROD for interim remedial actions to address contamination associated with Company Lake, the South Landfill area, the North Landfill area, and installation and operation of the groundwater focused extraction and production well optimization system. These areas were selected for cleanup in the Interim ROD because they posed a risk to human health and the environment and were sources of contamination in groundwater. The 2002 ROD was an interim action because the investigation and evaluation of some areas of the Site could not be done until after the plant demolition was completed.

The remedy selected in the Interim ROD cleans up and protects groundwater and the Sandy River with a phased approach to restoration. The first step

was removal of contaminated waste and soil that was the source of groundwater contamination. This was followed by installation of the focused extraction and production well optimization (FE/PWO) system. The system is operational and contaminated groundwater is being extracted to prevent further plume migration and restore groundwater quality. Groundwater monitoring is being conducted to confirm that the system is performing as designed and that intermediate and deep groundwater will be restored in a reasonable time frame.

This proposed action specifically addresses: (1) the final groundwater action through continued operation of the groundwater FE/PWO system; (2) the former plant process area where the buildings and other structures were demolished and removed over the past three years given that these areas were generally not addressed by the Interim ROD; and (3) site-wide institutional controls.

### **COMPLETED CLEANUP ACTIONS**

Several removal actions have been completed under EPA oversight in areas identified as high priority source areas of contamination. A number of these removal cleanup actions were previously described in the Interim ROD. Additionally, the Interim ROD required cleanup of other source areas as remedial actions. A summary of the

completed actions, including estimated quantities and updated information based on work that was performed under the Interim ROD is provided in Table 1. All of these actions, except for Fairview Farms, South Wetlands, Company Lake and North Landfill, were conducted in the East Area.

**Table 1 – Completed Cleanup Actions**

Area	Action
Bakehouse Sumps Area	Removal of 283 tons contaminated soil from sumps; removal and decommissioning of well points
Casthouse	Removal of 515 tons of PCB contaminated dust, siding, soil and concrete, and concrete decontamination
Company Lake	Excavation and removal of 93,854 tons of process residue and underlying sediment; geotextile and rock cap at west end and soil cap at east end adjacent to north toe of dike to cover small quantities of residue that could not be removed because of slope stability concerns
Cryolite Ponds	Excavation and removal of 13,900 tons of cryolite
Diesel Spill Area	Excavation and removal of 2,650 tons of soil
East Potliner Area	Excavation and removal of 11,542 tons of spent potliner and contaminated soil
ESP Containment Area	Excavation and removal of 1,193 tons of contaminated material
Fairview Farms	Excavation and removal of 150 tons of debris from four piles
North Landfill	Excavation and removal of 10,509 tons of waste and contaminated soil from the eastern portion of the landfill. Installation of rock cap cover on western portion.
Scrap Yard	Excavation and removal of 22,918 tons of waste and soil
South Landfill	Excavation and removal of 66,038 tons of waste and soil
South Wetlands	Excavation and removal of 90 tons of PCB-contaminated process residue and soil
West South Ditch	Excavation and removal of 8,775 tons process residue, soil and sediment (includes the hot spot portion of east south ditch).

The soil cleanup standards set in the Interim ROD were based on protection of human health through direct contact for industrial uses as defined in Oregon cleanup regulations, and protection of groundwater (from leaching of contaminants) as a potential future drinking water source and discharge to surface water in the Sandy River.

Additional details on some of the larger, more significant waste areas are provided below. For all areas, waste classified as hazardous was taken to permitted hazardous waste disposal facilities. Waste material that was not classified as hazardous was disposed in off-site permitted solid waste disposal facilities.

North Landfill – This 2.4-acre landfill is located north and outside of the dike. The landfill contained carbon waste, refractory brick, demolition waste, solid waste, and miscellaneous debris. Contaminants included high levels of fluoride and PAHs, with low levels of cyanide, metals, total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs) and PCBs. The eastern portion of this landfill had significantly higher levels of PAHs and a higher proportion of black carbon material compared to the western portion of the landfill. The eastern portion was removed and the western portion was capped (to prevent direct contact and flood protection) under the Interim ROD. Confirmation sampling was conducted to verify that cleanup levels for the eastern portion established in the ROD (4,000 mg/kg fluoride, 36 mg/kg for carcinogenic PAHs) were met, with post-cleanup levels of 437 mg/kg

fluoride and less than 1 mg/kg for carcinogenic PAHs.

