United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R10-90/021
December 1989

EPA

Superfund Record of Decision:

Teledyne Wah Chang, OR

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R10-90/021	2.	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Teledyne Wah Chang, OR
First Remedial Action

5. Report Date
12/28/89

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Orgainization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered
800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Teledyne Wah Chang (TWC) site, in Millersburg, Oregon, is an active plant used to produce nonferrous metals and products. The site consists of a 110-acre plant site, which contains the plant's former sludge ponds, and a 115-acre farm site, which contains four active wastewater sludge ponds. Portions of the TWC site are within the Willamette River's 100- and 500-year floodplain. The Wah Chang Corporation began operating a U.S. Bureau of Mines zirconium metal sponge pilot plant under contract with the U.S. Atomic Energy Commission in 1956. Additional facilities were subsequently built near the plant beginning in 1957 to produce nonferrous metals and products. The Lower River Solids Pond (LRSP) and Schmidt Lake sludge pond, which stored wastewater generated from the plant operations, are being addressed by this remedial action. The 3-acre LRSP received sludge from TWC's onsite wastewater treatment plant from 1967 to 1979 and currently holds approximately 75,000 cubic yards of sludge. Schmidt Lake covers 0.6 acre and accepted approximately 10,000 cubic yards of sludge from 1974 to 1979. The sludge in both the LRSP and Schmidt Lake contains heavy metals, organic compounds, and trace levels of radionuclides. Because the ponds contain radioactive materials and are a potential source of ground water contamination, TWC decided to clean up the ponds without waiting for the full site remedial investigation to be completed. This interim action addresses the contaminated sludge in the LRSP and (Continued on next page)

17. Document Analysis a. Descriptors
Record of Decision - Teledyne Wah Chang, OR
First Remedial Action
Contaminated Medium: sludge
Key Contaminants: organics, metals, (chromium, lead, zirconium), radioactive materials

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 58
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

DO NOT PRINT THESE INSTRUCTIONS AS A PAGE IN A REPORT

INSTRUCTIONS

Optional Form 272, Report Documentation Page is based on Guidelines for Format and Production of Scientific and Technical Reports, ANSI Z39.18–1974 available from American National Standards Institute, 1430 Broadway, New York, New York 10018. Each separately bound report—for example, each volume in a multivolume set—shall have its unique Report Documentation Page.

1. Report Number. Each individually bound report shall carry a unique alphanumeric designation assigned by the performing organization or provided by the sponsoring organization in accordance with American National Standard ANSI Z39.23–1974, Technical Report Number (STRN). For registration of report code, contact NTIS Report Number Clearinghouse, Springfield, VA 22161. Use uppercase letters, Arabic numerals, slashes, and hyphens only, as in the following examples: FASEB/NS–75/87 and FAA/RD–75/09.
2. Leave blank.
3. Recipient's Accession Number. Reserved for use by each report recipient.
4. Title and Subtitle. Title should indicate clearly and briefly the subject coverage of the report, subordinate subtitle to the main title. When a report is prepared in more than one volume, repeat the primary title, add volume number and include subtitle for the specific volume.
5. Report Date. Each report shall carry a date indicating at least month and year. Indicate the basis on which it was selected (e.g., date of issue, date of approval, date of preparation, date published).
6. Sponsoring Agency Code. Leave blank.
7. Author(s). Give name(s) in conventional order (e.g., John R. Doe, or J. Robert Doe). List author's affiliation if it differs from the performing organization.
8. Performing organization Report Number. Insert if performing organizaton wishes to assign this number.
9. Performing Organization Name and Mailing Address. Give name, street, city, state, and ZIP code. List no more than two levels of an organizational hierachy. Display the name of the organization exactly as it should appear in Government indexes such as Government Reports Announcements & Index (GRA & I).
10. Project/Task/Work Unit Number. Use the project, task and work unit numbers under which the report was prepared.
11. Contract/Grant Number. Insert contract or grant number under which report was prepared.
12. Sponsoring Agency Name and Mailing Address. Include ZIP code. Cite main sponsors.
13. Type of Report and Period Covered. State interim, final, etc., and, if applicable, inclusive dates.
14. Performing Organization Code. Leave blank.
15. Supplementary Notes. Enter information not included elsewhere but useful, such as: Prepared in cooperation with . . . Translation of . . . Presented at conference of . . . To be published in . . . When a report is revised, include a statement whether the new report supersedes or supplements the older report.
16. Abstract. Include a brief (200 words or less) factual summary of the most significant information contained in the report. If the report contains a significant bibliography or literature survey, mention it here.
17. Document Analysis. (a). Descriptors. Select from the Thesaurus of Engineering and Scientific Terms the proper authorized terms that identify the major concept of the research and are sufficiently specific and precise to be used as index entries for cataloging.

    (b). Identifiers and Open-Ended Terms. Use identifiers for project names, code names. equipment designators, etc. Use open-ended terms written in descriptor form for those subjects for which no descriptor exists.

    (c). COSATI Field/Group. Field and Group assignments are to be taken form the 1964 COSATI Subject Category List. Since the majority of documents are multidisciplinary in nature, the primary Field/Group assignment(s) will be the specific discipline, area of human endeavor, or type of physical object. The application(s) will be cross-referenced with secondary Field/Group assignments that will follow the primary posting(s).
18. Distribution Statement. Denote public releasability, for example "Release unlimited", or limitation for reasons other than security. Cite any availability to the public, with address, order number and price, if known.

19. & 20. Security Classification. Enter U.S. Security Classification in accordance with U. S. Security Regulations (i.e., UNCLASSIFIED).

21. Number of pages. Insert the total number of pages, including introductory pages, but excluding distribution list, if any.
22. Price. Enter price in paper copy (PC) and/or microfiche (MF) if known.

16. Abstract (Continued)

Teledyne Wah Chang, OR
PA/ROD/R10-90/021

chmidt Lake. Contaminated soil in the sludge ponds will be addressed as part of an overall site remedy. The primary contaminants of concern affecting the sludge ponds are organics; metals including chromium, zirconium, and lead; and radioactive materials.

The selected remedial action for this site includes excavation of 85,000 cubic yards of sludge with partial solidification of the sludge, followed by offsite disposal in a permitted solid waste landfill. The estimated present worth cost for this remedial action is $10,716,000, with no O&M costs.

RECORD OF DECISION,
DECISION SUMMARY, AND
RESPONSIVENESS SUMMARY

FOR

INTERIM RESPONSE ACTION
TELEDYNE WAH CHANG ALBANY SUPERFUND SITE
OPERABLE UNIT #1 (SLUDGE PONDS UNIT)
ALBANY, OREGON

DECEMBER 1989

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION
INTERIM RESPONSE ACTION

TELEDYNE WAH CHANG ALBANY SUPERFUND SITE
OPERABLE UNIT #1
ALBANY, OREGON

RECORD OF DECISION
INTERIM ACTION SELECTION (SLUDGE PONDS UNIT)
TELEDYNE WAH CHANG ALBANY
ALBANY, OREGON

Statement of Basis and Purpose

This decision document presents the selected remedial action for the sludge pond unit at the Teledyne Wah Chang Albany (TWCA) site in Millersburg, Oregon, just north of Albany, developed in accordance with CERCLA (42 U.S.C. §9601), as amended by SARA and, to the extent practicable, the National Contingency Plan.

This decision is based on the administrative record for this site. A copy of the administrative record index is attached as Appendix C.

The state of Oregon has concurred in the selected remedy. A copy of the state's letter is attached as Appendix B.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The sludge unit addressed by this ROD is the first operable unit to be addressed at the TWCA site. The Remedial Investigation/Feasibility Study (RI/FS) for the unit did not include certain components of a normal RI/FS, such as a complete baseline risk assessment, because these will be part of an overall site RI/FS (currently in the RI stage with the FS scheduled for completion in 1991). The sludge pond unit is being dealt with separately due to the property owners', and the public's, wish for an expeditious cleanup of the sludges, which may be contributing to groundwater contamination at the site.

The remedy consists of:

- Digging up and removing the sludge.
- Partially solidifying the sludge with a solidification agent such as Portland cement, to improve handling and reduce the gross mobility of the solids. A treatment plant will be built for this purpose.
- Transporting the sludge mixture to a solid waste landfill and disposing of it offsite.

The wastes being addressed in this Interim Action are not hazardous wastes as defined by the Resource Conservation and Recovery Act (RCRA); therefore, the RCRA Land Disposal Restrictions do not apply.

When the overall site Feasibility Study is completed, the sludge unit remedy will be reviewed to assure consistency with the overall remedial strategy for the TWCA site.

Declaration

This Interim Action is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. This Interim Action utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. This action does not constitute the final remedy for the site, but the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element of the overall site remedy is addressed for this action and will also be addressed for the final response action. Subsequent actions are planned to address fully the principal threats posed by this site.

Robert H Bird Jr.
Regional Administrator
EPA Region 10

12/26/87
Date

DECISION SUMMARY
INTERIM RESPONSE ACTION

TELEDYNE WAH CHANG ALBANY SUPERFUND SITE
OPERABLE UNIT #1
ALBANY, OREGON

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SITE NAME

Teledyne Wah Chang Albany (TWCA), Albany, Oregon

LOCATION AND DESCRIPTION

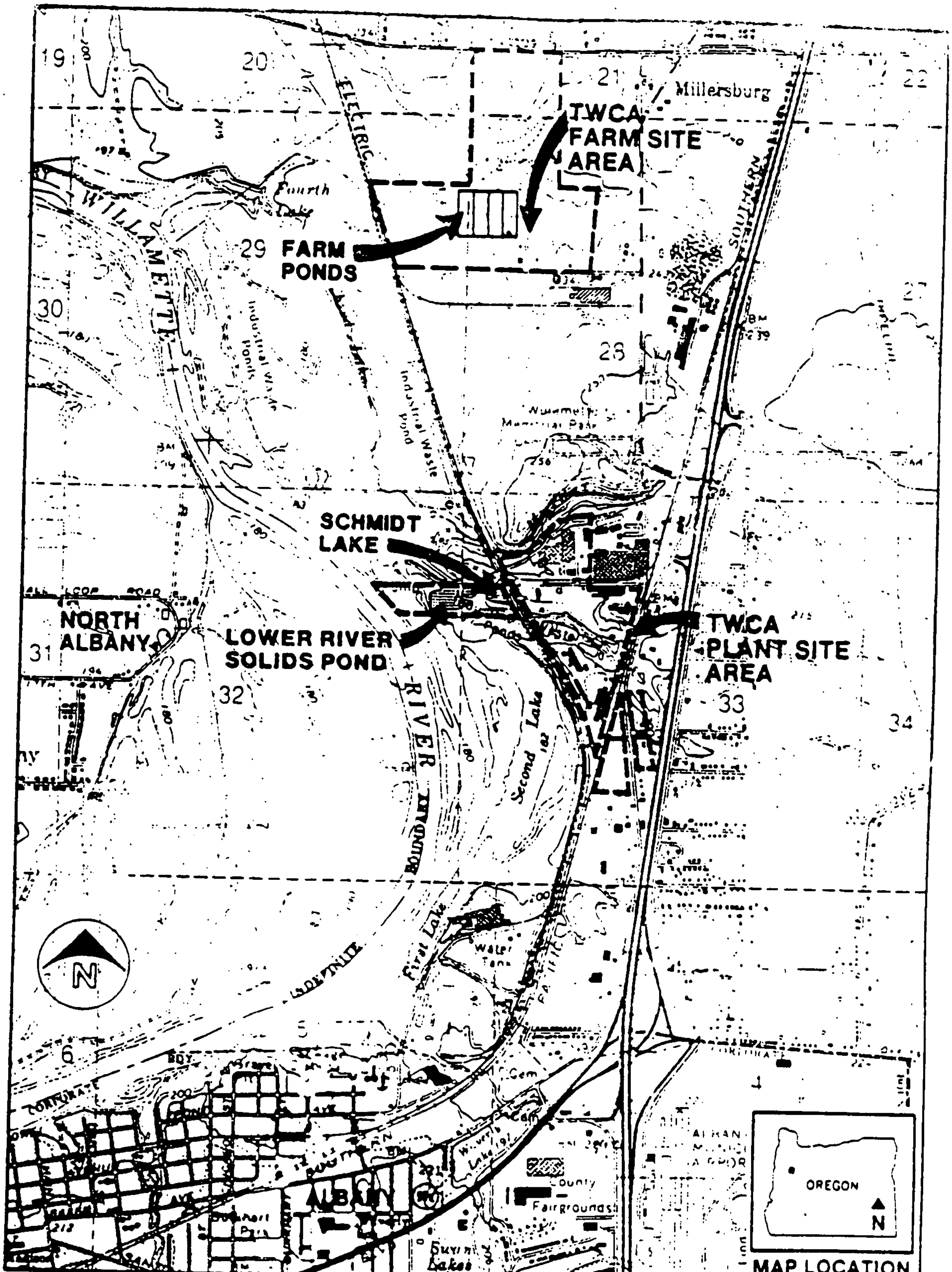
The TWCA facility is located in Millersburg, Oregon (about three miles north of Albany) in the Willamette Valley (see Figure 1). The Superfund site includes the 110 acre plant site property and the 115 acre facility known as the "farm site", which has the plant's active wastewater treatment sludge ponds ("farm ponds") and is located approximately 3/4 mile north of the plant site. Operable Unit #1, the unit addressed by this Interim Action, includes the solids in the Lower River Solids Pond (LRSP) and Schmidt Lake, which are located on the plant site near the Willamette River and have not been used since 1979.