Company Lake – This 16-acre lake is located north and outside of the dike. During plant operations, storm water and treated wastewater entered the lake from a discharge pipe at the southern end. An outfall ditch drained from the northwestern corner of Company Lake into the Columbia River. Process residue from historical discharges, containing fluoride, PAHs, TPH, cyanide, and low levels of PCBs, accumulated up to four-feet thick in the bottom of Company Lake. Wastewater and this process residue were the sources of elevated fluoride concentrations in the shallow and intermediate zone groundwater beneath and adjacent to Company Lake. An estimated 3,780 tons of process residue was removed from a portion of Company Lake in 2001 as part of an early action. An additional 90,850 tons of the process residue and underlying sediment was removed under the Interim ROD. Small quantities of process residue could not be removed because of concerns over slope stability at portions of the west and southeastern ends of the lake, and these areas were capped. Cleanup goals established in the Interim ROD for Company Lake were 1,000 mg/kg for fluoride and 36 mg/kg for PAHs. Following cleanup, mean total fluoride was 481 mg/kg and PAHs were 1.35mg/kg.

South Landfill – This 5.8-acre landfill was located in the East Area and was used for general plant waste disposal from the early days of operation until about the late 1960s. Contaminants



included fluoride (up to 48,000 mg/kg) and PAHs (up to 590 mg/kg). Fluoride migrated from the south landfill into shallow groundwater. A low permeability silt layer beneath the landfill provides a natural barrier that limits migration of contaminants to intermediate and deep groundwater. Waste and soil removal and confirmation sampling was completed for this area under the Interim ROD. Cleanup goals established in the Interim ROD for South Landfill were 4,000 mg/kg for fluoride and 36 mg/kg for carcinogenic PAHs. Following cleanup mean total fluoride was 427 mg/kg and carcinogenic PAHs were 1.9 mg/kg.

Scrap Yard – This 5.7-acre area was located in the East Area and was used as a storage area for the plant. Soil in the scrap yard was contaminated with fluoride, cyanide, PAHs, PCBs, and metals. Fluoride levels averaged over 30,000 mg/kg in the waste material, with the concentrations decreasing with depth. The scrap yard was the source of fluoride and metals contamination in the intermediate sand and sand/gravel water bearing zones, located between scrap yard and the production wells. This area was cleaned up through early removal actions. Additional waste removal was completed as part of plant demolition activities. Following cleanup from removal actions, mean total fluoride was 489 mg/kg and PAHs were 1.0 mg/kg.

### **Groundwater Evaluation and Cleanup Actions**

Underneath the RMC Site, groundwater in the upper grey sand and deeper water-bearing zones flows from the

south/southeast to the north/northwest, eventually discharging to the Columbia and Sandy Rivers. Groundwater flow is strongly influenced by pumping from the RMC production wells and surface water features.

The 1999 RI/FS identified plumes of fluoride-contaminated groundwater beneath the facility, with much smaller, localized areas of elevated metals, volatile organic compounds, and cyanide. The primary contaminant of concern in the groundwater is fluoride. Contaminated groundwater is a result of fluoride leaching from former waste areas including Company Lake, north landfill, south landfill, the scrap yard area, and the east potliner area.

Fluoride concentrations exceed the federal and state Safe Drinking Water Act standard of 4 mg/L MCL (maximum contaminant level) beneath the RMC facility. Metals and cyanide in the shallow silt layer were also detected above MCLs. The east potliner, scrap yard, and south landfill are the sources of these contaminants in groundwater. Figure 5 shows the location of the fluoride plume in the upper grey sand water-bearing zone and Figure 6 shows the location of the fluoride plumes in the intermediate water-bearing zone.

Removal of fluoride, PAH, metal and cyanide contaminated soil has been completed for all source areas through removal or Interim ROD remedial actions during the past ten years. Approximately 347,546 tons of material containing about 7,366 tons of fluoride mass have been excavated and disposed of off-site. Measurable groundwater improvement has resulted

from the actions and continued improvements are expected.

Groundwater remedial actions completed at the site include:

- the previously described soil source removals
- decommissioning several production wells
- installation of the focused extraction and production well optimization (FE/PWO) system under the Interim ROD.

The FE/PWO system, completed in October 2005, is designed to provide

hydraulic containment of contaminated groundwater and restore groundwater quality. Two extraction wells, FE02 and FE03, are located in the scrap yard and east potliner areas. Production wells include PW07 and PW08, with backup capacity provided by wells PW03 and 05. Startup performance monitoring began in early November, 2005, followed by 5 months of operation and performance evaluation. The monitoring program will include evaluation of changes in the fluoride plume over time and on plume containment. Selected monitoring wells will also be sampled periodically for VOCs and total cyanide analysis.

## **POST-DEMOLITION INVESTIGATION OF CONTAMINATION**

The post-demolition remedial investigation (RI) was a comprehensive data gathering and analysis program that evaluated site conditions following the plant demolition. Soil investigations, including surface and subsurface sampling, were conducted at 56 assessment areas. In addition, geophysical techniques, such as electromagnetic and resistivity surveys, were completed to identify buried material. Soil samples were analyzed for fluoride, PAHs, cyanide, PCBs, pesticides, metals, VOCs, and semivolatile organic compounds (SVOCs).

The assessment areas were combined into four general areas for investigation and evaluation as shown on Figure 2.

Fairview Farms– A drainage area in the northeastern portion of the Fairview Farms area was not adequately investigated during the original RI. Additional sampling was conducted in 2005 to assess current conditions in this area. The results showed the area has not been significantly impacted by the contamination from the Site.

East Area – Even though a number of historical investigations and cleanup actions were conducted in the East (plant) Area, a comprehensive evaluation of the area was conducted following demolition to ensure that areas of the Site that were newly accessible were properly assessed. RMC's Demolition Plan included collection of

samples and removal of structures, foundations and contaminated soils. EPA monitored demolition and sampling activities. Areas of the Site that were not addressed as part of the Demolition Plan were sampled by RMC with EPA oversight. The results of the post-demolition investigation, which are presented in the Post-Demolition RI report, showed low residual levels of contamination in soils.

Outside the Dike – Company Lake and the adjacent discharge ditch, and north landfill were cleaned up through removal and remedial actions pursuant to administrative orders or the Interim ROD. The post-demolition RI evaluated

these areas following the completion of this work to confirm that the performance criteria established in the Interim ROD were achieved.

South Wetlands Area – This area was assessed in the draft RI/FS and a removal of PCB-contaminated process residue was conducted in 1999. Additional sampling of a portion of the railroad embankment was conducted in 2004. Although this area has elevated levels of fluoride, it has not impacted upper grey sand water-bearing-zone beneath the silt zone. Residual levels of contamination were evaluated as part of the post-demolition investigation.

### **SUMMARY OF SITE RISKS**

A Baseline Risk Assessment (Baseline RA) was conducted by EPA prior to the Interim ROD and plant demolition. The Baseline RA addressed potential human and ecological exposure pathways associated with soil, surface water, sediment, and biota at the Site. The Interim ROD specified cleanup actions for several waste areas and for site groundwater to eliminate unacceptable risks that were identified in the Baseline RA.

The Post-Demolition Risk Assessment (Post-demolition RA) was completed by EPA in June 2006. The report evaluated risks associated with current site conditions, and updated some of the

analysis from the Baseline RA to reflect conditions at the site after completion of the plant demolition and cleanup of contaminated waste and soil. The Post-demolition RA determined the potential current and future effects of any residual soil contamination on human health and the environment and estimated the likelihood of health or environmental problems if no additional cleanup action is taken at the site. It is EPA's current judgment that the preferred alternative identified in this proposed plan is necessary to protect public health and the environment from actual or threatened releases of hazardous substances to the environment.

**Human Health Risks**

The majority of the Site is currently zoned for general industrial use. Property to the west and south of the site is currently used for a variety of commercial and industrial purposes. RMC property north and outside of the dike is zoned open space, and a small portion of Fairview Farms is agricultural. Further development of the RMC property north and east of the dike is not likely because the area is subject to flooding.

The human health risk assessment assumed that most of the site will have industrial uses, and considered exposure scenarios for direct contact pathways associated with soil for occupational workers, construction workers, excavation/trench workers, recreational users, and trespassers. The area outside the dike is expected to remain open space. The exposure scenarios assessed for each of the exposure areas are shown in Table 2.