Of the two major site areas, the plant site contains numerous buildings and facilities including an extraction area south of Truax Creek, a fabrication area north of Truax Creek, a solids storage area west of the Burlington Northern Railroad, and a parking and recreation area east of the Southern Pacific Railroad. The farm site contains four 2-1/2 acre solids storage ponds. The remainder of the site is used primarily for agriculture. The plant is currently operating and employs over 1300 people, making it the largest employer in the Albany area.

The LRSP and Schmidt Lake lie in the western portion of the plant site, next to the east bank of the Willamette River, between Murder Creek to the north and Truax Creek to the south (see Figure 2). The LRSP covers just over 3 acres and holds approximately 75,000 cubic yards of sludge; Schmidt Lake covers roughly 0.6 acre and contains approximately 10,000 cubic yards of material. The sludge in both ponds averages 40 percent solids. Both ponds are diked to contain the sludge, which also allows rainwater to collect on the top of the sludge; the rainwater is collected and pumped back to the plant wastewater treatment facility for treatment. The top few feet of the sludge in both ponds have deep cracks that remain year-round. Most of the surface of the LRSP stays wet throughout the year, but the surface of Schmidt Lake dries to dust during the summer.

Portions of the TWCA site, including the sludge ponds, are in the 100-year and 500-year flood plains of the Willamette River. The ground surface in the vicinity of TWCA slopes westward towards the river with a gradient of approximately 11 feet per mile.

Willamette Valley temperatures are moderate, with maximums seldom reaching 100° F and minimums rarely reaching 0° F. Roughly 70 percent of the 40-inch annual precipitation falls during November through March, while only 6 percent occurs during June, July, and August; fall and winter precipitation is the primary source of aquifer recharge in the area. There are usually only 3 or 4 days per year with measurable amounts of snow.



Source: USGS 1:24,000 Albany, Oregon

0 1000 2000 3000 4000 5000 FEET
SCALE

Figure 1
LOCATION MAP
Teledyne Wah Chang Albany
Albany, Oregon

CH2M HILL

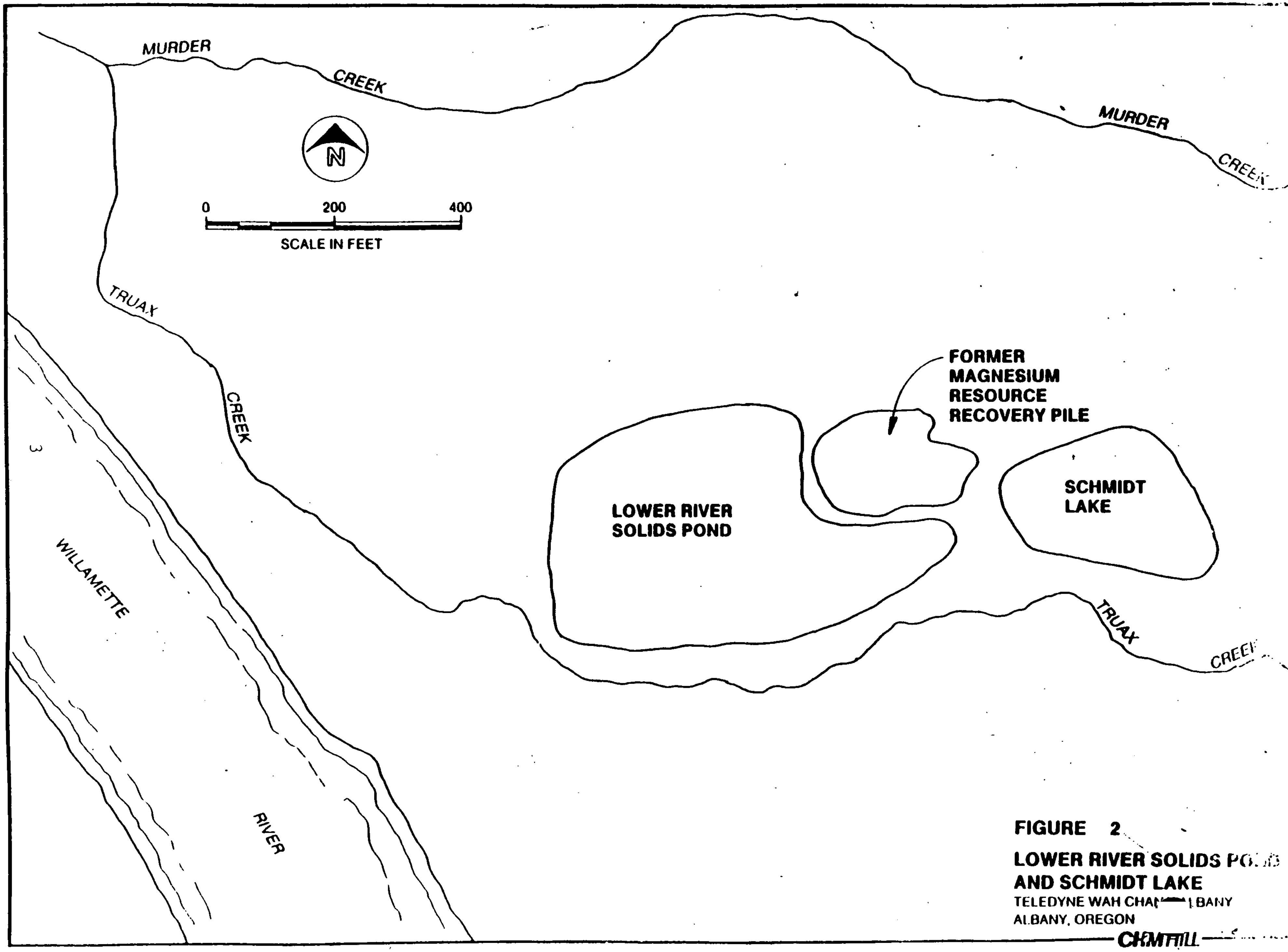


FIGURE 2

LOWER RIVER SOLIDS PO[illegible]
AND SCHMIDT LAKE

TELEDYNE WAH CHA[illegible]LBANY
ALBANY, OREGON

The immediate area surrounding TWCA is primarily industrial, with some land to the north being used for agriculture. The land east of Interstate 5 and south of the plant site is used mainly for residential and commercial purposes, while land west of the Willamette River, which borders the plant site, is used for farming. Albany, the urban area to the south of the site, has a population of approximately 27,000; Millersburg has a population of about 560.

There are approximately 250 known private drinking water wells within three miles of the facility; all of these wells are upgradient of the site. There are no known domestic, municipal, industrial, or irrigation wells located between the site and the Willamette River. The Willamette River is not used as a drinking water source in this area.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site History

Operations at the TWCA site began in 1956 when, under contract with the U.S. Atomic Energy Commission, Wah Chang Corporation began operation of the U.S. Bureau of Mines, Zirconium Metal Sponge Pilot Plant. Construction of new facilities at the existing plant began in 1957. These facilities were built primarily for the production of zirconium and hafnium sponge. However, tantalum and niobium pilot facilities were later included. Melting and fabrication operations were added starting in 1959. TWCA was established in 1967 after Teledyne Industries, Inc., purchased Wah Chang Corporation of New York.

Because of the many processes involved in the production of nonferrous metals and products, waste management programs at TWCA consist of a wide range of activities, including: process wastewater treatment; solid waste management; hazardous waste management; PCB equipment management; radioactive material control; waste minimization through beneficial use; and air quality control programs. Discharge of process wastewater is regulated by a National Pollutant Discharge Elimination System (NPDES) permit. An Air Contaminant Discharge Permit regulates air emissions at the facility. Teledyne is currently classified as a hazardous waste generator under the Resource Conservation and Recovery Act (RCRA) program.

The LRSP was constructed and placed into operation in 1967 to receive lime solids (sludge) from TWCA's onsite wastewater treatment plant; Schmidt Lake was constructed for the same purpose in 1974. Sludge was pumped into the two ponds until October 1979, when the farm ponds to the north of the facility were put into operation. The farm ponds were originally part of this operable unit, but because they are outside the flood plain and contain lower levels of radioactivity, they are not considered an immediate threat and are now being investigated as part of the overall site Remedial Investigation (RI). The sludge in both the LRSP and Schmidt Lake contains heavy metals, a few organic compounds, and trace levels of some radionuclides. Tables 1-4 summarize the contaminants found in the sludge.

In 1978, TWCA modified the process for the production of zirconium and hafnium metal such that radioactive materials were directed into a separate solid waste referred to as chlorinator residue. This residue is managed as a low specific activity radioactive waste and shipped to Hanford, Washington, for disposal. Sludge generated since the implementation of this modification has been stored in the farm ponds.

Enforcement History

The sludge ponds have attracted the attention of regulatory agencies and the public for many years, particularly because of the presence of low-grade radioactive materials which was first confirmed by the Oregon State Health Division in 1977. In March 1978, TWCA was granted a Radioactive Materials License to transfer, receive, possess, and use zircon sands and industrial byproducts containing licensable concentrations of radioactive materials. TWCA took samples from the ponds on several occasions in 1979 and 1980.

Table 1
INORGANIC CONTAMINANTS IN LRSP SOLIDS

	Detects/ Samples	Maximum	Minimum[a]	Average[b]	Background[c]
Arsenic	40/40	39	2	10	24
Barium	39/40	3,500	33	173	116
Beryllium	20/40	1.3	0.5	0.7	0.7
Chromium	39/40	220	65	100	20
Copper	40/40	77	29	48	12
Mercury	36/40	7.6	0.3	1.2	<0.2
Nickel	40/40	3,000	25	206	14
Lead	40/40	260	38	102	10
Antimony	29/40	24	5	11	<20
Selenium	35/40	16	1	3	3
Thorium	40/40	74 (8.3)	11 (1.2)	31.7 (3.5)	3.5
Uranium	40/40	129 (87.8)	12.7 (6.4)	69.2 (46.5)	0.8
Zinc	40/40	87	24	40	39
Cyanide	28/40	165.0	3.0	16	<2
Radium[d]					
Activity	40/40	(22.2)	(3.2)	(13.2)	(1.0)
Concentration		2.30×10^{-5}	3.32×10^{-6}	1.37×10^{-5}	1.04×10^{-6}
Zirconium[e]	40/40	10.0	3.0	5.1	<1.0

Note: All concentrations in mg/kg of as-received, wet solids.
Concentrations in parentheses are in pCi/g.
Only constituents that were detected in 10 percent or more of the samples are shown.

[a] Minimum value detected above detection limit.

[b] Geometric average. Duplicates were averaged to obtain one value that was then included in the geometric average. No values below detection limits were included in the average.

[c] From soil samples taken east of the existing Farm Ponds, October 1988. See RI report.

[d] As radium-226.

[e] Zirconium is expressed as a percent.

Table 2
INORGANIC CONTAMINANTS IN SCHMIDT LAKE SOLIDS

	Detects/ Samples	Maximum	Minimum[a]	Average[b]	Background[c]
Arsenic	10/10	36	8	16	24
Barium	10/10	72	36	39	116
Beryllium	10/10	1.1	0.7	0.8	0.7
Cadmium	7/10	1.2	0.1	0.3	<0.1
Chromium	10/10	13	79	90	20
Copper	10/10	72	34	45	12
Mercury	4/10	1.4	0.2	0.6	<0.2
Nickel	10/10	4,300	1,700	2,600	14
Lead	10/10	150	70	103	10
Antimony	10/10	14	8	9	<20
Selenium	7/10	4	1	2	3
Thorium	10/10	59.3 (7.5)	30.8 (3.4)	46.3 (5.1)	3.5
Uranium	10/10	237.7 (160.9)	104.6 (70.8)	162.6 (110.1)	0.8
Zinc	10/10	97	50	67	39
Cyanide	4/10	110	2.5	5.3	<2
Radium[d] Activity Concentration	10/10	(26.4) 2.54×10^{-5}	(14.9) 1.44×10^{-5}	(19.2) 1.85×10^{-5}	(1.0) 9.64×10^{-7}
Zirconium[e]	10/10	28.8	3.9	7.4	<1.0

Note: All concentrations in mg/kg of as-received, wet solids.
Concentrations in parentheses are in pCi/g.
Only constituents that were detected in 10 percent or more of the samples are shown.