**Table 2 – Human Health Soil Exposure Evaluation**

Area	Occupational worker	Construction and trench worker	Trespasser	Recreational
Outside dike	Not evaluated	Not evaluated	2 X 10 <sup>-6</sup>	2 X 10 <sup>-6</sup>
Fairview Farms	2 X 10 <sup>-6</sup>	2 X 10 <sup>-7</sup>	2 X 10 <sup>-7</sup>	Not evaluated
East Area	1 X 10 <sup>-5</sup>	2 X 10 <sup>-6</sup>	1 X 10 <sup>-6</sup>	Not evaluated
South Wetland	Not evaluated	3 X 10 <sup>-6</sup>	1 X 10 <sup>-5</sup>	Not evaluated

Fairview Farms, which is located west of the plant, was not previously used for industrial purposes and contaminant levels were low. The post-demolition RA did not assess risks associated with future residential use. When the area was previously evaluated in the Baseline RA, contamination levels and the associated risks were acceptable for all current and future land uses.

Groundwater extracted from the intermediate/deep water-bearing zone

beneath the site was used for industrial purposes and drinking water at the site prior to the plant shutdown. Groundwater exposures were evaluated as part of the Baseline RA, which found there was unacceptable risk associated with future drinking water use. The Post-Demolition RA did not re-evaluate groundwater risks because the groundwater remedy was recently initiated as required under the Interim ROD, and it is not likely that the system

has operated long enough to result in substantially changed conditions.

### Cancer Risks for Current and Future Exposures to Soil

The likelihood of any kind of cancer resulting from a Superfund site is expressed as a probability. For example, a “1 in 10,000” chance would mean that for every 10,000 people in the area, an extra cancer case may occur as a result of long-term exposure to site contaminants. EPA generally requires remedial action at sites where the excess cancer risk from exposure to contaminants exceeds 1 in 10,000. DEQ’s target risk levels are exceeded when the total lifetime excess cancer risk exceeds 1 in 100,000 for cumulative exposure to all carcinogens, or 1 in 1,000,000 for individual carcinogens.

The Baseline RA showed unacceptable cancer risk for the north landfill, south landfill, scrap yard, Company Lake, and the eastern portion of south ditch. The cancer risk for exposure to contaminated soil was primarily from carcinogenic PAHs (i.e., benzo(a)pyrene and benzo(a)anthracene). Risks have been reduced through the cleanup actions that were completed in 2004 and 2005 as required by the Interim ROD, and the risks are acceptable for industrial uses of the property.

The Post-Demolition RA indicated that soils meet EPA and DEQ’s cumulative target risk levels for all human health risk scenarios evaluated. The site also meets the individual target risk criterion,

except for relatively minor exceedences of the reasonable maximum exposure (RME) scenario for a site trespasser in south wetlands and the RME occupational worker scenario in the East Area.

### Non-Cancer Risk

Non-cancer risks are measured by an evaluation system called the Hazard Index (HI) that generates a numeric value. Any HI value greater than 1.0 may indicate a need for action.

The Baseline RA for the Site showed increased risk of noncancer health impacts for current or future industrial workers did not exceed a Hazard Index of 1.0 for the individual source areas. The Baseline RA estimated that without cleanup action, an off-site residential exposure scenario of using a hypothetical well in the northeast portion of the Fairview Farms area would result in a HI of 3.3.

The Post-Demolition RA concluded that non health impacts did not exceed 1.0 for the Fairview Farms Area, Outside the Dike Area, East Area, or the South Wetland Area.

The results of the Human Health Risk Assessment confirm that the soils at the site are within EPA’s acceptable risk, and within DEQ’s acceptable risk range for all contaminants except for a minor exceedance for one chemical, benzo(a)pyrene, in the East Area.

## **Ecological Risks**

The ecological risk assessment appraised the actual or potential effects of contamination at the site on plants and animals. The Baseline RA concluded that ecological hazard quotients (HQs) for fluoride (for mallards and heron) and PAHs (mink) exceeded corresponding background levels by at least 1. Process residue in Company Lake contributed the greatest percentage of the estimated site wide risk for fluoride and PAHs. Removal of the process residue was completed as part of the Interim ROD.

The Baseline RA also included ecological risk estimates for groundwater discharging to the Columbia and Sandy Rivers. There are no ambient water quality criteria for fluoride available, so water aquatic toxicity data from literature sources were used to estimate toxicity potential. RMC prepared an analysis of projections of fluoride concentrations in groundwater and estimated future discharges of fluoride-contaminated groundwater to the Columbia and Sandy Rivers. The

analysis showed that without operation of the groundwater production well optimization system to contain the plume, fluoride discharges to the Sandy River could reach levels of concern, especially during periods of low flow in the river, and would be expected to increase over the next few years and continue for several decades.