[a]Minimum value detected above detection limit.

[b]Geometric average. Duplicates were averaged to obtain one value that was then included in the geometric average. No values below detection limit were included in the average.

[c]From soil samples taken east of the Farm Ponds, October 1988. See RI report.

[d]As radium -226.

[e]Zirconium is expressed as a percent.

CVR126/051-2

Table 3
ORGANIC CONTAMINANTS IN LRSP SOLIDS

Volatiles	Detects/ Samples	Maximum	Minimum[a]	Average[b]
Methylene chloride	36/40	22.000	0.006	0.084
1,1,1,-Trichloroethane	7/40	0.860	0.053	0.155
4-Methyl-2-pentanone	23/40	1,400.000	0.040	3.929
1,1-Dichloroethane	12/40	0.860	0.053	0.174
Tetrachloroethene	19/40	0.970	0.005	0.164
Semivolatiles				
Hexachlorobenzene	39/40	64.000	0.740	6.600
bis(2-ethyl-hexyl) phthalate	5/40	1.700	1.000	1.295

Note: All concentrations in mg/kg dry weight.
Only compounds that were detected in 10 percent or more of the samples are shown.

[a]Minimum value detected above detection limit.

[b]Geometric average. Duplicates were averaged to obtain one value that was then included in the geometric average. No values below detection limit were included in the average.

Table 4
ORGANIC CONTAMINANTS IN SCHMIDT LAKE SOLIDS

Volatiles	Detects/ Samples	Maximum	Minimum[a]	Average[b]
Methylene chloride	10/10	0.090	0.031	0.046
1,1,1,-Trichloroethane	4/10	0.320	0.073	0.168
4-Methyl-2-pentanone	3/10	54.000	24.000	32.708
1,1-Dichloroethane	5/10	3.900	0.170	1.054
Tetrachloroethene	1/10	0.073	0.073	0.073
Semivolatiles				
Hexachlorobenzene	10/10	25.333	7.300	14.087
bis(2-ethyl-hexyl) phthalate	1/10	1.000	1.000	1.000
N-Nitroso-di-n-propylamine	2/10	0.590	0.190	0.048

Note: All concentrations in mg/kg dry weight.
Only compounds that were detected in 10 percent or more of the samples are shown.

[a]Minimum value detected above detection limit.

[b]Geometric average. Duplicates were averaged to obtain one value that was then included in the geometric average. No values below detection limit were included in the average.

In 1981, the company applied to the state of Oregon's Energy Facility Siting Council (EFSC) for a site certificate to close LRSP and to store approximately 120,000 cubic yards of lime solids. The TWCA facility was listed on the National Priorities List (NPL) in October 1983. After several years of hearings, court actions, and further sampling, EFSC ruled in 1987 that the sludge was not subject to their jurisdiction, the levels of radioactivity being too low. TWCA then submitted a closure plan to the Oregon State Health Division, but EPA and other agencies recommended that closure not take place until after the conclusion of the RI. On May 4, 1987, TWCA signed a Consent Order agreeing to conduct the Remedial Investigation/Feasibility Study (RI/FS).

The TWCA facility holds permits for water and air emissions. It was found in violation of wastewater discharge permits in 1975, 1977, and 1978; subsequent process changes reduced the toxicity of the facility's wastewater discharges. TWCA was assessed fines for other water quality permit violations in 1979, 1980, and 1989. The company was fined for illegal open burning in 1983. In 1986, TWCA was cited for several violations of the state's hazardous waste management rules.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

TWCA and its activities have always been of interest to the community. Historically, the environmental issue of greatest local concern has been odor from the plant. Process changes have since reduced the odor and the number of complaints about it.

TWCA came to the attention of state environmental groups again in 1982, when it submitted its disposal plan to EFSC and became known as a source of radioactive contaminants. One of the groups, Forelaws on Board, has sponsored three state ballot initiatives proposing tighter standards for licensing such disposal facilities (one passed, two failed), and has also appealed the final EFSC ruling, which was upheld by the Oregon State Supreme Court in July 1988. Greenpeace staged two protests on the issue in 1985.

The following EPA community relations activities have been conducted at TWCA under Superfund:

- December 1982 - site proposed for inclusion on the NPL.
- October 1983 - site listed on NPL.
- February-May 1987 - local citizens and officials interviewed in order to prepare a Community Relations Plan.
- November 1987 - final Community Relations Plan issued.
- November 1987 - Information Repositories established at Albany Public Library, Department of Environmental Quality (Portland), and EPA Region 10 (Seattle).
- November 1988 - RI/FS work plan for entire facility sent out for 30-day public comment period. Work plan was placed in information repositories and a fact sheet was published.
- February 1989 - Fact sheet published announcing EPA's approval of the final work plan.
- June 1989 - Fact sheet published announcing that TWCA had submitted a draft RI/FS report to EPA for Operable Unit #1.
- August 16, 1989 - Interim Action (Operable Unit #1) Proposed Plan published.
- August 18 - October 16, 1989 - Public comment period for the Proposed Plan.
- September 6, 1989 - Public meeting for the Proposed Plan held in Albany. This meeting was announced in the Proposed Plan and a local newspaper.

SCOPE AND ROLE OF OPERABLE UNIT WITHIN SITE STRATEGY

EPA and TWCA decided to separate the sludge ponds operable unit from the rest of the site in the summer of 1988, soon after commencement of the overall site RI, because:

a) the ponds are a likely source of groundwater contamination;
b) they are located in the Willamette River flood plain;
c) they contain radioactive materials, and thus have been the focus of community concerns about the site; and
d) TWCA, in response to these concerns, wishes to clean up the ponds without waiting for the full site RI/FS to be completed.

The potential for groundwater contamination alone justifies a separate, expedited action. Other potential sources of groundwater contamination include onsite process plants, drains, and farm ponds, as well as several offsite sources, such as neighboring pulp and paper plants. The relative importance of each of these sources, as well as the nature and extent of contamination, are the focus of the RI for the overall site.

The overall site RI/FS is underway and Phase I is scheduled for completion in 1990. To the extent possible, this Interim Action is consistent with future activities.

SUMMARY OF SITE CHARACTERISTICS

Contaminants Present

The sludge in the LRSP and Schmidt Lake was sampled and contains metal compounds produced by the various onsite processing units, including zirconium, hafnium, chromium, mercury, nickel, uranium, and radium; cyanide has also been found. Of organic compounds detected, the most prevalent one is hexachlorobenzene, which is probably a byproduct of plant operations (Tables 1-4).

TWCA's wastewater treatment system consists of a continuous chemical precipitation and sedimentation system. Metals are treated by neutralization with lime, magnesium hydroxide, or sulfuric acid and carbon dioxide to a pH range between 6 and 8 to form metal hydroxides and sulfates which will precipitate. Fluorides are removed by the formation of calcium fluoride. These compounds are removed in a clarifier by settling. Lime solids, referred to as "sludge", generated from the operation of the clarifier are placed in sludge ponds for additional settling, dewatering and storage.

Potential Routes of Migration

The LRSP and Schmidt Lake are unlined impoundments constructed on native soils in the Willamette River flood plain; thus, flooding is one potential cause of contaminant migration. Because the ponds are unlined, they could also be a source of groundwater contamination. Another possible route is dermal contact with the sludge by onsite workers or trespassers. A fourth potential route; dust, is a major concern because the dried sludge material can be spread by wind. Some dust is created when the surface of Schmidt Lake dries during the summer, and more could be created by sludge treatment or removal activities. Fortunately, most of the sludge contains a high percentage of water, which limits its migration as a dust.

SUMMARY OF SITE RISKS

The following assessment is based on the data generated and presented in the TWCA Operable Unit Remedial Investigation (OURI) report and deals only with the potential hazards associated with exposure to the sludges in the ponds. Any potential hazards associated with contaminated soils beneath or surrounding the sludges or with groundwater associated with the ponds will be evaluated as part of the overall site RI/FS. A baseline risk assessment is a part of the overall RI/FS.

Identification of Contaminants of Concern

During the OURI, sludges in the LRSP and Schmidt Lake were found to contain inorganic elements, organic compounds, and radionuclides. In estimating average concentrations, a value of one-half the method detection limit (MDL) was assumed for cases where no detectable contaminant quantities were found. Of all the chemicals measured in the sludges, the inorganic elements, particularly zirconium, were found in the highest concentrations.

Thirty-four chemical substances were detected and positively identified in the LRSP and Schmidt Lake sludges during the RI. In addition, several tentatively identified compounds were also detected. Of the 34 positively identified chemicals, 26 are chemicals of concern and potential contributors to public health risk.

For carcinogens, since there is no safe dose, an estimate of the likelihood of developing cancer is derived from the average daily dose over a lifetime multiplied by the potency factor for that particular chemical. The potency factor is the plausible upper bound estimate of the probability of a response per unit intake of a chemical over a lifetime. EPA has developed a classification system (A-E) for chemicals which have been evaluated as potential carcinogens. The system is based on a weight of evidence scheme, with those chemicals being known human carcinogens considered as A carcinogens and those for which there is no evidence of carcinogenicity in the E category.

For non-carcinogens, the average daily dose over the period of exposure is compared to a reference dose or other toxicity constant. A reference dose is an estimate (with a safety factor of 10 to 1000) of a daily exposure level for the human population that could occur without producing harmful health effects. Non-carcinogenic effects include behavior changes, nervous system disorders, birth defects, and damage to kidneys, blood, liver and lungs.

Carcinogens

Twelve (non-radionuclide) chemicals found in the pond sludges may cause cancer. Three elements--arsenic, chromium, and nickel--are known to have the potential for causing cancer in humans when inhaled. Analyses done at TWCA were for total chromium, with the type unspecified; in order to be more protective of public health, this risk assessment is based on chromium VI (the most toxic form). Eight chemicals are probable human carcinogens through either ingestion or inhalation (Group B) and one is a possible human carcinogen (Group C). Potency estimates and EPA classification for these chemicals are provided in Table 5.

TABLE 5

TELEDYNE WAH CHANG
OPERABLE UNIT NUMBER ONE
HUMAN HEALTH RISK ASSESSMENT

CONTAMINANT	CANCER POTENCY ORAL (mg/kg/d)^(-1)	CANCER POTENCY INHALATION (mg/kg/d)^(-1)	EPA CLASSIFICATION
Arsenic	1.50E+00	1.50E+01	A
Beryllium	4.80E+00	8.40E+00	B2
Bisethylhexylphthalate	1.40E-02		B2
Cadmium		6.10E+00	B1
Chromium VI		4.10E+00	A
Hexachlorobenzene	1.67E+00		B2
Methylene chloride	7.50E-03	1.40E-02	B2
Nickel		8.40E-01	A
Tetrachloroethene	5.10E-02	3.30E-03	B2
Trichloroethene	1.10E-02	1.30E-02	B2
1,1 Dichloroethane		9.10E-02	C

Radionuclides

The presence of uranium, thorium, and radium isotopes in the sludges from Schmidt Lake and the LRSP presents the potential for radiation induced cancer. In the Teledyne Wah Chang Endangerment Assessment (part of the Operable Unit Feasibility Study), the committed dose equivalent was converted into an estimate of cancer risk using conversion factors from the "Effects on Populations of Exposure to Low-Levels of Ionizing Radiation" NAS, (1980), ranging from 67 to 227 cancer deaths per million-man-rem. These factors suggest that if one million individuals were each to receive one rem, then 67 to 227 excess cancer deaths would be observed. These conversion factors may be translated into estimates of individual cancer risk. The individual cancer death risk is 6.7×10^{-4} per rem. Recent information indicates that the maximum number of cancer deaths per million-man-rem should be 400 instead of 227. The new number of 400 cancer deaths per million-man-rem was used in the supplementary assessment to estimate maximum cancer deaths from radiation exposure. Radiation induced cancer is assumed to be fatal and chemically induced cancer may or may not be fatal.

Non-Carcinogens

For the non-carcinogens, antimony is likely to produce the most severe effect from the ingestion exposure route; barium from the inhalation route. Zirconium, which occurs at the highest concentration, is not acutely toxic, but accumulates in the body and may produce chronic effects.