The Baseline RA indicated that PCBs were a chemical of potential ecological concern in the south wetlands area. A removal action was conducted in 1999 to remove a hot spot of PCB contamination. The Post-demolition RA included an updated assessment of the south wetlands area. Residual contamination was evaluated in an updated assessment that included Tier 1 (screening level) and Tier 2 (site specific) exposure estimates. The Post-demolition RA concluded, based on calculated HQs for heron (0.9) hawk (0.2) and mink (1.0), that the area does not pose significant risk to those species.

## **REMEDIAL ACTION OBJECTIVES**

The Remedial Action Objectives (RAOs) for the final remedy selection at this site include the following:

*1) Reduce human exposure through direct contact (ingestion, inhalation, and dermal contact) with contaminated soil and debris that would result in unacceptable excess lifetime cancer risk or above a Hazard Index of 1.0 for the*

*reasonably anticipated (non-residential) future land uses.*

*2) Restore and maintain use of the groundwater (except the shallow silt zone) as a drinking water source. The restoration goal is the federal and state safe drinking water standard (MCL).*

3) *Minimize the migration of contaminants from waste and soils to groundwater, reduce the fluoride mass in shallow and intermediate groundwater, and control migration of fluoride and other constituents of concern in groundwater.*

4) *Reduce and control the migration of fluoride to the Sandy River.*

The above RAOs are consistent with the RAOs that were developed for the Interim ROD.

Soil and debris removals were conducted to meet the first and third objectives. Based on the results of the post-demolition remedial investigation and risk assessment, reduction of

human exposure through direct contact with contaminated soil and debris has been achieved. The site no longer poses an unacceptable risk based on the exposure scenarios evaluated. However, future site use will need to be restricted to non-residential uses to meet the first objective, and the north landfill cap and the two small capped areas in Company Lake will need to be maintained.

The Interim ROD required the installation and operation of the FE/PWO system to meet the second, third and fourth objectives. The FE/PWO system has been operating successfully for the past six months and will need to continue to operate.

### **SUMMARY OF CLEANUP ALTERNATIVES**

The Post-Demolition RA demonstrated that as long as land use is maintained and caps are in place, exposure to site soils no longer poses an unacceptable risk to human or ecological receptors. As a result only two alternatives for soils are being evaluated: no action and institutional controls. Although institutional controls were required by the Interim ROD, they have not been finalized for the site.

For groundwater, EPA previously selected construction and operation of the FE/PWO system, in conjunction with monitoring, and institutional controls as the groundwater cleanup alternative in the Interim ROD. The FE/PWO system was recently placed into operation and an evaluation of the system is presented. The no action alternative

and institutional controls are also evaluated for groundwater.

#### **Alternative 1 - No Action (Soils and Groundwater)**

Analysis of the “no action alternative” is generally required to establish a baseline for comparison. Under this alternative, EPA would take no action to prevent current or future exposure to soil or groundwater, either through institutional controls or additional groundwater cleanup at the site. Discontinued operation of the FE/PWO system would be a component of the no action alternative.

#### **Alternative 2 - Institutional Controls (Soils and Groundwater)**

Institutional controls are actions such as restrictive easements, fencing and warning signs, or use restrictions. Institutional controls for soils include restrictive covenants, easements or equitable servitude to prevent future residential use of the Site and restricting occupational use of the south wetlands area. Institutional controls would also include provisions to protect areas capped through previous cleanup actions against disturbance, other than appropriate maintenance activities. These capped areas include the western portion of north landfill and the two small areas in Company Lake.

This alternative would not include groundwater pumping. An evaluation of a “no pumping” scenario as an alternative for groundwater was presented in the 1999 feasibility study. This scenario included groundwater monitoring but would discontinue operation of the production wells.

Institutional controls for groundwater would be developed and implemented to prevent use of contaminated groundwater for drinking water until cleanup levels are achieved. The groundwater use restrictions are expected to be permanent for shallow contaminated groundwater (the silt unit) in the south plant area. There are no current or projected uses of the shallow groundwater in the south plant area because of low yield.

#### Alternative 3 - Continued Operation of the Interim ROD Groundwater Remedy

Contaminated groundwater will be hydraulically contained through

operation of production wells and concentrations of fluoride reduced through focused extraction of groundwater in the south plant area as required by the Interim ROD. The well locations are shown in Figure 7. The groundwater system operates the production wells to contain contaminated groundwater by maintaining a “capture zone.” Production wells PW07 and PW08, or designated backup wells, will be pumped at an estimated 600 gallons per minute (gpm) each to control migration of fluoride and other chemicals of concern in the intermediate and deep zones under the facility.

The combined flow from the production wells and focused extraction wells is being discharged to the Columbia River in accordance with limits established by NDPES permit number 100757. The anticipated flow is approximately 1250 gpm with an initial fluoride concentration of about 4 to 5 mg/l. During the first 5 months of operation, the system operated as designed with fluoride discharge levels of 2 to 3 mg/l. Fluoride concentrations are expected to decrease over time as concentrations in groundwater in the south plant area decrease. This alternative also includes groundwater monitoring.

#### Alternative 4 – Continued Operation of the Interim ROD Groundwater Remedy and Institutional Controls.

This alternative combines all of the elements of Alternatives 2 and 3.



## **EVALUATION OF ALTERNATIVES and the Preferred Alternative**

EPA's Preferred Alternative, Alternative 4, combines the elements of Alternative 2, Institutional Controls, and Alternative 3, Continued Operation of the Interim ROD Groundwater Remedy. This section summarizes the evaluation of the Preferred Alternative and a comparison with the other alternatives (no action, institutional controls, and the Interim ROD groundwater action)

against the nine criteria described above. The "no action" alternative is not described in detail because it does not provide overall protection of human health and the environment or meet ARARs. EPA cannot select an alternative that does not satisfy these threshold criteria, and this alternative is not carried forward for evaluation beyond the threshold criteria.

### **CRITERIA USED BY EPA TO EVALUATE ALTERNATIVES**

CERCLA established nine criteria that are used to evaluate and compare cleanup alternatives. The criteria are divided into three categories as follows:

**Threshold Criteria** – These two criteria must be met by the chosen alternative.

- *Overall Protection of Human Health and the Environment* addresses whether or not adequate protection of health and the environment is provided during and after construction of the remedy.
- *Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)* addresses whether or not the alternative would meet requirements of federal and state laws and regulations that apply or that are relevant and appropriate to the actions.

**Balancing Criteria** – These criteria are the primary factors taken into account in comparing alternatives and choosing the preferred alternative.

- *Long-term Effectiveness and Permanence* refers to the ability of the alternative to reliably protect human health and the environment over time once the cleanup actions have been implemented.
- *Reduction of Toxicity, Mobility, or Volume through Treatment* addresses the expected performance of treatment technologies that may be used and whether treatment is a main element of the proposed actions.
- *Short-term Effectiveness* evaluates the potential to adversely affect human health and the environment during the time when cleanup actions are taking place, and how quickly the alternative achieves protection of human health and the environment.
- *Implementability* refers to the technical and administrative difficulties for carrying out the alternative, including the availability of special materials or services, the need for regulatory approvals, and how hard it would be to construct and operate a particular remedy at this site.
- Cost is the estimate of the construction costs, plus the operating and maintenance costs of the alternatives.

**Modifying Criteria** – These criteria involve consideration of state and public concerns that may change or modify the alternative picked for the site.

- *State Acceptance* – refers to whether the alternative addresses the concerns of the state.
- *Community Acceptance* – pertains to whether or not the alternative adequately addresses the concerns of the community.

## **Overall Protection of Human Health and the Environment**

Direct contact exposure risks have been addressed by the cleanup actions that have been completed throughout the site. Excavating the waste and contaminated soil under the Interim ROD and additional waste removal associated with plant demolition have reduced exposure for workers, recreational users and trespassers by eliminating direct contact with unacceptable levels of chemicals of concern in waste, surface and subsurface soils. It has also reduced the migration of chemicals of concern to groundwater by removing sources of groundwater contamination.

Alternative 1, no action, would not be adequately protective of all potential future uses at the site and would not prevent the use of contaminated groundwater as a source of drinking water. It also would not provide restoration of beneficial uses for most portions of the aquifer, and would not provide hydraulic containment or reduce fluoride mass in groundwater in the south plant area to control anticipated future discharges of fluoride-contaminated groundwater to the Sandy River.

Institutional controls under Alternatives 2 and 4 (Preferred Alternative) provide additional protection of human health and the environment by eliminating, reducing, or controlling residual risks associated with soils and groundwater exposure. However, institutional controls alone (Alternative 2) would not restore the beneficial uses of groundwater, and would not provide

adequate protection of the Sandy River from anticipated future discharges of contaminated groundwater. An evaluation of a “no pumping” scenario as an alternative for groundwater was presented in the 1999 feasibility study. The analysis showed that a significant mass of fluoride would be discharged to the Sandy River in a few years and would continue for several decades if the plume in the south plant area was not contained by pumping of the production wells at the site.