Exposure Assessment

Under current and future operating conditions, if no cleanup actions are undertaken at the site, the most likely exposures are for workers and trespassers coming into direct contact with the chemicals in the sludge. In addition, if land use patterns change and the sludge site is opened to residential development, onsite residents may be exposed to contaminated sludges.

In order to estimate potential health risks from contact with the sludge, four exposure scenarios were evaluated in the risk assessment. Two scenarios were used to describe operations continuing at the facility with no corrective action. Under these two scenarios workers were assumed to come into direct contact with pond sludges for an average of 10 years and a maximum period of 40 years. For future risks, if the sludge site should become residential, it was assumed that the average resident would live on the site for 35 years and would be in direct contact with the sludges for 22 to 365 days per year. For the highest residential exposure, it is assumed that an individual would be in direct contact with the pond sludges for his or her entire lifetime (75 years) for 66 to 365 days per year.

Exposure estimates (total dose over a lifetime for carcinogens and over the exposure period for non-carcinogens) for ingestion of contaminated sludges and skin absorption of chemicals were based on average and maximum concentrations of chemicals measured in pond sludges. If the ponds dry, the sludges could be dispersed into the atmosphere by the wind or man's actions. In order to complete the assessment for inhalation of chemicals, maximum particulate concentrations were assumed to be equivalent to the federal particulate standard of 150 ug/cubic meter (National Ambient Air Quality

Standards, 40 CFR 50, particulate matter less than or equal to 10 microns, 24 hour average). A particulate concentration of 50 ug/cubic meter was used as an average exposure condition. In addition, contaminant concentrations were assumed to be the same in the airborne particulates as they are in the sludges, with particles being 100 percent respirable.

Risk Characterization

A summary of risk estimates for exposure to contaminated sludges is given in Table 6. As this is only a preliminary assessment for a portion of the TWCA facility, the summary risk estimates should not be viewed as a statement about health risks to residents in the vicinity of the site. The risk estimates presented in this report are representative of long term exposures to chemicals in the ponds (from 10 to 75 years) for average and maximum worst case scenarios. Future residential development on the sludge site without cleanup of the contaminants in the ponds is clearly the maximum worst case scenario. The purpose of evaluating this unlikely event is to provide EPA and the public with sufficient information to make a decision regarding the necessity for cleanup of toxic materials in the environment.

Another scenario which is viewed as a potential worst case event is the movement of contaminants into the Willamette River or nearby residential areas due to flooding. The probability of a flood overtopping the ponds has been estimated at a one in 500 year event. Due to this relatively small likelihood, and difficulty in predicting how contaminants would disperse if such an event should occur, risk estimates were not completed for this exposure pathway. However, one can assume that the residential scenario provides a measure of what health effects would be predicted if contact with contaminants should occur over a long period of time. Health risks due to flooding should not exceed those which are predicted for a residential exposure.

Cancer Risk Estimates

The risk of developing cancer ranges from less than one chance in one million to greater than one chance in one thousand, depending on the level and length of exposure. For onsite workers, the greatest risk of developing cancer is under maximum exposure conditions (40 years at work). Nickel, chromium VI, arsenic, and hexachlorobenzene are the major contributors to the increased cancer risk. The potential risk of developing cancer for people who may reside onsite in the future, if no action is taken, ranges from an additional cancer risk of one in one thousand to three in one thousand for exposure over a lifetime. Nickel, chromium VI, arsenic and hexachlorobenzene are also the major chemicals contributing to the cancer risk for this scenario.

The risks of death from cancer due to exposure to radionuclides if no cleanup action is taken are equivalent to those from other chemicals, ranging from seven in one million to one in one thousand. The greatest risk is for residents under maximum exposure conditions (75 years direct contact with pond sludges).

Non-cancer Risk Estimates

Under current or future operating conditions, risks of health effects other than cancer are only expected for the highest worker exposure (40 years

TABLE 6

TELEDYNE WAH CHANG
OPERABLE UNIT NUMBER ONE
HUMAN HEALTH RISK ASSESSMENT
RISK SUMMARY TABLE

EXPQSURE SCENARIO	EXPOSURE ROUTE	EXCESS LIFETIME CANCER RISK	HAZARD INDEX
FUTURE-NO ACTION* AVE. RESIDENT		NON-RADIOISOTOPES	
	INGESTION	8 x 10-05	1.2
	INHALATION	4 x 10-05	0.1
		RADIOISOTOPES	
	INGESTION	4 x 10-06	
	INHALATION	2 x 10-04	
	TOTAL RISK	3 x 10-04	1.3
FUTURE-NO ACTION* UPPER BOUND RESIDENT		NON-RADIOISOTOPES	
	INGESTION	1 x 10-03	10.8
	INHALATION	1 x 10-03	5.7
		RADIOISOTOPES	
	INGESTION	1 x 10-04	
	INHALATION	1 x 10-03	
	TOTAL RISK	3 x 10-03	16.5
FUTURE-NO ACTION* AVE. WORKER		NON-RADIOISOTOPES	
	INGESTION	4 x 10-07	0.05
	INHALATION	5 x 10-06	0.05
		RADIOISOTOPES	
	INGESTION	8 x 10-08	
	INHALATION	7 x 10-06	
	TOTAL RISK	1 x 10-05	1.0
FUTURE-NO ACTION* UPPER BOUND WORKER		NON-RADIOISOTOPES	
	INGESTION	8 x 10-05	1.1
	INHALATION	5 x 10-04	4.1
		RADIOISOTOPES	
	INGESTION	3 x 10-05	
	INHALATION	5 x 10-04	
	TOTAL RISK	1 x 10-03	5.2
SHORT-TERM WORKER**		NON-RADIOISOTOPES	
	INGESTION	1 x 10-06	0.74
	INHALATION	9 x 10-07	0.06
		RADIOISOTOPES	
	INGESTION	4 x 10-06	
	INHALATION	1 x 10-05	
	TOTAL RISK	2 x 10-05	0.8

TABLE 6 (cont'd)

TELEDYNE WAH CHANG
OPERABLE UNIT NUMBER ONE
HUMAN HEALTH RISK ASSESSMENT
RISK SUMMARY TABLE

EXPOSURE SCENARIO	EXPOSURE ROUTE	EXCESS LIFETIME CANCER RISK	HAZARD INDEX
TRESPASSER**		NON-RADIOISOTOPES	
	INGESTION	2 x 10-06	0.06
		RADIOISOTOPES	
	INGESTION	3 x 10-06	
	TOTAL RISK	5 x 10-06	0.06

*EPA, September 1989 Supplemental Risk Assessment
**Teledyne Wah Chang Albany, Operable Unit Number One Endangerment Assessment, August 1989

at the site.) Barium is the only chemical for which the average daily dose exceeded the reference dose. This was due to the high maximum concentration found at the site. At average concentrations, barium would not present a health risk.

Under a future no action assessment, the non-carcinogens are not a source of health risks to people under average residential conditions. However, under maximum exposure (high contact rates, longer duration and maximum concentrations) the risks of adverse health effects will exceed acceptable limits. The average daily dose of barium, nickel and uranium would exceed their respective reference doses under these maximum exposure conditions.

DESCRIPTION OF ALTERNATIVES

In the FS for this operable unit, seven cleanup alternatives, representing three different types of remediation--containment, onsite landfilling, offsite landfilling--were developed and analyzed in detail. Of these, the four most feasible and protective (numbers 1, 5, 6, and 7) were considered in the Comparative Analysis of Alternatives. The other three represent the same range of alternatives, with minor technical variations. The four alternatives given detailed evaluation are discussed below and in the following section, using the numbers assigned to them in the FS and Proposed Plan.

Offsite transportation of the sludge is a component of several remedial alternatives considered for this operable unit. Under a worst-case scenario, risk to workers from a spill is considered to be the same as for workers doing cleanup onsite.

The sludge is not a characteristic or listed hazardous waste under the Resource Conservation and Recovery Act (RCRA), so the Land Disposal Restrictions are not applicable and were not a consideration in selecting alternatives.

This Interim Action addresses only the sludge materials stored in the LRSP and Schmidt Lake, since they are the source of the contaminants of concern. The surrounding and underlying soils and dikes which will remain after any sludge relocation actions occur will be investigated as a part of the overall site RI/FS which is currently underway. The restoration of the wetlands or filling of the excavated ponds will also be part of the larger site study. The sludge materials can be visually distinguished from the soils forming the bottom and sides of the storage ponds.

Alternative 1: Consolidation, Barrier Wells, Capping, Flood Protection

This alternative consists of moving the sludge from Schmidt Lake into the LRSP, pumping and treating the groundwater downgradient of the impoundment, stabilizing the dikes, and capping the sludge to minimize infiltration of precipitation.

During the excavation of Schmidt Lake and transportation to the LRSP, dust control measures would be implemented as needed, including wetting of the surface sludge if necessary.

Approximately eight barrier wells would be installed in a semicircle formation downgradient of the LRSP. Extracted groundwater from each well would be channelled to a pipe for return to the existing plant wastewater treatment system for treatment and discharge.

According to an investigation by a TWCA contractor (Dames and Moore) in 1981, the existing LRSP dikes would be unstable during a major flood. Therefore, this alternative incorporates measures for stabilizing the dikes. This work would be accomplished by conventional earth-moving and compacting equipment.

An impermeable cap would be installed to minimize the infiltration of surface water into the LRSP and reduce migration of contaminants to groundwater. Capping would also eliminate dust and reduce radon flux. Dike stabilization will reduce the risk of contaminant dispersal by flooding. This alternative does not include any form of treatment of the sludge.

Applicable or relevant and appropriate standards (ARARs) include Executive Orders 11988 (Protection of Floodplains) and and 11990 (Protection of Wetlands), the Oregon Solid Waste Regulations (for capping), and State Historic Preservation Office regulations on identifying the potential for historic artifacts in previously undisturbed areas. The onsite wastewater treatment plant is subject to Clean Water Act requirements, including an NPDES permit. Clean Air Act and Occupational Safety and Health Administration (OSHA) regulations would apply during construction.

Operation and maintenance (O&M) for the barrier wells would be required for approximately 30 years. O&M for the flood protection and cap would consist of inspection and repair of observed damage twice each year. Groundwater would be monitored quarterly.

Implementation time for this alternative is estimated to be approximately one year, and present worth costs are estimated at $1.8 million.

<u>Alternative 5: Removal, Solidification, Onsite Disposal</u>

This alternative consists of constructing an onsite landfill east of the present farm ponds, removing the sludge from the LRSP and Schmidt Lake, solidifying the sludge by adding a solidification agent such as Portland cement, and placing it into the landfill.

The onsite landfill would be designed to contain the sludge with minimal infiltration from precipitation. The major features of the landfill would include:

- Above-grade construction to prevent infiltration of groundwater into the fill (the seasonal high water table in the area of the farm site is 1-3 feet below the existing ground surface).
- A gravel underdrain system to ensure that the water table remains below the bottom liner.
- A composite liner constructed above the gravel underdrain. Leachate (liquid runoff from the landfill) is not expected because the solids are nonbiodegradable and would be partially solidified; if leachate occurred, it would be pumped from the sump into containers or a tank truck and taken to the wastewater treatment plant.
- A landfill cover.

In order to mix the sludge with Portland cement (or whatever agent is selected), it would be removed from the river ponds and transported approximately one mile to the solidification mixing plant located near the landfill. Once solidified, it would be placed into the new landfill. The proposed solidification process is not total solidification but a partial treatment designed to improve handling and reduce moisture content in the sludge. The solidification process also reduces leachate potential by chemically treating the sludges to bond the metal compounds within the sludge matrix.

Treatment of the sludge will reduce the gross mobility of the metal compounds, and landfilling will make the contaminants less accessible to human contact. This alternative also removes the contaminated materials from the flood plain. It would not reduce toxicity of the contaminants.

ARARs for this alternative include the substantive requirements of the Oregon Solid Waste Regulations for the landfill (though a permit will not be required). Clean Air Act and OSHA regulations will apply during construction. Wetlands should not be affected.

O&M for the landfill would consist of sampling and testing groundwater from monitoring wells, monitoring the leachate collection system, and inspecting and repairing any damage to the landfill.

This alternative would take approximately 2 years to implement. Present worth costs are estimated at $12.8 million.

Alternative 6: Removal, Offsite Disposal Without Treatment

Under this alternative, the sludge would be excavated and placed on a concrete slab where it would be allowed to drain excess water. It would then be loaded into watertight containers and hauled to a permitted disposal facility. Two new solid waste landfills in north-central Oregon which have recently been permitted and have the capacity to accept the solids are considered as possible facilities. Both are remote from population centers, with a depth to groundwater of at least 100 feet below ground surface and net annual precipitation of 4 inches or less. Both landfills have expressed an interest in receiving the sludges, which would be disposed in a cell separate from other wastes. A specific landfill would be selected as part of the Remedial Design process.

As with the preceding alternative, the sludge would be removed permanently from the flood plain, and the potential for human contact would be even further reduced by the landfill cap. The sludge would not be treated.

ARARs for offsite disposal include the Oregon Solid Waste Disposal Regulations. Both landfills being considered in Oregon already have state permits under these regulations. Hauling would need to be performed by a contractor authorized by the state as a solid waste hauler and in compliance with state of Oregon Public Utility Commission rules. Clean Air Act and OSHA regulations would again apply during construction.

There would be no O&M under this alternative, aside from routine maintenance to be performed by the landfill operator. Implementation time would be approximately 8-9 months. Present worth costs are estimated at $8.5 million.

Alternative 7: Removal, Solidification, Offsite Disposal

This alternative is the same as the preceding one, except that the sludge would be partially solidified with Portland cement (as in Alternative 5) prior to offsite disposal. From the solidification plant, it would be hauled to an offsite landfill.

The advantages of offsite disposal would be combined with the reduction of gross mobility by partial solidification. ARARs would be the same as for Alternative 6.

There would be no O&M required under this alternative, except for landfill maintenance as under Alternative 6. Implementation would take approximately 9-10 months. Present worth costs are estimated at $10.7 million.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Each of the four alternatives described in the preceding section was evaluated according to the following nine criteria:

Threshold Criteria

1. Protectiveness of human health and the environment: whether or not the remedy provides adequate protection or describes the mechanisms for controlling risk for the different exposure pathways.

2. Compliance with ARARs: whether or not the remedy ensures compliance with ARARs of other federal and state environmental standards or statutes.

Primary Balancing Criteria

3. Long-term effectiveness and permanence: the ability of the remedy to provide protection and reduce risks to health and the environment after cleanup goals have been met.

4. Reduction of toxicity, mobility, or volume through treatment: the anticipated effectiveness of treatment technologies used.

5. Short-term effectiveness: the speed with which the remedy achieves protection, as well as any adverse effects which it may create during construction and implementation.

6. Implementability: the technical and administrative feasibility of the remedy.

7. Cost: includes capital and O&M costs.

Modifying Criteria

8. State acceptance: whether the state concurs with or opposes the remedy.

9. Community acceptance: whether or not the remedy is acceptable to the community, and how it addresses their continuing concerns about the site.

The following section describes how each alternative meets the various criteria. Table 7 provides a summary of the criteria assessment.

1. Protectiveness of Human Health and the Environment

Alternative 7 is the most protective, because it reduces contaminant mobility through solidification, removes the sludge from the flood plain, and places the sludge in a place where it will have minimal contact with the environment by any pathway (dermal, air, groundwater).

Alternative 6 is the next most protective, as it reduces risk of contact and removes the sludge from the floodplain, although it does not reduce contaminant mobility. Alternative 5 reduces mobility and removes the sludge

Table 7
SUMMARY OF CRITERIA ASSESSMENTS FOR INDIVIDUAL ALTERNATIVES

Criteria	Alternative 1 Barrier Wells, Capping, Flood Protection	Alternative 5 Removal, Solidification, Onsite Disposal	Alternative 6 Removal, Offsite Disposal As-Is	Alternative 7 Removal, Solidification, Offsite Disposal
Overall Protectiveness				
Human Health Protection				
- Direct Contact/Solids Ingestion	Capping would reduce access to solids.	Landfilled solids would be inaccessible.	Solids landfilled in north central Oregon site would be remote from population centers and essentially inaccessible.	See Alternative 6. Effectiveness enhanced by solidification.
- Inhalation of Dust, Radon, Organic Vapors	Capping would prevent migration of metals and trace radionuclides in dust. Would reduce radon flux and volatilization of organics.	Landfilling would prevent migration of metals and trace radionuclides in dust. Would reduce radon flux and volatilization of organics. Solidification enhances protectiveness.	Landfilling would prevent migration of metals and trace radionuclides in dust. Would reduce radon flux and volatilization of organics.	See Alternative 5.
- Ingestion of Groundwater	To be addressed during overall site RI/FS.	See Alternative 1.	See Alternative 1.	See Alternative 1.
Environmental Protection				
- Dispersal by Flooding	Reduces risk of dispersal by flooding by stabilizing dikes.	Prevents dispersal by flooding by removing solids from the 500-year floodplain. Solidification enhances effectiveness.	Removes solids from floodplain.	See Alternative 5.
- Migration of TDS to Groundwater	Capping and barrier wells curtail further migration of TDS to groundwater.	Lined landfill prevents migration of TDS to groundwater.	Lined landfill, arid climate, and distance to groundwater minimizes risk of migration of TDS to groundwater.	See Alternative 6. Solidification enhances effectiveness.
- Aquifer Restoration	To be addressed during overall site RI/FS.	See Alternative 1.	See Alternative 1.	See Alternative 1
Compliance with ARARs	Satisfies solid waste closure requirements for closure of an existing solid waste disposal unit. Barrier wells may be needed indefinitely to prevent groundwater from entering the solids, and for use in long-term monitoring. Public access to the area must be restricted. Coordination with DEQ will be needed to comply with regulations governing wetlands, rivers, streams, and floodplains. An archaeological survey would be required for newly disturbed areas.	Solidification of LRSP solids and construction of new solid waste landfill would satisfy solid waste disposal and closure requirements. Long-term maintenance and monitoring of the landfill would be required, as well as treatment of any leachate collected. Public access to the area must be restricted. Coordination with DEQ will be needed to comply with regulations governing wetlands, rivers, streams, and floodplains. An archaeological survey would be required for newly disturbed areas.	Offsite disposal of solids from the LRSP and Schmidt Lake in a licensed solid waste disposal facility would satisfy solid waste disposal requirements. The solids would have to pass the paint filter test prior to disposal. The solids must be transported by a licensed hauler in approved vehicles.	Solidification of LRSP solids, and disposal of Schmidt Lake and LRSP solids in a licensed solid waste disposal facility would satisfy solid waste disposal requirements. The solids must be transported by a licensed hauler in approved vehicles.

Table 7
(Continued)

Criteria	Alternative 1 Barrier Wells, Capping, Flood Protection	Alternative 5 Removal, Solidification, Onsite Disposal	Alternative 6 Removal, Offsite Disposal As-Is	Alternative 7 Removal, Solidification, Offsite Disposal
Long-Term Effectiveness and Permanence				
Magnitude of Residual Risk				
- Direct Contact/Solids Ingestion	Risk of direct contact/ingestion would be minimized with capping.	Minimal residual risk; solids would be solidified, totally enclosed in secure, monitored landfill.	Minimal residual risk. Solids landfilled at north central Oregon site would be remote from population centers and inaccessible.	See Alternative 6. Risk further reduced by solidification.
- Inhalation of Dust, Radon, Organic Vapors	Risk of inhalation of metals, trace radionuclides, and radon, and volatilization of organics would be minimized with capping.	Minimal residual risk of dust inhalation; radon exhalation and volatilization of organics would be reduced/eliminated by capping.	See Alternative 5.	See Alternative 5.
- Ingestion of Groundwater	To be addressed during overall site RI/FS.	See Alternative 1.	See Alternative 1.	See Alternative 1.
- Dispersal by Flooding	Would minimize but not eliminate risk of dispersal of solids by flooding.	Residual risk prevented.	Residual risk prevented.	Residual risk prevented.
- Migration of TDS to Groundwater	Some residual risk of further TDS to groundwater.	Risk minimized as long as integrity of lined landfill is maintained. Risk further reduced by solidification.	Risk minimized as long as integrity of lined landfill is maintained. Residual risk is also reduced by arid climate, depth to groundwater, and distance to groundwater discharge.	See Alternative 6. Risk further reduced by solidification.
Adequacy and Reliability of Controls				
- Reliability of Technologies	All technologies are simple, straightforward, and reliable.	Exact results of pozzolanic reaction cannot be predicted because of variability of solids. Increase in structural strength, reduction of gross mobility, and binding of interstitial water can be expected. Possible reduction of radon flux. Other technologies straightforward and reliable.	Reliable.	See Alternative 5.
- Long-Term Management	Operation of the barrier wells, maintenance of cap, and monitoring and treatment of the pumped water would be required. (Restoration of the aquifer in this area will be evaluated in the overall site RI/FS and may subsume the function of the barrier wells.)	Required for maintenance to ensure integrity of landfill.	Long-term management provided as integral part of existing landfilling service, under regulation by state.	See Alternative 6.
- Long-Term Monitoring	Required to prevent future migration of TDS to groundwater.	See Alternative 1.	Provided as integral part of existing landfill service, under state regulation.	See Alternative 6.
[illegible]d for 5-year Review	Needs periodic (5-year) review.	Needs [illegible]c (5-year) review.	No periodic review required.	No periodic review [illegible]ed.

15
~1

Table 7
(Continued)

Criteria	Alternative 1 Barrier Wells, Capping, Flood Protection	Alternative 5 Removal, Solidification, Onsite Disposal	Alternative 6 Removal, Offsite Disposal As-Is	Alternative 7 Removal, Solidification, Offsite Disposal
- Potential Need to Replace Technical Components	If components are given ongoing maintenance to prevent erosion, they should last indefinitely. Mechanical components, such as pumps, and screens, would need to be replaced periodically. Vendor estimates life of HDPE in absence of specific damage at 1,800 years.	See Alternative 1.	Operation, maintenance, closure, and post-closure will be performed in accordance with Oregon Administrative Rules in force at the time. No need to replace landfill components is anticipated.	See Alternative 6.
- Magnitude of Risk if Technical Components Fail	Risk to human health and environment if further migration of contaminants to groundwater occurs will be determined during overall site RI/FS. If dike failed or were breached during a flood, lime solids might be washed downstream, dispersed so widely as to be greatly diluted. High water at low velocities, however, might spread the solids over a smaller area as the flood receded, leaving a discernible layer of lime solids accessible to receptors.	Risk posed by contaminant migration to groundwater will be determined during overall site RI/FS. Likelihood of both landfill and pozzolanic reaction failing is small.	Geographic location and hydrogeologic setting are such that risk to human health and environment if technical components fail is minimal.	See Alternative 6.
<u>Reduction of Toxicity, Mobility, or Volume Through Treatment</u>				
Treatment Process	No treatment used.	Solidification.	No treatment used.	Solidification.
Toxicity	Waste is not amenable to reduction of its main toxic constituents through treatment.	See Alternative 1.	See Alternative 1.	See Alternative 1.
Mobility	Does not treat waste to reduce mobility.	Solidification reduces gross mobility; increases structural strength; binds interstitial water reducing TDS migration; reduces radon flux. Metals and radionuclides remain immobile.	See Alternative 1.	See Alternative 5.
Volume	Reduction of volume (by dewatering) would increase concentration of radionuclides, level of radon flux, and dust generation.	See Alternative 1.	See Alternative 1.	See Alternative 1.
Irreversibility	Not applicable--no treatment.	Pozzolanic reaction is irreversible. Resistance to physical degradation of treated solids cannot be predicted with certainty because of high TDS levels, including fluorides, chlorides, and sulfates.	Not applicable--no treatment.	See Alternative 5.

Table 7
(Continued)

Criteria	Alternative 1 Barrier Wells, Capping, Flood Protection	Alternative 5 Removal, Solidification, Onsite Disposal	Alternative 6 Removal, Offsite Disposal As-Is	Alternative 7 Removal, Solidification, Offsite Disposal
Inherent Hazards Reduced by Treatment?	No	Possible reductions of radon flux. TDS expected to be less mobile. Metals and other radionuclides remain immobile.	No.	See Alternative 5.
Short-Term Effectiveness				
Protection of Community	Potential dust generation during excavation, hauling, and redisposal of Schmidt Lake will be addressed by wetting of surface solids, prompt cleanup of spills, frequent hosing of residues.	Potential dust generation during excavation, solidification, and landfilling will be addressed by wetting of surface solids, prompt cleanup of spills, frequent hosing of residues.	Potential dust generation during excavation, and hauling, will be addressed by wetting of surface solids, prompt cleanup of spills, frequent hosing of residues. Short-term risk is introduced by transport to landfill. (Rail transport will be investigated if this alternative is selected.)	See Alternatives 5 and 6.
Protection of Workers	Ingestion, prolonged dermal contact, and inhalation should be avoided and reasonable precautions taken. (See Appendix B.)	See Alternative 1.	See Alternative 1.	See Alternative 1.
Environmental Impacts	Short-term impacts from noise, construction, etc., will have minimal effects in this industrial area.	See Alternative 1.	See Alternative 1. Transport to landfill will have environmental impacts associated with truck emissions, traffic.	See Alternative 6.
Time to Achieve Objectives (Does not include planning and design periods.)	Approximately 1 year. Seasonal limitations: cap must be installed during summer, when surface solids are driest and can support workers and light equipment.	Approximately 2 years. Seasonal limitations: landfill construction limited to construction season (April to October) because of seasonally high water table (up to ground surface at times). Heavy winter rains would limit excavation, solidification, and landfilling to construction season.	8 to 9 months. Seasonal limitations: extremely heavy rain at TWCA could limit excavation; extreme cold at landfill could limit placement of waste.	9 to 10 months. Seasonal limitations: extremely heavy rain at TWCA could limit excavation and solidification; extreme cold at landfill could limit placement of waste.
Implementability				
Technical Feasibility				
- Ability to Construct and Operate Technology	Not difficult to construct or operate.	Technologies not difficult to construct, operate. Exact results of pozzolanic reaction cannot be predicted.	Not applicable.	Exact results of pozzolanic reaction cannot be predicted, but technology is not difficult to construct or operate.
- Ease of Undertaking Additional Remedial Actions	Consistent with probable future aquifer restoration under overall site RI/FS.	Beneficial--removes solids permanently from LRSP area, where future aquifer restoration is pr[illegible]e under overall site	Beneficial--removes solids permanently from site.	Beneficial--removes solids permanently from site.