Alternative 3 would provide protection of the Sandy River and restoration of beneficial uses of groundwater, but would not provide adequate protection if there are no restrictions on future use of the property or drinking water.

Alternative 4, the Preferred Alternative, provides the best overall protection of human health and the environment by controlling risks associated with exposure to residual levels of contamination, controlling further migration of fluoride-contaminated groundwater to other portions of the aquifer and the Sandy River, and protecting and restoring beneficial uses of the groundwater. The Groundwater FE/PWO will need to operate for an estimated 5 to 10 years to maintain hydraulic control and achieve protective levels in the intermediate and deep zones. Restrictions on the use of groundwater may need to continue for 20 years for some (generally shallower) portions of the aquifer, and are expected to be permanent for the shallow silt zone in the south plant area.

## **Compliance with ARARS**

Alternatives 1 and 2 would not achieve compliance with Applicable Relevant and Appropriate Requirements (ARARs) from Federal and State laws because groundwater would not meet MCLs for fluoride and this beneficial use would not be protected and restored.

Alternatives 3 and 4 (Preferred Alternative) are expected to achieve compliance with ARARs for groundwater. It is estimated that the groundwater FE/PWO system will need to operate for at least an additional 5 to 10 years after the source control actions were completed in 2005 to achieve compliance with the MCLs for intermediate and deep groundwater. Restoration of some portions of the aquifer (shallower areas beneath the silt unit or near Company Lake) could take up to 20 years.

Although Alternative 2 does not comply with ARARs for groundwater, soil cleanup levels achieved during the Interim Action, combined with institutional controls (Alternatives 2 and 4) would comply with ARARs for soils.

## **Long-term Effectiveness and Permanence**

Excavation and off-site disposal of contaminated waste and soil, including sources of groundwater contamination, has been an effective and permanent solution to human and ecological exposure to contamination at the Site. Removal of the process residue layer in Company Lake is expected to be effective in achieving long-term restoration of groundwater quality in the northern part of the Site.

Alternatives 3 and 4 (Preferred Alternative) includes removal of fluoride mass through the FE/PWO system, which is expected to provide long-term protection of groundwater in the southern part of the Site and minimize any future impacts to the Sandy River. Institutional controls in Alternatives 2 and 4, including restrictive covenants for future site and groundwater use, are an effective means of ensuring that the site use is compatible with the protective levels achieved and the continued operation of the FE/PWO system. Institutional controls will also protect the areas that have been capped.

## **Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment**

Highly contaminated waste and soil have already been excavated and disposed off-site as part of early cleanup actions, the Interim ROD and additional cleanup associated with plant demolition activities. Removal of contaminated soil and debris that was a source of groundwater contamination has reduced leaching of contaminants to groundwater.

Continued operation of the groundwater system under the Preferred Alternative does not include treatment of fluoride. The Interim ROD concluded that the treatment processes evaluated in the feasibility study have not been shown to be effective in treating the expected fluoride concentration of 75 mg/l that would be pumped from the focused extraction wells. The Interim ROD indicated that treatment would be re-evaluated if fluoride concentrations in

the focused extraction wells exceeded 75 mg/l. Results of the first months of operation indicate that the fluoride levels in water from wells FE02 and FE03 have been about 40 mg/l and 20 mg/l, respectively. Groundwater from the production wells are already below the MCLs.

### **Short-term Effectiveness**

All of the alternatives with institutional controls provide some measure of short-term effectiveness by preventing exposures to residual levels of contamination. Alternative 3 would provide hydraulic control and fluoride mass reduction in groundwater, but would not restrict use of groundwater while the cleanup is underway. The combination of hydraulic control, reduction of fluoride mass in groundwater and institutional controls in Alternative 4 will provide the best short-term protection during the groundwater cleanup and initial site re-development activities.

### **Implementability**

The groundwater FE/PWO system that would be operated under Alternatives 3 and 4 has been constructed and is functioning as designed during the first months of operation. The components of the system are proven and reliable and are capable of removing fluoride mass from the plume beneath the southern part of the Site. The effectiveness of groundwater extraction and containment will be monitored and evaluated. The FE/PWO system was

designed and constructed with the flexibility to allow operational adjustments and minor modifications as necessary. Institutional controls in Alternative 2 and 4 can be implemented and are expected to be put in place after completion of the final Record of Decision. Institutional controls will be put in place through enforceable mechanisms such as an easement and equitable servitude that have been used successfully at other sites in the State of Oregon.