Table 7
(Continued)

Criteria	Alternative 1 Barrier Wells, Capping, Flood Protection	Alternative 5 Removal, Solidification, Onsite Disposal	Alternative 6 Removal, Offsite Disposal As-Is	Alternative 7 Removal, Solidification, Offsite Disposal
- Ability to Monitor Effectiveness of Remedy	Sole remaining pathway is potential migration to groundwater; wells would be monitored.	Sole remaining pathway is potential migration to groundwater in event of landfill failure; wells and leachate would be monitored. Existing groundwater contamination at LRSP will be addressed in overall site RI/FS.	Solids deposited at landfill will be monitored. Existing groundwater contamination at TWCA will be addressed in overall site RI/FS.	See Alternative 6.
- Magnitude of Risk if Monitoring Fails (and exposure pathway goes undetected)	Risk posed by contaminant migration to groundwater will be evaluated during overall site RI/FS.	See Alternative 1. Risk is slight because solids are solidified, landfill is impermeable, leachate collection provided.	Minimal risk if monitoring fails at offsite landfill because of remoteness of site.	See Alternative 6.
Administrative Feasibility	Consult with State Department of Fish and Wildlife if flood protection will require alteration of Truax Creek. Consult with Corps of Engineers if flood protection will significantly alter floodplain. Consult with DEQ to be sure cap satisfies solid waste closure requirements.	Right-of-way of easement needed from Willamette Industries and Burlington Northern Railroad for haul roads between LRSP and the landfill. Consult with DEQ to determine if landfill design satisfies solid waste disposal and closure requirements.	Right-of-way or easement needed from Willamette Industries and Burlington Northern Railroad for haul roads between LRSP and I-5. Consult with DEQ to determine if landfill design satisfies solid waste disposal and closure requirements.	See Alternative 6.
Availability of Necessary Equipment and Specialists				
- Technologies	Technologies are available and have been demonstrated for similar applications.	See Alternative 1.	See Alternative 1.	See Alternative 1.
- Construction	Grading of the LRSP after placing of Schmidt Lake solids will require some expertise by the drag line operator.	Landfill design assumes use of conventional dike construction. Suitable materials are available in vicinity.	Grading of haul roads to I-5 would not pose a problem.	See Alternative 6.
- Equipment	Only conventional equipment will be required.	A system of specialized equipment is required for the solidification treatment plant. Part of the plant will need to be fabricated.	Only conventional equipment required.	See Alternative 5.
- Special Services	A special contractor will be required to install the HDPE liner. Hazardous waste-trained well driller needed for barrier wells.	Special contractors required to install solidification plant and to install HDPE liner.	No special services required.	See Alternative 5.
- Transportation	Dump trucks with tailgate gaskets will be used.	See Alternative 1.	Semitruck-mounted sludge boxes that are water-tight will be used. (Rail transport will be investigated if Alternative 6 or 7 is selected.)	See Alternative 6.
- Offsite Landfilling	Not applicable.	Not applicable.	Available.	Available.

Table 7
(Continued)

Criteria	Alternative 1 Barrier Wells, Capping, Flood Protection	Alternative 5 Removal, Solidification, Onsite Disposal	Alternative 6 Removal, Offsite Disposal As-Is	Alternative 7 Removal, Solidification Offsite Disposal
Costs				
Capital	$1.1 million	$11.3 million	$8.5 million	$10.7 million
Annual O&M	$22,400	$70,700	$0	$0
Future Replacement Costs Average Annual Amount	$9,400	None anticipated.	Not applicable.	Not applicable.
Present Worth				
- At 5 percent, 30 years	$1.6 million	$12.4 million	Same as capital cost.	Same as capital cost.
- At 5 percent, perpetuity	$1.8 million	$12.8 million	Same as capital cost.	Same as capital cost.

from the flood plain, but leaves the sludge in an area where groundwater is high. It would require very careful construction and long-term monitoring to ensure protection of the groundwater.

Alternative 1 leaves the sludge where it is and does not reduce its mobility, though it does offer protection from direct contact and flooding.

2. Compliance with ARARs

The four alternatives would all comply with ARARs; however, some would require more effort than others to comply. Alternatives 6 and 7, for example, involve disposal at landfills already permitted under state regulations, while the onsite landfill required by Alternative 5 would have to undergo inspection and satisfy all substantive permit requirements. Alternatives 1 and 5 would also have to comply with state solid waste regulations for capping and construction. In addition, the greater amount of work at the ponds themselves would be subject to wetlands protection statutes. Alternatives 1 and 5 would require archeological surveys.

3. Long-Term Effectiveness and Permanence

Both Alternatives 6 and 7 would remove the contaminated materials from the site. Long-term maintenance would be the responsibility of the landfill operator or as specified in the applicable state permits and licenses. The solidification aspect of Alternative 7 increases the long-term stability of the sludge.

Alternative 5 is less effective, as it would require O&M on the TWCA site, with higher costs because the groundwater is closer to the surface than at the proposed offsite landfills. Alternative 1 is less effective still, as it leaves the sludges in contact with the groundwater and does not provide any treatment.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment

The nature of the sludge makes treatment by reducing toxicity or volume impracticable. However, the solidification treatment performed under Alternatives 5 and 7 would make the contaminants somewhat less mobile.

Alternatives 1 and 6 do not employ any form of treatment.

5. Short-Term Effectiveness

Alternative 1 presents the least risk to onsite workers, as most of the sludge (except that in Schmidt Lake) would be left where it is and the implementation time is fairly short.

The other alternatives all involve moving the sludge and therefore present more opportunities for workers to be exposed to contaminants. In addition, Alternatives 6 and 7 present the possibility of transportation accidents. Alternative 5 would not present this particular problem, but the longer implementation time would mean greater opportunity for exposure.

6. Implementability

None of these alternatives would be difficult to implement. Alternative 6 would be the most easily implemented, as it involves only removal and transportation. Alternative 7 would add solidification, marginally increasing the time and costs involved. Alternative 1 would be more complicated because of the dike and extraction well construction activities. Alternative 5 would be still more complicated because of additional substantive permit requirements for the onsite landfill, as well as construction of the landfill itself.

7. Cost (estimated)

Alternative 1 is the least expensive: $1.1 million capital for construction and $31,800 annually for O&M.

Alternative 6 is next least expensive, at $8.5 million with no O&M. Alternative 7 would have capital costs of $10.7 million; it too requires no O&M.

Alternative 5, the most expensive remedy, has capital cost of $11.3 million and O&M of $70,700 per year.

8. State Acceptance

The Oregon Department of Environmental Quality (DEQ) has been closely involved with the development and review of the RI and FS processes. DEQ commented on the RI/FS, worked with EPA on the Proposed Plan, and attended the public meeting presenting the Proposed Plan to the community. They also reviewed and commented on the draft Record of Decision (ROD), providing updated information on TWCA's compliance history.

The state's letter of concurrence with the remedy is attached as Appendix B.

9. Community Acceptance

Community members who commented on the Proposed Plan favored Alternative 7. Most agreed that it had the highest level of environmental protection; some felt it was higher than necessary but hoped that this remedy would satisfy community concerns about the site. Some commentors had concerns about the landfilling component of this alternative but preferred it to other options. The most frequent concern voiced by local residents and officials was that the matter should be settled and controversy ended.

The next most popular alternative was number 1, which was seen as providing sufficient environmental protection at a much more reasonable cost. However, those preferring this alternative had no serious objections to number 7. Neither of the other alternatives was preferred by any commenter.

The attached Responsiveness Summary (Appendix A) provides a complete summary of public comments received during the comment period.

THE SELECTED REMEDY

Based upon consideration for the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, both the EPA and the state of Oregon have determined that Alternative 7 (removal, solidification, and offsite disposal) is the most appropriate remedy for Operable Unit #1 at the TWCA site. It has been selected because it consistently ranked among the best choices under all the ranking criteria except cost. It effectively reduces the likelihood of contact with the sludges and ensures that contaminants are not transported into groundwater, surface water or air. Human health and environmental risks associated with the identified routes of exposure will be eliminated or controlled by this remedial action.

Approximately 85,000 cubic yards of sludge will be excavated from the LRSP and Schmidt Lake. The sludge will be mixed with a solidification agent such as Portland cement. This will improve handling characteristics, reduce mobility of contaminants, and increase the structural strength for landfilling and capping. The mixture will then be transported to an offsite permitted solid waste disposal site. The mixture would be placed in a separate monocell (adequately protected from coming into contact with other wastes) and capped in accordance with state and local disposal requirements, applicable permit conditions, and EPA approval. The sludge mixture can be taken to a solid waste landfill because it is not a RCRA hazardous waste. The monocell must have a liner and a leachate control system. This Interim Action, including the removal and relocation of the sludges, is scheduled to be completed within three years of the signing of the Consent Decree.

The sludge relocation removes all of the sludge materials from Schmidt Lake and the LRSP, both areas which could be impacted by a one in 500 year flood. The sludge material must go to a permitted solid waste disposal facility which by definition cannot be in a floodplain. No location or facility is specified by this ROD, but two facilities were identified in the FS which meet the state requirements for a disposal facility. There are also out of state permitted landfill disposal facilities available.

The disposal facility must not comingle the TWCA waste sludge materials with any other waste; i.e., it must be a monofill. This is to facilitate compliance with any monitoring requirements that may differ from those for other wastes. A suitable cap must be placed which prevents sludge exposure to people or the environment outside of the disposal unit. The cap must also protect people from the release of radon contained or created from contaminants in the sludge.

A treatment step is part of this remedy. Prior to relocation in the permitted landfill, the sludges will undergo partial treatment by using a solidification agent like Portland cement. The object of this partial solidification treatment process is to reduce the free water content of the sludges, make the sludges easier to handle using conventional equipment, and reduce the mobility of contaminants by chemical and physical processes. Although this treatment process will not make the sludges into rigid solids, it will improve the final handling characteristics and provide a level of treatment to the sludge materials. The FS identified onsite treatment as part of the recommended alternative. Offsite treatment (e.g., at the disposal facility) may be considered during the design phase, if EPA can be assured it will be performed in accordance with CERCLA and meet ARARS.

The risk reduction by this Interim Action is from an estimated 3 excess cancers in a population of 1000 without any future control actions (assuming an extreme residential use scenario of the actual sludge pond area) to acceptable risk levels of less than 1 excess cancer in a population of 1 million by permanently removing the routes of exposure. Additional environmental risk assessment data is being developed during the overall site investigation. Because the existing sludge ponds are unlined, there is a future risk of contaminated groundwater being exposed to the environment. Relocation of the sludges reduces this risk.

Long term monitoring of the solidified wastes is required and may be the responsibility of the permitted landfill facility. Monitoring and management of the facility are specified in the applicable permit and state laws. EPA must approve the use of any disposal site prior to its accepting the TWCA sludge material.

The estimated cost of the remedy is $10.7 million. The major cost elements as presented in the FS are listed below:

Sludge removal and hauling	$ 590,000
Solidification treatment process	1,586,000
Offsite disposal	6,000,000
Engineering design, bids, contingencies, etc.	2,540,000
Total Costs	$ 10,716,000

The long-term O&M costs, including monitoring, are included as part of the offsite disposal cost. O&M and monitoring are the responsibility of the disposal facility. The cost estimates may change based on final engineering, design, disposal costs, etc. This decision does not specify the treatment process, disposal site or engineering designs. These activities are part of the design phase of this action which occurs during the ROD implementation process.

Performance standards for the ROD include the ARARs for excavation, treatment, transportation, and disposal processes. Partial treatment of the sludge material is required to reduce the water content, to improve handling characteristics, and to reduce contaminant mobility. The degree of solidification will be determined during the design phase. Special landfill cap requirements to prevent radiation release are necessary (4' of cover material plus 1' of clay). Long-term monitoring of any disposal site selected must be consistent with the state of Oregon's minimum requirements.

THE STATUTORY DETERMINATIONS

Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by removing the sludge from the floodplain; eliminating it as a source of onsite groundwater contamination, and placing the material at a site where there will be minimal exposure to it by any pathway. The sludge will be mixed with a solidifying agent to reduce contaminant mobility. Special design features (composite liners, leachate collection, and detection monitoring) will control the migration of contaminants to groundwater at any approved proposed disposal facility. A cap will be placed over the material in accordance with state permit requirements, reducing possible exposure to radon or contaminated dust. Specifically, radon-226 will decay to solid particles before reaching the surface if contained under a cover of approximately five feet of normal soil, or less for compacted clay. A minimum of four feet of final cover, including at least one foot of clay material, would be required at the offsite disposal facilities under consideration.

The proposed offsite disposal facilities will provide protection from exposure to the sludges by dermal contact, ingestion, and inhalation. The sites being considered in Oregon are located in relatively unpopulated areas, with low average precipitation and a minimum of 100 feet depth to groundwater. Should the sludge be disposed in another state, EPA would, regardless of that state's permitting requirements, stipulate that disposal be in a solid waste facility that meets RCRA Subtitle D requirements and includes the following features: monocell, cap, liner, and long-term monitoring.

Compliance with ARARs

The selected remedy of excavation, solidification, and offsite disposal will comply with all applicable or relevant and appropriate chemical-specific, action-specific, and location-specific requirements (ARARs). These are listed below. This analysis does not include ARARs that might apply in states other than Oregon.

Action-specific ARARs:

1. Clean Air Act requirements (40 CFR 50-99) for control of dusts during excavation activities. In addition, the Oregon DEQ regulates emissions of hazardous air pollutants (including beryllium and mercury, two contaminants of concern identified in the sludge) under OAR 340-25-470 and 340-25-480.

2. Oregon Solid Waste Regulations (OAR 340-61), which address the siting, construction and operation of solid waste disposal facilities in the state of Oregon.

3. Occupational Safety and Health Act (29 CFR 1910) requirements for worker protection training and monitoring during remedial action.

4. Oregon State Health Division Requirements (OAR 333-104), which provide standards for protection from radiation hazards.

5. Oregon Environmental Cleanup Rules (OAR 340-122-090), which include requirements to restore the environment to levels of contamination that are equal to background or protective of public health and the environment.

6. Oregon Public Utility Commission Rules, which regulate commercial transportation, including transportation of solid waste.

Chemical-specific ARARs:

1. Clean Water Act requirements for discharges under NPDES permits, which regulate the water removed from the sludges to be treated at the existing TWCA wastewater treatment plant.

   There are currently no chemical-specific ARARs for sludges or solids.

Location-specific ARARs:

1. Executive Order 11988, Protection of Floodplains (40 CFR 6, Appendix A)

2. Executive Order 11990, Protection of Wetlands, which requires that actions minimize the destruction, loss, or degradation of wetlands.

3. National Archeological and Historical Preservation Act, which requires action to recover or preserve artifacts for construction on previously undisturbed ground.

Other Criteria, Advisories or Guidance To Be Considered for the Selected Remedial Action (TBCs):

1. U.S. Regulatory Commission's policy statement on below-regulatory-concern radioactive material (December 12, 1988, Federal Register) was included as criteria considered in evaluating the proposed disposal options.

Cost Effectiveness

The estimated cost to implement the selected remedy is $10.7 million, which was in the middle range of the final alternatives evaluated for this operable unit. This is within an order of magnitude of the costs associated with the least costly alternative (Alternative 1) and requires very low operation and maintenance. It offers several advantages by removing a source of groundwater contamination and providing a much higher degree of certainty that future risks associated with various pathway exposure will be minimized by partially solidifying the sludges and relocating them to a facility designed and permitted for disposal of such wastes.

Land Disposal Restrictions

The selected remedy does not require the placement of any RCRA hazardous wastes either on or offsite. Therefore, the Land Disposal Restrictions do not apply.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

EPA and the state of Oregon have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner. The sludge will be partially solidified to reduce contaminant mobility. The nature of the sludge material (low permeability, insoluble contaminants, low organic content) made it impractical to apply other treatment technology process options that were considered in the initial screening of alternatives. In addition, the treatment options that included further dewatering of the sludge were screened out because of concern over increased dust and radon exposure.

The two permitted offsite disposal facilities identified in the FS would need to provide long term assurance that risks associated with contaminant migration will be minimal. Institutional controls (solid waste disposal permit requirements) will ensure that the sludge mixture will continue to be isolated from the surrounding environment.

Preference for Treatment to Reduce Toxicity, Mobility, or Volume as a Principal Element

The partial solidification proposed in the preferred alternative will help reduce the risk of migration of contaminants to groundwater, increase the strength of the material for landfilling and capping, and provide some reduction of radon release.

As indicated above, the nature of the sludge makes treatment by reducing toxicity or volume impractical. A number of treatment technologies were initially evaluated and screened out for this operable unit.

The FS for the overall TWCA site will evaluate alternatives for reducing toxicity, mobility, and volume of contaminants that are identified in the ongoing RI. The statutory preference for treatment as a principal element of the overall site cleanup will be addressed by the final ROD for this site.

APPENDICES

RECORD OF DECISION
TELEDYNE WAH CHANG ALBANY
OPERABLE UNIT #1
ALBANY, OREGON

Appendix A: Responsiveness Summary

Appendix B: State Letter of Concurrence

Appendix C: Administrative Record Index

December 1988

RESPONSIVENESS SUMMARY
TELEDYNE WAH CHANG ALBANY
OPERABLE UNIT #1 INTERIM ACTION

Overview

The Teledyne Wah Chang Albany (TWCA) facility is located in Millersburg, Oregon (about 3 miles north of Albany) in the Willamette Valley of western Oregon. The TWCA Superfund site includes a 110 acre plant site property and the 115 acre facility known as the "farm site". The entire facility was placed on the Environmental Protection Agency's (EPA) National Priorities List (NPL) in 1983. A Remedial Investigation and Feasibility Study (RI/FS) is underway for the entire facility. This responsiveness summary addresses public comments made regarding a proposed Interim Action at the facility.

This Interim Action addresses cleanup of the Lower River Solids Pond (LRSP) and Schmidt Lake which are unlined surface impoundments that previously received process wastewater from the various operations at the site.

The facility has been operating since 1956 when the Wah Chang Corporation began operation of the U.S. Bureau of Mines Zirconium Metal Sponge Pilot Plant. New facilities have been added at the site which now include the production of zirconium and hafnium-sponge from zircon sands, melting and fabrication operations and facilities for the production of other speciality metals. Solids generated from the process wastewater treatment system have been stored in a number of surface impoundments; including the and Schmidt Lake prior to 1980.

Since 1980 wastewater sludges have been stored in the farm ponds which were originally part of this Interim Action, but will be addressed under the investigation of the entire facility. The TWCA sludges have been the subject of several ballot initiatives, regulatory control processes, and environmental group attention since the early 1980's primarily because of the small amounts of radioactive materials and the location of two of the ponds in the floodplain of the Willamette River. In 1979, TWCA modified their production process to significantly reduce the concentration of radioactive compounds in their wastewater sludges.

In May 1987 TWCA signed an agreement (Consent Order) with EPA to investigate the nature and extent of the contamination problems at the facility and develop alternatives for cleanup where necessary. This work is called a Remedial Investigation and Feasibility Study and is currently underway. As part of this Order, EPA and TWCA agreed to address the LRSP, Schmidt Lake, and Farm Pond sludges prior to completion of the RI/FS for the entire facility. This action was due to concern over the sludges potential contribution to groundwater contamination, public concern over the materials, and their location in the floodplain.

Although the Farm Ponds were part of this investigation, they will be addressed in the RI/FS for the remainder of the site and will be cleaned up if necessary.

On August 16, 1989 EPA's published it's preferred alternative for cleanup of the two sludge ponds in a document called a Proposed Plan. The Proposed Plan as well as the reports of the investigation of the sludges were released for public comment. EPA's preferred alternative included:

- Removal of the sludges from the LRSP and Schmidt Lake,
- Solidification of the sludges by adding Portland cement to improve handling characteristics and to reduce contaminant mobility; and
- Relocation of the mixture to a permitted offsite disposal facility.

Background on Community Involvement and Concerns

As described above, the sludges have been the subject of ballot initiatives, regulatory control processes and concern by environmental groups. Local residents, state legislators, city (Albany and Millersburg) officials, and the media have all expressed interest in the TWCA sludges over the years. Recently, local officials have expressed their support for TWCA and EPA's Proposed Plan.

Environmental activists affiliated with statewide or national organizations have been particularly involved in the activities related to the TWCA sludges. By far the most vocal of these has been Forelaws on Board of Portland, Oregon, which has been involved in sponsoring three ballot measures aimed at insuring the sludge pond wastes are removed from the floodplain and treated as low-level nuclear wastes. Greenpeace has also been interested in TWCA sludges and staged two protests in 1985.

Overall, community concerns centered around the sludges' location in the floodplain, the low level radioactive nature of the sludges, and the potential for groundwater contamination from the unlined storage ponds.

A list of community relations activities conducted by EPA can be found at the end of this summary.

Summary of Comments Received

EPA held a public comment period from August 18, to September 16, 1989, which was extended to October 16, 1989, upon the request of a commentor. Comments and questions raised during the public comment period on the Proposed Plan for Operable Unit #1 of the TWCA site are summarized below and are grouped by category.

As part of the public comment period a public meeting was held on September 6, 1989, at Linn Benton Community College in Albany, Oregon. About 20 people attended the meeting and ten people gave comments. Comments given at this meeting are included in the following summary. The meeting consisted of presentations by EPA staff and CH_2M Hill (TWCA contractors) followed by a question and answer period, and public comments.

Copies of the transcript from the meeting are available at the Albany Public Library, Albany and Millersburg City Halls, EPA's Seattle office and the Portland office of the Department of Environmental Quality (DEQ).

RESPONSIVENESS SUMMARY

Superfund Process and Policy

The following comments were made about the process used to arrive at the preferred alternative.

Comment: One commentor was concerned about separating the sludges as an operable unit from the rest of the site. The commentor was concerned about information that is to be developed in the future (during the overall site RI/FS) that may impact the decision now being made for the sludges.

Response: EPA's Proposed Plan for the sludge ponds was selected while considering future long term options. EPA believes the action will be consistent with future actions; however, it will be reviewed for consistency as part of the overall site RI/FS.

Comment: One commentor expressed concern that the sludge issues were not only of concern locally but that individuals state-wide have been interested. The commentor suggested that additional public meetings be held in Salem and Portland.

Response: CERCLA §117(a)(2) provides for an opportunity for public meetings on the Proposed Plan to be held "at or near the facility at issue". Although this does not preclude holding additional meetings elsewhere, EPA believes that the meeting was widely publicized offering an opportunity for anyone to attend. The meeting was primarily publicized through the fact sheet which was sent to all individuals who had previously been interested including individuals outside the Albany area. A notice of the meeting was also published in the newspaper. EPA extended the public comment period for an additional 30 days, during which time no additional requests for public meetings in other locations were received.

Comment: One commentor stated that further evaluation should be conducted to determine how each alternative would impact future cleanup activities that may be needed at the site.

Response: This type of evaluation will be part of the overall site RI/FS.

Comment: One commentor suggested that the radiological analyses have all been done by TWCA and that independent sampling and laboratory testing should be done.

Response: EPA contractors have provided oversight for all RI/FS sampling, and analyses of samples has been done with EPA approved methods. EPA has obtained split samples and has analyzed them independently from TWCA labs as part of the oversight. EPA also does quality assurance reviews of all data to insure they meet agency standards, and is satisfied with the quality of the data from the TWCA site.

The split samples for radiological analysis were analyzed by the Oregon Health Division laboratory. The EPA radiation office has also reviewed the radiation oversight program.

The Preferred Alternative

Comment: Several state and local officials, a union leader, and a local newspaper publisher volunteered their support for TWCA and for an expeditious cleanup of the sludges. They hope this will end the years of controversy over the site.

Response: Comment noted.