### **Cost**

The Preferred Alternative and Alternative 3 have an estimated annual operation and maintenance costs of \$229,000. This cost is for operation of the FE/PWO system and groundwater monitoring. Annual costs for groundwater monitoring only under Alternative 2 are estimated at \$84,000.

### **State/Support Agency Acceptance**

The State of Oregon was consulted during preparation of this Proposed Plan and the Preferred Alternative. EPA will request that the State concur on the selection of the final remedial action for this Site.

### **Community Acceptance**

Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the final ROD for the site.

## **SUMMARY OF THE PREFERRED ALTERNATIVE**

The Preferred Alternative for the Reynolds Metals Company (RMC) Site consists of: institutional controls for soils and groundwater and continued operation of the groundwater FE/PWO system that was constructed and is currently being operated by RMC as required by the Interim ROD.

The Preferred Alternative was selected because the Post-Demolition RA shows that current site conditions are within acceptable risk levels for the reasonable expected future uses at the site.

Previous cleanup actions have achieved substantial and long-term risk reduction. Based on current information, EPA believes that known contaminated soil and debris have been removed from the Site to acceptable levels, and residual risks can be controlled by use of institutional controls. The final ROD will include requirements for maintenance of the caps to ensure that they remain protective.

The groundwater remedy will complete the phased approach to groundwater restoration. The first phase of the groundwater remedy was source removal, which was completed through early removal actions and the remedial actions required by the Interim ROD to eliminate the sources of contamination to groundwater. The second phase was construction of the FE/PWO system, followed by successful start-up testing to demonstrate that the system is functioning as designed. The final phase is the operational phase, which requires operation of the FE/PWO system for approximately 5 to 10 years to contain the plume in the south plant

area and restore groundwater quality. Progress of remediation, measured by containment of the fluoride plume and restoration of groundwater quality will be confirmed by sampling of monitoring wells. Performance criteria for meeting the remedial action objectives for groundwater, including capture zone monitoring and water quality, were developed as part of the Site-wide Groundwater Monitoring Plan (2006 through 2010) and will be established in the final ROD.

The beneficial use of the aquifer (except for the shallow silt layer) is as a source of water for industrial uses and for drinking water. Groundwater extracted from the deep portions of the aquifer has been used for this purpose both on and off site. In addition, discharge to surface water is a beneficial use of the aquifer. The Preferred Alternative will significantly reduce the mass of fluoride, protect the Sandy River, and restore beneficial uses within a reasonable time frame.

The shallow silt zone is not considered to be a usable source of drinking water because of low yields in this portion of the aquifer. An evaluation of the restoration potential of the silt zone estimated that yields were generally below 0.1 gpm, which limits its potential use as a drinking water source and the technical practicability of active remediation options that were considered to reduce fluoride levels in a reasonable timeframe. The source removal in the waste areas located above the silt zone, and the focused extraction of fluoride contaminated

water beneath the silt zone are expected to reduce and control migration of fluoride from this zone to lower portions of the aquifer.

Based on the information available, EPA and the State of Oregon believe the Preferred Alternative provides the best course of action among the alternatives with respect to the nine criteria. The Preferred Alternative satisfies the statutory requirements in CERCLA 121(b) to be protective of human health and the environment, comply with ARARs, and to be cost-effective, and

utilizes permanent solutions and alternative technologies to the extent practicable. However, because major sources of contamination have been cleaned up through previous removal and remedial actions, and treatment was not found to be practicable for groundwater, this remedy does not satisfy the statutory preference for treatment as a principle element of the remedy.

The Preferred Alternative can change in response to public comment or new information.

### **ADDITIONAL INFORMATION**

If you have any questions about this Proposed Plan, please contact either:

Chip Humphrey  
EPA Project Manager  
(503) 326-2678  
email: [humphrey.chip@epa.gov](mailto:humphrey.chip@epa.gov)

Judy Smith  
Community Involvement Coordinator  
(503) 326-6994  
email: [smith.judy@epa.gov](mailto:smith.judy@epa.gov)

Visit the EPA Reynolds Metals Company website at:  
<http://yosemite.epa.gov/r10/cleanup.nsf/sites/reynolds>