Comment: One commentor expressed disagreement with screening out Alternative 1, which would cap the sludges in place. He stated that the preferred alternative assumes a greater risk than is actually present, and that public disapproval is not a legitimate reason for discounting an alternative. He further stated that such a lower cost remedy would be sufficiently protective.

Response: The risks to public health and the environment are judged to be higher under Alternative 1 than Alternative 7, because Alternative 1 does not reduce the mobility of the contaminants, and groundwater is adversely effected. Also, Alternative 1 requires long-term maintenance of dikes, and groundwater pumping and treatment. Therefore its long-term effectiveness is less certain than Alternative 7.

Comment: A local official noted that preference for Alternative 7 seems to be based partly on the reduction of risk that would result from removing the sludges from the floodplain. However, the commentor noted that it appears there is no evidence that a flood which dispersed the sludges would cause detectable contamination downstream.

Response: EPA considered several factors in its support for Alternative 7 including: removing a potential source of groundwater contamination as the ponds are unlined; and reducing potential human contact with the sludges. Although the risk of dispersal of the sludges through flooding is of concern, the risks resulting from such dispersal cannot be quantified. Because of this uncertainty, Alternative 1 is considered less effective in protecting the environment than other alternatives which remove the sludges from the floodplain.

Comment: One commentor believed that the sludge materials should not be placed in a municipal landfill and that special attention should be given to their disposal.

Response: EPA and Oregon DEQ have determined that the sludges are not "Hazardous Waste" as defined by law. Accordingly, there is no regulatory basis for requiring that the material go to other than an approved solid waste disposal site. However, EPA is requiring that the sludges be placed in a separate area isolated from other wastes (monocell). Also, the monocell must be lined, capped, and regularly monitored.

Comment: Two commentors, who both identified themselves as environmental activists, are concerned that the sludges will be mixed with other wastes when they are disposed in a landfill. They felt that these wastes deserve special attention because they are radioactive.

Response: The sludges would be placed in their own separate cell from other landfill wastes. Radioactivity levels of the sludges are below regulated levels and the landfill cap, which is required as part of the relocation to a permitted landfill, would reduce exposure to the contaminants.

Comment: One commentor indicated that the sludges should be capped with an impermeable cap once placed in the landfill.

Response: A suitable cap will be placed over the waste to reduce exposure to the sludge. The permits for the landfills under consideration contain specific requirements for soil compaction and the permeability of the cap material, which prevents or minimizes the infiltration of rainwater into the fill. The exact design of the cap will be determined during the Remedial Design phase of the project, following the issuance of a Record of Decision.

Supplemental Risk Assessment

The following comments were made about the supplemental risk assessment prepared by EPA. The results of the supplemental assessment were presented at the September 6 public meeting and were published in a document in September 1989 which is available at the information repositories previously mentioned.

Comment: One commentor expressed concern during the public meeting that a full analysis of the risk assessment had not been completed by EPA. The commentor felt that because a written summary was not available at the public meeting, this indicated EPA was not finished with its analysis.

Response: EPA had concluded its further analysis of the risk assessment and had completed a supplemental assessment at the time of the September 6, 1989, public meeting. The final analysis was presented at the meeting, however because written documentation was not available at the time of the meeting, EPA extended the public comment period to October 16, 1989, to allow time for public review and comment on its supplemental risk assessment. This extension was at the request of the commentor.

Comment: A local official commented that EPA used too many assumptions in its supplemental risk assessment that were far from actual existing scenarios.

Response: In order to be protective of public health and the environment over the long term, EPA must look at all possible future uses of a site. Although some of the scenarios used do not exist today, EPA also attempts to protect against future adverse impacts a site may have on public health or the environment.

Comment: Teledyne Wah Chang commented that a risk assessment based on no action was not required as part of the work plan agreed upon between EPA and TWCA. They further commented that a no action alternative was not appropriate.

Response: Although EPA agreed that TWCA did not have to consider a "no action alternative" for the sludges, upon receiving the final reports developed by TWCA and its consultants, EPA felt information on the potential risks if no action were taken was needed to help determine the best course of action. Because EPA had agreed that TWCA need not conduct such analyses, EPA elected to conduct the additional work.

Comment: TWCA indicated that chromium values from the RI were based on total chromium. TWCA commented that assuming that all of the chrome was chrome VI for the supplement risk assessment was inaccurate.

Response: For clarification of the measurements of chromium at the facility see the "Teledyne Wah Chang Albany Endangerment Assessment". Total chromium was measured in sludges from the ponds. Since the type of chromium was not specified, EPA assumed for its supplemental risk assessment that the most toxic form (chromium VI) was present in order to be more protective of public health.

Comment: TWCA commented on the reference "Personal Communication" used to reference a dose conversion factor in the supplement assessment. They felt that using such a reference was insufficient.

Response: References such as "Personal Communication" are used in the risk assessment because at this time certain parameters can only be determined based on best professional judgement.

Comment: TWCA clarified that ambient air modeling of concentrations of the pond solids was performed. TWCA indicated that the results of the modeling showed that the radioactive particulate concentrations averaged 23.5 ug/m^3 for the LRSP and 16 ug/m3 for Schmidt Lake. They indicated that these values were well below the value used in the TWCA endangerment assessment.

Response: EPA was not aware of the modeling described in TWCA's comments. The information provided to EPA by TWCA in their endangerment assessment indicated that ambient air concentrations were based on theoretical levels rather than concentrations predicted through modeling. To maintain consistency with the exposure assumptions used by Teledyne Wah Chang in their endangerment assessment, EPA used the same theoretical concentrations.

Comment: TWCA commented that in conducting the endangerment assessment it used engineering judgement and EPA guidance as well as estimated risks which were likely rather than "extreme". TWCA indicated that its opinion is that estimating risks which are very unlikely (extreme) exposure scenarios provide little or no decision making value unless the actual results show low risk.

Response: EPA finds value in evaluating all possibilities in order to be protective. This allows for a higher degree of confidence and a wider margin of safety in risk management decisions.

Other Concerns

Comment: An environmentalist commented that a careful analysis should be conducted of sludge deposited by TWCA on agricultural fields near the TWCA site.

Response: These fields are currently considered to be outside the boundaries of the TWCA site and thus beyond the scope of this Interim Action. However, further evaluation will be done to determine whether these fields would be appropriately considered as part of the overall site RI/FS. Currently responsibility for this issue belongs to the state of Oregon and this comment has been passed on to DEQ.

Comment: An environmental consultant had specific questions about the process for solidifying the sludges and the requirements for a bidder to bid on the work. Specifically the questions were as follows:

1) Can the Portland cement or other approved material be added to the sludge at the point of delivery (as opposed to on site before transportation)?

Response: Although EPA's proposal called for solidification before transportation, a final decision will be made during "Remedial Design" at which time all of the specific processes will be outlined. The location of an offsite treatment process would have to be as protective to health and the environment as an onsite system to be considered.

2) Would EPA permit a bidder to make a fully loaded 600-mile test run of a specifically designed transport vehicle?

Response: More details would need to be provided but nothing precludes tests to be made prior to final design.

3) Would EPA permit a bidder to use an approved water reduction process in order to reduce the weight of the sludge as well as increase its stiffness?

Response: The action of the solidification process is two-fold: improving the sludge handling characteristics and binding contaminants to reduce migration. The methods for achieving these properties are not specified in the Record of Decision. However, the RI/FS raised concerns about reducing the water content of the sludges because of increased risk of releasing radon.

4) What is the purpose of requiring Portland cement, and can this step be eliminated?

Response: See above. Tests performed on the sludges using Portland cement did improve handling characteristics and improved the binding characteristics of the contaminants.

Attachment

COMMUNITY RELATIONS ACTIVITIES

The following EPA community relations activities have been conducted at TWCA under Superfund:

- December 1982 - site proposed for inclusion on the National Priorities List (NPL).
- October 1983 - site listed on NPL.
- February-May 1987 - local citizens and officials interviewed in order to prepare a Community Relations Plan.
- November 1987 - final Community Relations Plan issued.
- November 1987 - Information Repositories established at Albany Public Library, DEQ (Portland), and EPA Region 10 (Seattle).
- November 1988 - RI/FS work plan for entire facility sent out for 30-day public comment period. Work plan was placed in information repositories and a fact sheet was published.
- February 1989 - Fact sheet published announcing EPA's approval of the final work plan.
- June 1989 - Fact sheet published announcing that TWCA had submitted a draft RI/FS report to EPA for Operable Unit #1.
- August 16, 1989 - Interim Action (Operable Unit #1) Proposed Plan published.
- August 18 - October 16, 1989 - Public comment period for the Interim Action Proposed Plan.
- September 6, 1989 - Public meeting for the Operable Unit #1, Proposed Plan, held in Albany. This meeting was announced in the Proposed Plan and a local newspaper.

APPENDIX B

NEIL GOLDSCHMIDT
GOVERNOR

Department of Environmental Quality

811 SW SIXTH AVENUE, PORTLAND, OREGON 97204-1390 PHONE (503) 229-5696

DEC 20 1989

Mr. Robie G. Russell
Regional Administrator
U. S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

Re: Teledyne Wah Chang Albany
Record of Decision

Dear Mr. Russell:

The Oregon Department of Environmental Quality (DEQ) has reviewed the draft Record of Decision, for Operable Unit Number One (sludges), at the Teledyne Wah Chang Albany (TWCA) Superfund site. DEQ concurs with EPA's selected remedy (i.e., removal, solidification, and off-site disposal), with the following condition:

> If the sludges are to be sent to a disposal site in Oregon, the disposal site must hold a valid Solid Waste Disposal Permit or Hazardous Waste Disposal Site Permit, issued by the DEQ, and must obtain specific written approval from the DEQ to accept these wastes.

I find that this alternative provides the best balance of protectiveness, cost effectiveness, and the use of alternative treatment technologies, as required by ORS 466.573.

I am pleased that DEQ, EPA, and TWCA have reached agreement on this issue. As you know, the presence of these sludges in the floodplain of the Willamette River has been a concern to many Oregonians. I look forward to the swift implementation of the selected remedy and to continued good working relationships with EPA and TWCA on the investigation and cleanup of the remainder of the site.

Sincerely,

Fred Hansen
Director

WD:m
Site\SM2672
cc: Neil Thompson, EPA
Al Goodman, EPA, OOO
Mike Downs, ECD, DEQ
Steve Greenwood, HSW, DEQ

APPENDIX C

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Not included

ADMINISTRATIVE RECORD INDEX

for

TELEDYNE WAH CHANG ALBANY SUPERFUND SITE

Albany, Oregon

October 13, 1989

INDEX TO ADMINISTRATIVE RECORD FOR TELEDYNE WAH CHANG ALBANY

SECTION 1.0 SITE IDENTIFICATION

Doc #	File	Type/Description	Date	Pgs	Author/Organization	Addressee/Organization	Doc Location
1.1 Correspondence							
AR 1.1 0001	1.1 Correspondence	Letter/Preliminary evaluation of radiological aspects of plant operations	5/17/77	2	William Young, Director/ Oregon Department of Environmental Quality (DEQ) and Keith Putman, Administrator/Oregon Sate Health Division (OSHD)	Vincent de Poix, President/Teledyne Wah Chang-Albany (TWCA)	
AR 1.1 0002	1.1 Correspondence	Notes/Discussion with Ted Groszkiewicz from DEQ regarding disposal pits, lagoons, and ponds	5/13/80	3	Bob Stamnes/Ecology and Environment, Inc.	Files	
AR 1.1 0003	1.1 Correspondence	Letter/Sampling of the Willamette River and Conser Slough with attached maps and notes	6/30/81	11	Karen Weliky, Mitchell Lyle, Jack Dymond, and Bill Rugh/Oregon State University	David Stewart-Smith and George Toombs/OSHD	
AR 1.1 0004	1.1 Correspondence	Memorandum/Status report on TWCA as controlled vs. uncontrolled hazardous waste site	11/23/81	9	Hussein Aldis/Ecology and Environment, Inc.	Bill Schmidt/Ecology and Environment, Inc.	
AR 1.1 0005	1.1 Correspondence	Memorandum/Review of status report on TWCA as controlled vs. uncontrolled hazardous waste site	12/02/81	2	Carolyn Wilson/Ecology and Environment, Inc.	J.E. Osborn/Ecology and Environmenta, Inc.	
AR 1.1 0006	1.1 Correspondence	Memorandum/Possible EPA involvement	12/7/81	1	Hussein Aldis/Ecology and Environment, Inc.	Bill Schmidt/Ecology and Environment, Inc.	
AR 1.1 0007	1.1 Correspondence	Background memorandum	9/19/82	3	Unknown	Unknown	
AR 1.1 0008	1.1 Correspondence	Notes/Sampling at sludge ponds	9/27/82	3	Unknown	Unknown	